

Washington State University
2013-2015
Graduate Course Catalog



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Academic Calendar

Fall Semester	2013-14	2014-15
Classes Begin	Aug 19	Aug 25
Labor Day Holiday	Sept 2	Sept. 1
Veterans Day holiday	Nov 11	Nov 11
Thanksgiving Vacation	Nov 25-29	Nov 27
Final Examinations, Monday through Friday	Dec 9-13	Dec 15-19
Final Grades, due 5PM	Dec 17	Dec 23

Spring Semester	2013-14	2014-15
Classes Begin	Jan 13	Jan 12
Martin Luther King Jr. Day	Jan 20	Jan 19
President's Day	Feb 17	Feb 16
Spring Vacation	Mar 17-21	Mar 16-20
Final Examinations, Monday through Friday	May 5-9	May 4-8
Commencement	May 10	May 9
Final Grades, due 5PM	May 13	May 12

Summer Session	2013-14	2014-15
Early Session Begins	May 12	May 11
Memorial Day	May 26	May 25
Eight-Week Session	Jun 9	Jun 8
Late Six-Week Session	Jun 23	Jun 22
Independence Day	Jul 4	Jul 4
Summer Session Ends	Aug 1	Jul 31
Final Grades, due 5PM	Aug 5	Aug 4

Administration of Washington State University

Executive Officers

Elson S. Floyd, President

Daniel J. Bernardo, Interim Provost and Executive Vice President

Board of Regents

www.regents.wsu.edu

Chancellors

Keith Moo-Young

Mel Netzhammer

Lisa Brown

Chancellor, WSU Tri-Cities

Chancellor, WSU Vancouver

Chancellor, WSU Spokane

Academic Deans

Ron Mittelhammer

Patricia Butterfield

Candis Claiborn

Daryll DeWald

William Andrefsky, Jr.

Lawrence Pintak

Gary Pollack

Mike Trevisan

Bryan Slinker

Eric Spangenberg

Jay Starratt

Mary Wack

Grant Norton

College of Ag, Human, and Natural Resource Sciences

College of Nursing

College of Engineering and Architecture

College of Arts and Sciences

Graduate School

Murrow College of Communication

College of Pharmacy

College of Education

College of Veterinary Medicine

College of Business

Libraries

University College

University Honors College

View the entire list online at: publishing.wsu.edu/mailling-services/admin.html

Graduate Education at Washington State University

Washington State University, the State of Washington's land-grant institution, was founded in 1890. The first class of 21 students enrolled on January 13, 1892. Since that time, the University has grown steadily in size and diversity. It now includes 11 colleges and a graduate school, with a total enrollment for all campus locations of over 20,000. The main campus of nearly 600 acres, located at Pullman in the Palouse country of southeastern Washington, encompasses one of the largest residential universities west of the Mississippi. More than 80 percent of all students live on or near campus. In addition to the main campus, Washington State University offers courses of study at three regional campuses located in Spokane, Tri-Cities (Richland), and Vancouver. In addition, the University maintains over 5,000 acres of farmland and eight agricultural research centers located at various points in the state.

Washington State University offers more than 70 degree programs. Permanent tenure-track faculty number over 1,000 and approximately 70 percent of all full-time graduate students hold positions as teaching, research, and/or staff assistants.

The Dean of the Graduate School administers the diverse graduate programs throughout the University, but the faculty are primarily responsible for directing graduate education. The Graduate Studies Committee of the Faculty Senate, composed of faculty members and graduate students, assists the Graduate School in the establishment of the policies and procedures of the Graduate School.

The Graduate School is committed to helping graduate students become learned scholars, effective researchers, and masters of disciplinary and interdisciplinary knowledge. WSU faculty emphasize both independent scholarship, research, and classroom learning. State-of-the-art equipment is present in the research centers and academic departments to help students conduct their research. Close research collaboration between students and faculty helps to create an atmosphere that stimulates intellectual curiosity. The individualized nature of graduate education at Washington State University also provides student with considerable flexibility in designing programs of study, and broadens the possibilities for unique creative endeavors.

The Graduate School may be contacted at:

PO Box 641030

Pullman, WA 99164-1030

509-335-6424

Email: gradsch@wsu.edu

www.gradschool.wsu.edu

Graduate Degrees

All programs are offered on the Pullman campus unless otherwise noted.

Key: (G) Global Campus
(S) Spokane
(T) Tri-Cities
(V) Vancouver

Doctor of Philosophy Degrees (Ph.D.)

Agricultural Economics
American Studies
Animal Sciences
Anthropology
Biological and Agricultural Engineering
Botany
Business Administration
 Accounting
 Finance
 Hospitality and Tourism
 Information Systems
 Management
 Marketing
 Operations
Chemical Engineering
Chemistry
Civil Engineering
Communication
Computer Science
Criminal Justice (S, G)
Crop Science
Economics
Education
 Counseling Psychology
 Educational Leadership
 Educational Psychology
Cultural Studies and Social Thought in Education
Language, Literacy, and Technology
Mathematics and Science Education
Special Education
Electrical and Computer Engineering
Engineering Science
English
Entomology
Environmental and Natural Resource Sciences (T, V)
Food Science
Geology
History
Horticulture (T)
Individual Interdisciplinary Doctoral Program
Materials Science
Mathematics
Mechanical Engineering
Molecular Biosciences
Molecular Plant Sciences
Neuroscience (S, V)

Nursing (S, V)
Nutrition and Exercise Physiology
Pharmaceutical Sciences
Physics
Plant Pathology
Political Science (V, G)
Prevention Science (S, V)
Psychology
 Clinical
 Experimental (V)
Sociology
Soil Science
Veterinary Science
 Combined Anatomic and Pathological Residency
 Combined Clinical Microbiology Residency
 Immunology and Infectious Diseases
 Veterinary and Comparative Anatomy, Pharmacology,
 and Physiology
 Veterinary Clinical Training Program
Zoology

Master of Arts Degrees (M.A.)

American Studies
Anthropology
Apparel, Merchandising, and Textiles
Communication
Criminal Justice (S, G)
Education
 Community Counseling
 Counseling Psychology
 Educational Leadership (S)
 Educational Psychology
 Curriculum and Instruction (S)
 English Language Learners
 Literacy Education
 Special Education
 Sport Management
English
Foreign Languages and Cultures
History (V)
Interior Design
Music
Political Science
Prevention Science (S, V)
Sociology (not listed)
Speech and Hearing Sciences (S)

Master of Business Administration Degrees (M.B.A.)

Master of Business Administration (S, V, T, G)
Master of Business Administration Executive (S) (S not listed) (G)

Master of Science Degrees (M.S.)

Agriculture (G)
Animal Sciences
Applied Economics
Biological and Agricultural Engineering
Botany
Chemical Engineering (T)
Chemistry (T)
Civil Engineering
Computer Engineering
Computer Science (V, T)
Coordinated Program in Dietetics, Nutrition, and Exercise
 Physiology (S) (not listed)
Crop Science
Electrical Engineering (S, T)
Engineering
Entomology
Environmental Engineering (V, T)
Environmental Science (V, T)
Food Science
Geology
Horticulture (T)
Landscape Architecture (S)
Materials Science and Engineering
Mathematics
Mechanical Engineering (V, T)
Molecular Biosciences
Molecular Plant Sciences
Natural Resource Sciences
Neuroscience (S, V)
Nutrition and Exercise Physiology (S)
Pharmaceutical Sciences
Physics
Plant Pathology
Psychology
Soil Science
Statistics
Veterinary Science
 Combined Anatomic and Pathological Residency
 Combined Clinical Microbiology Residency
 Immunology and Infectious Diseases
 Veterinary and Comparative Anatomy, Pharmacology,
 and Physiology (P, S, V)
 Veterinary Clinical Training Program
Zoology

Professional Schools

Pharmacy
Veterinary Medicine

Specialty Degrees

Master of Accounting, M.Acc. (V)
Master of Architecture, M.Arch.
Master of Education, Ed.M.
 Curriculum and Instruction (S, T, V)
 English Language Learners (T, V)
 Literacy Education (T, V)

Special Education (V)
Educational Leadership (S, T, V)
Educational Psychology
Teacher Leadership (S, V)
Master in Teaching, M.I.T. (S, V)
 Teaching (elementary) (S, V)
 Teaching (secondary) (S, V)
Master of Engineering and Technology Management M.E.T.M.
(S, V, T only)
Master of Fine Arts, M.F.A.
Master of Health Policy and Administration (S only)
Master of Nursing, M.N. (V, T)
 Advanced Population Health (S, V)
 Family Nurse Practitioner (S, V)
 Psychiatric/Mental Health Nurse Practitioner (S, V)
Master of Public Affairs, M.P.A. (V)
Professional Science Master's, P.S.M. (G)
Doctor of Design (S only)
Doctor of Education, Ed.D.
 Teacher Leadership (S, T, V)
 Education Leadership
Doctor of Nursing Practice, D.N.P. (S, T, V)

Graduate Certificates

Agribusiness
Bioethics
Biotechnology Management
Constraints Management
Construction Project Management
Contextualized Foreign Language Instruction
Early Childhood Leadership and Administration
Engineering Nanotechnology
Exercise Science
Family Nurse Practitioner
General Engineering Management
Global Justice and Security Studies
Health-Assistive Smart Environment Design
Interdisciplinary Environmental Biogeochemistry
Manufacturing Leadership
Molecular Biosciences
Nuclear Engineering
Nurse Educator
Project Management
Protein Biotechnology
Psychiatric Mental Health Nurse Practitioner
Reproductive Biology
Six Sigma Quality Management
Supply Chain Management
Sustainable Agriculture
Systems Engineering Management

Online Degrees and Certificates

Degrees
Agriculture M.S.
Agriculture, Food Science, and Management, M.S.
Criminal Justice, M.A.

Engineering and Technology Management, M.E.T.M
Master of Business Administration, M.B.A.
Executive Master of Business Administration, Executive M.B.A.
Master's in Special Education
Professional Science Master's in Molecular Biosciences
Sport Management M.A.

Certificates

Bioethics Certificate
Engineering and Technology Management Certificate
Molecular Biosciences Certificate

Interdisciplinary Opportunities

Biotechnology
Clean Technology
IGERT
Environmental Research
Materials Science
Molecular Plant Sciences
School for Global Animal Health

Admission and Registration

Admission

General Information

Admission to Washington State University is granted without regard to age, sex, race, religion, color, creed, disability, national or ethnic origin, sexual orientation, or marital status. Graduates of Washington State University and other colleges and universities whose degrees are recognized by this institution and who meet the requirements for admission to the Graduate School may be admitted. Inquiries and requests for information may be found at gradschool.wsu.edu, or you may write the Graduate School at: The Graduate School, Washington State University, Pullman, WA 99164-1030. You can also contact Graduate School Admissions at 509-335-1446.

Applicants for admission must have or anticipate receiving a bachelor's degree from an accredited school before the start of the semester for which they have applied to the Graduate School. Previous schools must be accredited by a recognized accreditation association. Applicants must have a 3.0 grade point average of graded undergraduate coursework, or from graded graduate coursework where there are 12 or more graded semester hours of graduate coursework taken after the bachelor's degree.

Applicants must have official transcripts from colleges or universities from which any degrees have been granted or are expected, and those transcripts which show the last 60 graded semester or 90 graded quarter hours of undergraduate work. Transcripts are also required from colleges or universities showing graded graduate level coursework taken after the bachelor's degree. Official transcripts are those mailed directly to the Graduate School from the Registrar of the institution attended. Transcripts mailed by the student are not considered official. Complete credentials should be on file at least one month before registration. Transcripts from other institutions cannot be returned. Records of previous work at Washington State University need not be submitted.

The Dean of the Graduate School may approve admission of a student from a foreign university if the student presents a superior academic record, satisfactory evidence of adequate ability in English, and has sufficient financial resources. Such applications should be completed at least six months in advance of the proposed date of enrollment in the Graduate School. International students who have taken graduate courses at other institutions will be accepted only after evaluation of their undergraduate records, and their performance in graduate study and the minimum criteria, described above, is met.

In a graduate program, a student is required to complete appropriate advanced courses to participate in seminars and to make an original contribution of knowledge. At least one academic year of graduate study, or the equivalent, is necessary for the completion of a program leading to a master's degree. The residence requirement for the master's degree is one academic year.

Most advanced degree programs emphasize the preparation of students for careers as productive scholars with research accomplishments. Those who earn advanced degrees often become teachers in institutions of learning, so many departments provide special attention to preparing students for careers in the teaching profession.

Departmental approval is required for any admission regardless of grade point average, and departments may require higher levels of performance than those cited. Because of limitations within certain departments, it may be necessary to deny admission to some qualified applicants. Graduate students are subject to the usual procedures and regulations of the institution and to the Graduate School rules and procedures outlined in the *Graduate School Policies and Procedures Manual*.

Enrollment Requirements

The normal load for a graduate student is 10-18 credit hours per semester (6-8 hours in an eight-week summer session). Graduate students on half-time teaching or research assistantships are expected to carry 10-18 credits per semester with no more than 12 hours of graded credit (3-6 in an eight-week summer session). See the *Graduate School Policies and Procedures Manual* for requirements for graduate students on appointment or taking examinations.

Classification of Students

Regular Student Status

Applicants with at least a B (3.00 on a 4.00 scale) grade point average, or the equivalent in the last 60 graded semester (90 quarter) hours, from a recognized college or university; or at least a B grade point average in any graduate work from a recognized graduate school are eligible for admission to regular student status. Applicants with at least 12 semester hours of approved coursework from recognized graduate schools with at least a B grade point average are eligible for admission to regular student status.

Provisional Student Status

A student not eligible for regular student status may be admitted on provisional student status upon special recommendation of the chair of the major department and with approval of the Associate Dean of the Graduate School.

Registration

Instructions for registration and policies and procedures for dropping and adding classes are included in the time schedule of classes available on the Registrar's Office homepage at www.registrar.wsu.edu.

Full-time Students

Graduate students must register for a minimum of 10 credit hours to maintain full-time enrollment status in the fall and spring semesters. All full-time graduate students must register for at least one (1) 700 (Master's), 702 (non-thesis Master's), or 800 (doctoral) level research credit each semester. Students should check with their departments for additional information and/or exceptions to this policy.

Part-time Students

Graduate students must register for a minimum of 2 credit hours and no more than 9 credit hours to maintain part-time enrollment status in the fall and spring semesters.

Continuous Enrollment

All full- and part-time degree-seeking graduate students at all campus locations must maintain continuous enrollment in the Graduate School by registering for each semester, excluding summer sessions, from the time of first enrollment until all requirements for the degree are completed. Continuous enrollment is maintained by registering for a minimum of 2 graduate credits per semester (excluding the summer). International students who enroll for fewer than 10 credits must be approved by the Office of International Programs in consultation with the Graduate School, prior to part-time enrollment during the academic year. Exceptions to the continuous enrollment policy are noted in Chapter 5 of the Graduate School's Policies and Procedures Manual. Continuous doctoral status meets the continuous enrollment requirement.

Exceptions to Continuous Enrollment

Typically, degree-seeking graduate students enroll in credits every semester until degree completion. However, sometimes circumstances are such that degree-seeking students are unable to enroll for credits. Such circumstances may include illness, family issues, financial need, work, or other obligations.

The exceptions to continuous enrollment discussed in this section address circumstances in which a degree-seeking

student must be away from campus and cannot enroll for credits. These students must complete the appropriate graduate leave or internship leave paperwork, obtain approval from their faculty advisor and program chair, and submit the paperwork to the Graduate School in advance of the semester they will be away. Official leave of absence, internship leave status, and absences not approved under this policy are included in the time limits to complete a degree.

Graduate Leave of Absence

Students who must be away from campus for reasons such as medical issues, family obligations, job obligations, military service, and Peace Corps service, and who cannot maintain continuous enrollment in any given semester, may apply for an official graduate leave of absence. See the Graduate School's Policies and Procedures Manual, Chapter 5, for additional information and procedures. Only graduate leave for medical reasons (EFML), military service, and Peace Corps service is available to doctoral students in continuous doctoral status. Students who are approved for graduate leave while in continuous doctoral status will not be charged the \$50 administrative fee.

Internship Leave

Students who wish to go on an internship approved by their program and who do not need to register for credits for the internship may apply for internship leave status. See the Graduate School's Policies and Procedures Manual, Chapter 5, for information and procedures. Only internship leave required by the student's program is available to doctoral students in continuous doctoral status. Students who are approved for internship leave while in continuous doctoral status will not be charged the \$50 administrative fee.

Short-term Parental Leave

The Short-term Parental Leave plan provides up to four consecutive weeks of leave for the period directly before or after the birth or adoption of a child. During this time, the student continues to be enrolled and, if on an assistantship appointment, will continue to receive graduate assistant benefits (i.e., tuition waivers will remain in place, health benefits, and salary). For additional information, see the Graduate School's Policies and Procedures Manual, Chapter 5.

Other Policies and Procedures

Special Projects or Independent Study (600), Master's Research, Thesis and/or Examination (700), Master's Special Problems, Directed Study, and/or Examination (702), and Doctoral Research, Dissertation, and/or Examination (800) shall have as a pre-requisite regular or provisional student status in the Graduate School.

Graduate students must register for the required amount of 700, 702, or 800 credits during the semester or summer session in which they take their final examination. Fall and spring semesters and summer session officially end on the last day of finals week. Examinations normally are not scheduled between regular terms. However, students who

have received special permission from the Graduate School to schedule final master's or doctoral oral examinations in the interim non-class period after the end of a term will be required to register for the following semester or summer session.

Academic Regulations

Scholarship Standards

A student must earn a 3.00 grade point average for all course work (including all courses listed on the program and other graduate upper- and lower-division courses). No work of C grade or less may be dropped from a program, nor can a course be repeated for a higher grade if the final grade is C or higher. Any course listed on the program in which a grade of C-, D, or F is earned must be repeated.

Any graduate student who fails to maintain a cumulative grade point average of 3.00 or higher for all coursework subsequent to admission to the Graduate School will be dropped from the University. A student who is dropped may be permitted to re-enroll if the chair of the major department makes a special recommendation with the concurrence of the Dean of the Graduate School.

Requirements for a Graduate Degree

The graduation requirements of the Graduate School (as published in the Graduate School Policies and Procedures Manual) in effect at the time of the student's initial admission as a regular or provisional graduate student must be met for completion of a graduate degree program. Subsequent changes in degree requirements of the Graduate School or departmental may be substituted at the option of the student upon approval by the master's or doctoral committee, by the department chair, and by the dean of the Graduate School. If a student is dropped from the University for failure to maintain continuous enrollment, the graduation requirements of the Graduate School are those in effect at the time of readmission.

The time limit for the use of graduate credits toward a master's degree is six years from the beginning date of the earliest course applied toward the degree. Each program for a doctoral degree is considered individually. In all cases, work for the degree must be completed within three years of the date of the satisfactory completion of the preliminary examination. At least four months must elapse between preliminary and final examinations for doctoral degrees.

Transfer Credit and Credit Restrictions

Detailed policies and procedures on transfer credit and credit restrictions are outlined in the Graduate School Policies and Procedures Manual.

Transfer of Graduate Credits

Appropriate credits (with a grade of B or higher) earned in other accredited graduate schools may be applied to a limited extent toward an advanced degree. No extension credits from other institutions, or work done by correspondence with this or any other institution, or credit earned by special examination may be used to meet advanced degree requirements.

Graduate Study by Seniors

Seniors who have at least a 3.00 grade point average in the last half of their undergraduate work at Washington State University may register for up to six semester hours of work in the Graduate School in excess of the number of hours required to complete the bachelor's degree. Graduate School approval is required at the time of registration. Only grades of "B" or higher may be applied toward an advanced degree. Seniors who wish to enroll in 500-level courses for undergraduate credit must obtain approval of the major advisor and the chair of the department of program in which the course is offered.

Tuition and Fees

Tax revenue from the state finances a portion of the facilities and operations of the instructional programs, student services, and related activities. Graduate students share in the cost by paying tuition, fees, and other charges as established by the Board of Regents.

Tuition, fees, and other charges are subject to change, and are effective when established by the Legislature of the State of Washington and adopted by the WSU Board of Regents. For the most up-to-date rates, visit <http://finaid.wsu.edu/college-costs/cost-of-attendance/>. Part-time students appointed to graduate assistantships may receive waivers of tuition (see the Assistantship, Fellowship, and Traineeships section).

Payment of registration fees is due on or before the fifth Friday of class. Receipt of payment after that day will result in a 5% late payment fee. Any tuition balances not paid by the eighth Friday of class will receive another 10% late payment fee.

On the Pullman Campus, fees for the Student Health Center, the Student Recreation Center, and Pullman Transit are charged each semester. (NOTE: Graduate students appointed to half-time graduate assistantships qualify for medical insurance coverage. See Assistantships, Fellowships, and

Traineeships section for more information). Other fees, including parking permits and health insurance are optional.

NOTE: Overdue accounts owed to the University will prevent release of transcripts and enrollment. Registration is not complete until all of the student's tuition and fees are paid.

Student Financial Aid Programs

Graduate students wishing to apply for financial aid must complete the Free Application for Federal Student Aid (FAFSA). The FAFSA priority processing date is March 1. Students may apply online at www.fafsa.ed.gov, or pick up a paper version at any local high school, community college, public library, or the Washington State University Office of Student Financial Aid and Scholarship Services (OSFA/OSS), Room 380 Lighty Student Services Building.

Graduate students are considered for the following programs: Federal Family Educational Loans (subsidized and unsubsidized Stafford loans) and Federal or State Work Study Programs. Work Study Program funds may be used toward funding graduate assistantships. The Office of Student Financial Aid determines student eligibility for these programs and will notify students in a letter of eligibility. Financial aid counselors are available to assist students and families with their financial aid concerns at 509-335-9711. You will also find information at: wsu.edu/studacct/finaid.htm.

Each academic year a number of graduate students at WSU are awarded a graduate assistantship from their departments. The assistantship usually covers the majority of tuition costs. This Operating Fee Waiver is considered a resource when the OSFA determines the student's eligibility for other financial aid programs. In order to ensure your Financial Aid Award Notification is correct, please notify the OSFA if your department has granted you an Operating Fee Waiver. If the OSFA is notified after the first disbursement of your loan, any subsequent disbursement may be reduced accordingly.

NOTE: All graduate awards are initially based on resident tuition costs, regardless of resident status. You may request (in writing) an adjustment for nonresident tuition costs. If you have unmet need on your Financial Aid Award Notification and/or the Cost of Attendance has not been met, you may qualify to borrow an Alternative Loan. Contact the OSFA for more information. Short-term loans may be available to students who encounter delays in their financial aid delivery through the OSFA.

Satisfactory Academic Progress (SAP) Policies

To receive and continue to be eligible to receive financial aid, graduate students must be in good standing with their department and the Graduate School. The maximum timeframe calculation is based on all semesters of enrollment regardless of whether or not financial aid was

received each semester. Semesters in which enrollment is less than 10 hours will be counted as one-half of a full-time semester. The maximum timeframe for financial aid (exclusive of graduate assistance) is three years (6 full-time semesters) for master's degree candidates; three years (6 full-time semesters) for doctoral degree candidates who have a previous master's degree; six years (12 full-time semesters) for doctoral candidates without a master's degree; and five years (10 full-time semesters) for professional students and veterinary medicine students.

Assistantships, Fellowships and Traineeships

Teaching and research assistantships are available in most departments offering advanced degrees, and nonservice research fellowships and traineeships are granted in some departments. Ordinarily, graduate appointments are limited to those who pursue programs of study leading to advanced degrees at Washington State University.

The Graduate School Policies and Procedures Manual should be consulted concerning qualifications, eligibility, and application procedures. As most appointments for fall semester are made by April 1, or as soon thereafter as possible, it is desirable to have applications completed by February 1; nonservice appointment applications should be completed by January 1. Spring semester applications should be completed by September 1. Applications received at a later date can be considered only for positions still available. Assistantship appointments require part-time service. The term of a graduate appointment may be for a nine-month period, a semester, or a summer. Students on appointment must maintain regular enrollment in the Graduate School (10 credit hours or more during the academic year; 3 credit hours during summer session) for the duration of their appointments. Stipends vary according to the amount of required service, the extent of the student's training, and merit factors (e.g., academic record, experience). Contact the Graduate School Office for salary information.

Graduate students who are not residents of the State of Washington, appointed to assistantships of one-half time service (20 hours per week) or more by the Board of Regents, and who reside in the State of Washington while attending WSU, may receive a waiver of the nonresident portion of the tuition. (NOTE: Nonresident tuition waivers cannot be assured beyond the first year of graduate

students' assistantships. Students who intend to remain in the state are encouraged to review Washington statutes and associated administrative rules governing the establishment of residency for tuition purposes. These may be obtained from the Office of Student Affairs, the Graduate School, or at:

gradschool.wsu.edu/FutureStudents/StudentLife/Residency.aspx.

The residency operating fee may also be waived for resident students who hold half-time (or greater) service appointments (20 hours per week) and who qualify based on merit factors, and for nonresident students who reside in Washington state, who hold half-time graduate service appointments, and who qualify based on merit factors. Further, graduate students who hold half-time (or greater) service appointments automatically qualify for and receive medical insurance coverage.

All students on assistantships pay the general tuition and activities fees. (Please note: to be eligible for any waiver, a student must be physically living in the State of Washington).

Forms for assistantship or fellowship applications are included as part of the general application for admission to Graduate School. For information about special scholarships and fellowships, write to the dean of the Graduate School or the chair of the department concerned.

Resolution regarding Scholars, Fellows, Trainees, Assistants

Acceptance of an offer of financial support (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by a prospective or enrolled graduate student completes an agreement that both student and graduate school expect to honor. In that context, the conditions affecting such offers and their acceptance must be defined carefully and understood by all parties. Students are under no obligation to respond to offers of financial support prior to April 15; earlier deadlines for acceptance of such offers violate the intent of this Resolution. In those instances in which a student accepts an offer before April 15, and subsequently desires to withdraw that acceptance, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student to not accept another offer without first obtaining a written release from the institution to which the commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer. It is further agreed by the institutions and organizations subscribing to the above Resolution that a copy of this Resolution should accompany every scholarship, fellowship, traineeship, and assistantship offer.

WSU Campuses

Global Campus

Our technology-based Global Campus is located wherever there's an Internet connection, helping WSU deliver premier educational, research, and training opportunities worldwide. Offering online degree programs including virtual career fairs, certificate courses for working professionals, and a wide variety of free interactive seminars for students, WSU's Global Campus reaches out to students in unprecedented ways.

Graduate Programs at Regional Campuses

With the creation of WSU's multi-campus system in July 1989, select graduate programs are offered at the University's regional campuses in Spokane, Tri-Cities, and Vancouver. Expansion of offerings will continue as the campuses grow. Graduate students who plan to use coursework and research undertaken through the regional campuses must be admitted to the Graduate School on the Pullman campus. Requirements are generally the same.

WSU Spokane

Riverpoint Campus in east Spokane is our urban health sciences campus, preparing the state's future generations of doctors, nurses, pharmacists, and other health professionals, and conducting world-class research that leads to healthier people and communities. WSU Spokane offers master's degrees in criminal justice, education, health policy and administration, nursing, nutrition and exercise physiology, speech and hearing sciences, and teaching. WSU Spokane offers doctoral degrees in criminal justice, education, nursing, nutrition and exercise physiology, and pharmacy, and medical sciences. Certificate programs include field-based principal, field-based superintendent, nursing, program administrator, and teaching. Portions of some programs are completed at the WSU Pullman campus.

Students benefit from the metropolitan context and urban amenities of Spokane. The full range of academic and student services are available, including the Cooperative Academic Library Service (CALs) shared by students of WSU Spokane and Eastern Washington University. WSU Spokane also has exclusive research and public service programs with access to community resources for collaborative research and internship opportunities for students. For specific information, contact

WSU Spokane Student Services
Health Sciences Building 125E
310 N. Riverpoint
PO Box 1495
Spokane, WA 99202-1495

enroll@wsu.edu

509-358-7537 or visit spokane.wsu.edu

WSU Tri-Cities

WSU Tri-Cities offers master's degree programs in biology, business administration, chemistry, computer science, education, electrical engineering, environmental engineering, environmental science, nursing, and mechanical engineering. Supporting coursework is available in mathematics and physics. The present facilities provide classrooms, offices, laboratories, networked computing, and an extensive library. Research is carried on in a wide variety of areas. Additional opportunities are available to share research laboratories and equipment of nearby US Department of Energy contractors through individual arrangements. Graduate assistantships are available in certain departments for qualified students who wish to pursue study and research at WSU Tri-Cities. For specific information about courses, programs, facilities, or admission, contact

WSU Tri-Cities:
2710 University Drive
Richland, WA 99354-1643
509-372-7250

www.tricity.wsu.edu

WSU Vancouver

WSU Vancouver is located on a 351-acre campus in Salmon Creek, where students enjoy small classes and schedules designed for place-bound students balancing their education with career and family responsibilities. Master's degrees offered include business administration, education, environmental science, history, nursing, and public affairs. For more information contact

WSU Vancouver Office
360-546-9779,
admissions@vancouver.wsu.edu,
vancouver.wsu.edu

Graduate Certificate Programs

Graduate certificates are designed to provide students graduate education in a specific area of study. While the requirements for each graduate certificate vary among departments and programs, the core is typically 9 to 12 credits of graded coursework taken at the graduate level. These core courses are generally selected to provide the student with expertise on a specific topic. In order to determine the applicability of any credits earned while a certificate student, the student must file a Program of Study as part of the admission material. The determination of applicable coursework will be made by the academic department or graduate program at the time of admission. Graduate certificates that are currently offered at Washington

Regional Programs

Washington State University and the University of Idaho have developed a program of cooperative courses in which one institution offers exclusively a particular course for use by graduate students of both universities. The program provides a wider variety of graduate courses than otherwise would be possible at either university. This arrangement permits graduate students at Washington State University to take cooperative courses at the University of Idaho on the same basis that they take resident courses. No special fees are charged for these courses, but they do appear on the WSU transcript as cooperative transfer coursework, which does not impact the student's GPA. In each cooperative class, the regulations of the host institution prevail, but only the institution in which the student is seeking an advanced degree records official enrollment and grades.

The cooperative program is limited to specific courses. Courses outside of the cooperative program taken at the University of Idaho must be presented as transfer courses with the usual rules and fees applying. For further information, consult the chair of the department or program or the Office of the Dean of the Graduate School.

Western Regional Graduate Programs – WICHE

The Western Interstate Commission for Higher Education (WICHE) coordinates a program involving 17 graduate institutions where students who are residents of Alaska, Arizona, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming may attend Graduate School in Washington. WICHE students pay resident tuition and receive some admission preference. For more information about your program, visit wiche.edu/sep/wrgp. Washington State University receives students in the following programs:

American Studies (M.A. and Ph.D.)
Anthropology-Archaeology Option (M.A. and Ph.D.)
English - Rhetoric and Composition Emphasis (M.A. and Ph.D.)
Food Science (M.S. and Ph.D.)
Health Policy and Administration (M.H.P.A.)
History-Public History Option (M.A. and Ph.D.)
Neuroscience Interdisciplinary (M.S. and Ph.D.)
Nutrition (Ph.D.)

Student Services

Libraries

The Libraries system is an integral part of WSU's educational resources. The Libraries' collection contains more than seven million items including about two million volumes and 28,000 serial publications (scientific, scholarly, and specialized journals and periodicals); regional and national newspapers; foreign, federal, state, and municipal documents; United Nations publications; and other materials in a variety of print, electronic, multimedia, and micro formats.

The Libraries' online catalog, Griffin, provides access to information on books, journals, documents, media materials, and select electronic resources. Summit, a joint catalog that WSU shares with 33 academic

Libraries in Washington and Oregon, provides an online requesting service for book delivery at participating campuses.

The Libraries provide Internet access to a wide variety of electronic indexes and abstracts, as well as thousands of full-text electronic journals and books. Librarians provide personal assistance and online and email reference to users of these traditional and electronic collections, and provide access to materials from other libraries.

Holland/Terrell Library, the largest of six Pullman-campus libraries, provides extensive collections in the social sciences, business, fine arts, and the humanities, as well as sophisticated service components designed to assist students, faculty, and researchers. Manuscripts, Archives, and Special Collections contain rich collections of primary source materials including books, manuscripts, maps, photographs, and digital collections to support study and research in a number of fields, including Pacific Northwest history, modern British literature, regional publishing, veterinary history, agricultural history, wildlife and outdoor recreation, WSU history, and other subjects. Media Materials & Reserves houses course reserves, equipment, CDs, DVDs, videotapes, films, slides, audio tapes and other media for classroom instruction and for personal checkout. Special media collections include the WSU-UI Regional Media Collection, the McCaw Classic Feature Films, Gnaedinger Historical Films, Pitzer Classic Radio Tapes, and others.

The **Owen Science and Engineering Library** supports study and research in the pure and applied sciences with substantial traditional and electronic collections in these disciplines. The Owen Library's wireless commons has workstations, high speed Internet connections, hotwired carrels, a reference/info center, and collaborative learning areas.

The collections of the **George W. Fischer Agricultural Science Library** located in Wegner Hall primarily support the instructional and research needs of the College of Veterinary Medicine and the College of Pharmacy.

The **George B. Brian Education Library** in Cleveland Hall offers a wide range of materials and services to meet research and instructional needs from preschool through higher education and adult education.

The **Architecture Library**, which supports programs in the School of Architecture, is located in Carpenter Hall. In addition, library facilities and services are available at the Spokane, Tri-Cities, and Vancouver regional campuses, and at the Intercollegiate College of Nursing (Spokane) and the WSU Energy Library (Olympia). Library services for students enrolled in the Global Campus, or other distance learning programs are available via toll-free telephone, email, and/or web-based services. The WSU Libraries are open throughout the year, although hours vary during intersessions and holidays. Visit wsulibs.wsu.edu for detailed information on library resources, services and hours.

Computing Services/Information Technology

infotech.wsu.edu

The Information Technology Help Desk assists students with wireless setup, passwords, setting up email, and other computer and Internet issues. The WSU community is welcome to take advantage of a collection of free software and also order items at an educational discount through the Tech Store. Visit the website for detailed information and answers to your questions. The IT Help Desk is located in the CUE Room 302. 509-335-4357

Museums and Collections

The **Minnie Barstow Drucker Memorial Collection** of Oriental art is maintained by the Department of Apparel, Merchandising, Design, and Textiles. The Drucker Collection consists of Oriental furniture, accessories, art, textiles, and costumes. The collection was given to the University in 1944 by the late Arthur Eilert Drucker in memory of his wife. The Chinese, Korean, and Japanese artifacts were collected during the years the Druckers made the Orient their home. The collection is in storage in the Holland Library. For more

information contact the Department of Apparel, Merchandising, Design, and Textiles at 509-335-3823.

The **Historic Textiles and Costume Collection** contains approximately 4,000 items of women's, children's, and men's clothing and costume accessories from 1935 to the present, as well as quilts and woven coverlets. It also contains a limited number of ethnic textiles and costumes from around the world. The collection is housed in Kruegel Hall. Contact the Department of Apparel, Merchandising, Design, and Textiles at 509-335-3823.

The **Maurice T. James Entomological Collection** houses one of the largest insect collections in the Pacific Northwest with over 1.5 million insect specimens and an extensive working library. Primarily of regional significance, the collection includes considerable material for the New World topics, eastern North America, and Europe. The collection functions essentially as a research facility by providing specimens on loan to recognized scientists worldwide, by offering identification services to University extension entomologists, and by serving as a repository of type specimens and other materials. The collection room is located in the Food Science and Human Nutrition building, Room 157. Contact Dr. Richard Zack at 509-335-3394 to arrange a tour and presentation.

The **Mycological Herbarium** was founded by Frederick D. Heald, the first chair of the Department of Plant Pathology, in 1915. It now contains more than 70,000 specimens of fungi. Loans are freely available to individuals associated with recognized botanical institutions anywhere in the world. The Herbarium is maintained by the Department of Plant Pathology and is located on the third floor of Johnson Hall. Specialists wishing to utilize the facilities are welcome and are asked only to inform the Department of Plant Pathology in advance. 509-335-9541

The **Henry W. Smith Soil Monolith Collection** contains more than 150 preserved soil profiles, presenting soils from all of the geographic regions in the state of Washington and nine of the eleven soil Orders in Soil Taxonomy. Soils that are particularly well represented in the collection are those of the Palouse region and those from eastern and central Washington that contain layers of volcanic ash from the many prehistoric and historic eruptions of volcanoes in the Cascade Region. The collection is the work of Dr. Henry W. Smith, Emeritus Professor of Soils at Washington State University. The soil monoliths constitute a very valuable resource for both teaching and research within the Department of Crop and Soil Sciences. The collection is located in Johnson Hall 114, and may be viewed from an observation window any time the building is open. Persons interested in touring the collection should contact Dr. Alan Busacca at 509-335-1859.

Permanent exhibits in the **Museum of Anthropology** include topics in human biological and cultural evolution and the

culture of the native people of the Columbian Plateau. The museum houses archaeological collections from the interior Northwest that represent a record of the last 11,000 years of human occupation. This is the most extensive collection of archaeological materials from the Columbian Plateau, an important research resource for those interested in this region's archaeological history. Research collections representing faculty archaeological research in the Southwestern U.S. are also maintained. In addition, there are important collections of historic period Native American basketry from several parts of western North America.

The **Charles R. Conner Museum**, located in Abelson Hall, exhibits fish, amphibians, reptiles, and several hundred mounted birds and mammals, including deer, antelope, mountain sheep, mountain goat, cougar, and small species. The display collection is open to the public from 8:00 a.m.-5:00 pm weekdays.

The **Culver Display**, located in Webster, houses the Jacklin Petrified Wood Collection. This collection contains more than 2,000 cut and polished specimens of petrified wood from all major localities in the western United States and is the largest display of its kind in the western United States. Also included in the Collection is a large selection of cut and polished agate, geodes, and dinosaur bone. The Culver Collection includes over 100 classic rock and mineral specimens from localities throughout the world. Both the Jacklin and Culver Collections may be viewed weekdays, 8:00 a.m.-5:00 pm. Tours may be arranged by calling the Department of Geology, 509-335-3009.

The **Marion Ownbey Herbarium** is an internationally recognized resource for research, teaching, and service. The Herbarium houses 300,000 plant specimens, primarily from the Pacific Northwest, but including worldwide collections. In addition to native vascular plants and weeds, the Herbarium contains mosses, liverworts, lichens, and special collections of seeds and cultivated plants. The Herbarium is located in Heald G-9 and is open weekdays from 8:00 a.m.-5:00 pm and by appointment 509-335-3250.

The **Worthman Veterinary Anatomy Teaching Museum** features several hundred specimens of mammals and several exhibits of fowl. The collection consists primarily of domesticated animals, since they represent the species most important to veterinary medical education and research, yet a few wild species are included also. The only one of its kind in the nation, the Museum offers a unique learning environment and is used extensively for teaching purposes in anatomy, radiology, and surgery classes, and serves as a reference tool for current research by veterinary medicine faculty members. The Museum is located on the second floor of Wegner Hall. For information, call 509-335-6621.

The **Museum of Art** was established in 1974 around a core collection of American paintings assembled by former President E.O. Holland and former WSU Regent Charles Orton. Dedicated to serving the educational purposes of WSU and the people of the state of Washington, the Museum operates a program that embraces a wide variety of changing exhibitions ranging from antiquity to the contemporary, from design and photography to sculpture and painting, by internationally, nationally, and regionally known artists. Many of the exhibits originated by the Museum staff have toured the nation. The Museum offers a wide variety of speakers, films, and special programs throughout the year. The Museum's programs are free and open to the public. For more information, call 509-335-1910.

Research Support Facilities

The **Office of the Campus Veterinarian (Laboratory Animal Resource Center)** is the central coordinating facility for the care, production, procurement, and use of laboratory animals at WSU. It provides assurance to governmental agencies, granting authorities, accrediting bodies, and the public that all animals utilized by WSU in teaching, research, and testing are cared for in a humane manner consistent with established federal and state guidelines. The Office also provides formal presentations, informal assistance, and educational services to assist instructors and investigators in their use of animals.

The **Center for Integrated Biotechnology (CIB)** is an organized research unit that has broadly defined biotechnology as the use of living organisms or their products to modify human health and the human environment. The applications of biotechnology are extensive and have already had critical impacts in agriculture, human health, and environmental protection. The CIB promotes multi-investigator research programs and the development of new and innovative advanced technologies, designed to enhance and increase the level of basic and applied research being done in the area of biotechnology at WSU. The Center also operates Core Laboratories that provide high-tech centralized services to members in areas such as bioinformatics, genomics and proteomics. These cores enhance faculty research capabilities and improve opportunities to compete for federal and industry research grants and contracts. For more information go to: biotechnology.wsu.edu/

WSU's **Office of Grant and Research Development (OGRD)** assists the university's faculty and graduate students in securing extramural support for their scholarly, research, teaching, and community service activities. OGRD promotes and facilitates the procurement of grant and contract funding through information dissemination and outreach, proposal and award processing. OGRD offers education and training for proposal development and writing classes throughout the

year. For more information please visit OGRD's website at: ogrd.wsu.edu.

Washington State University's **Office of Intellectual Property Administration** is the campus resource for patents and technology transfer. The office assists faculty researchers in applying for patents and transferring their technology to the public domain. Patents protect the rights of WSU and the inventors.

The **Nuclear Radiation Center** serves as an all-University resource unit, supporting research and graduate education related to nuclear engineering and physics, radiochemistry, elemental analysis, and neutron activation analysis.

The **Radiation Safety Office** administers a program providing for the safe use of radiation machines and radioactive materials in research, service, and instruction at the main campus, regional campuses, and extension centers. Program activities are conducted in accordance with the statutes and rules of radiation protection specified in WAC-246, and with the conditions enumerated in Radioactive Materials License WN-C003-1 issued by the State of Washington.

The **Office of Research Assurances** provides oversight and coordinates compliance efforts (as required by federal and state laws and University policies) primarily through close cooperation and coordination with the following faculty/Presidential Committees:

- Institutional Animal Care and Use Committee (IACUC)
- Institutional Biosafety Committee (IBC)
- Institutional Review Board (IRB)
- Radiation Safety Committee (RSC)

The **Research Compliance Office** offers support and help to researchers to identify, understand, and comply with all pertinent regulations, rules, and policies. The Office is a resource for facilitating the conduct of research at WSU.

The mission of the **Social and Economic Sciences Research Center** is to strengthen research in the social, economic, and behavioral sciences at Washington State University. This mission is pursued through a variety of activities including a computer-assisted telephone interview facility, mail survey capabilities, personal interviewing capabilities, assistance to faculty in the preparation and submission of research proposals for extramural funding, and efforts to stimulate and organize interdisciplinary research. Consultation is also provided to faculty, staff, students, and others on the development and implementation of research projects.

The **Water Research Center** is a cooperative venture by WSU and the University of Washington with input from other state research universities. The mission of the Center is to plan,

promote, conduct, and administer research in water resources; to educate and train scientists and engineers through participation in research projects; and to disseminate the results of completed research to users through publications, conferences, seminars, short courses, and symposia. The Center operates in consultation with state, federal, and private water-interested organizations.

Statistical Services is a statistical consulting service provided by the Department of Statistics for WSU faculty, staff, and student researchers. Assistance is provided in the design of experiments and sample surveys, analysis of data including use of statistical packages, and interpretation of results of statistical analysis.

Research Facilities

College of Agricultural, Human, and Natural Resource Sciences

CAHNRS research is conducted within Agricultural and Natural Resource Sciences; Animal Sciences; Apparel, Merchandising, Design and Textiles; Biological Systems Engineering; Crop and Soil Sciences; Entomology; Food Science and Human Nutrition; Horticulture and Landscape Architecture; Human Development; Interior Design; Plant Pathology; Natural Resource Sciences; Rural Sociology; and Statistics. The Institute of Biological Chemistry performs fundamental research in the biochemistry and molecular biology of plants.

CAHNRS also houses the Center for Precision Agriculture Systems, the Center for Nonthermal Processing of Food, the International Marketing Program for Agricultural Commodities and Trade (IMPACT) Center, and the Center for Sustaining Agriculture and Natural Resources. CAHNRS also conducts collaborative and interdisciplinary research projects involving other colleges and regional campuses within the University.

The research programs in CAHNRS require many sites that carry out the work, and many WSU scientists are located throughout the state to solve problems associated with production and marketing of Washington's agricultural and forestry products and to provide basic knowledge for improving the efficiency, quality, and quantity of production for food, fiber, and improvement in the quality of life.

The **International Marketing Program for Agricultural Commodities and Trade** (IMPACT) Center funds interdisciplinary research, extension, and teaching to assist the state in exporting its agricultural products. Its major thrusts are in uncovering marketing opportunities, developing strategies to exploit those opportunities, solving economic and technical impediments to current agricultural exports, and finding alternative products or processes with export market potential.

The **Center for Nonthermal Processing of Food** includes faculty members from Biological Systems Engineering, Food Science and Human Nutrition, Electrical Engineering, Biochemistry/Biophysics, and Microbiology. Research at the Center is focused on pulsed electric fields, oscillating magnetic fields, and high hydrostatic pressure as alternatives to food processing that involve application of heat.

The **Center for Precision Agricultural Systems** fosters collaborative research, education, and outreach that produces practical technologies and management systems for precision agriculture. Technologies include sensors for monitoring plant and environment status, software for data analysis and modeling, decision models for system optimization, and equipment to implement precision management decisions.

The **Center for Sustaining Agriculture and Natural Resources (CSANR)** creates sustainable agriculture and natural resource systems. The Center leads in developing and implementing interdisciplinary systems-oriented research and education programs at WSU. CSANR facilitates work towards sustainable agricultural systems, provides information through educational activities and encourages the use of sustainable agriculture practices.

The **Institute of Biological Chemistry** is dedicated to research on fundamental aspects of biological chemistry relevant to agriculture and forestry. Although not offering a formal course of study leading to a degree, the Institute provides research opportunities to fulfill the requirements for the Master of Science and Doctor of Philosophy in the graduate programs in the School of Molecular Biosciences (biochemistry/biophysics, chemistry, genetics, and cell biology), and the Graduate Program in Molecular Plant Sciences.

Research fellowships and assistantships are available in the Institute for incoming students on a competitive basis. Teaching assistantships are available from cooperating instructional departments and programs through which entry to the Graduate School is obtained. The internationally recognized research programs of the Institute cover a broad spectrum of areas from plant biochemistry, molecular biology, and genetic engineering to plant pathology and pest resistance, as well as the traditional areas of biochemistry.

College of Business

The **Small Business Development Center (SBDC)**, located at WSU Spokane, provides training programs, research services, and management counseling to business firms and communities throughout Washington. To this end, the Center draws on its own professional staff as well as on the resources of the University and other cooperating Washington institutions of higher education. The Center's business development specialists provide free, confidential, one-on-one counseling on all management topics. The counselors have certified broad-based skills and significant experience as

business owners or managers. Business counseling is also available through NetCounseling, an internet counseling program that performs business counseling and technical assistance. The SBDC also evaluates new products through its Innovation Assessment Center on a fee basis and provides business training through many Washington community colleges. It offers seminars, workshops, and conferences to assist small business owners and operators with specific skills and methods to maintain or expand their business.

College of Engineering and Architecture

The **Center for Materials Research** includes more than 20 faculty researchers from physics, chemistry, mechanical, and materials engineering that attract funding for equipment and research in such projects as deformation and fracture, diamond and thin films, soft lithography, semiconductors, electron tunneling microscopy, and nondestructive probes (e.g. positron beams) of defects in solids at the atomic and nuclear levels. Visit cmr.wsu.edu to learn more.

The **Center for Multiphase Environmental Research** unites doctoral students from a variety of departments to address threats to the water, air, and earth. Students in this program work in teams to transfer their own innovations to industry for application and commercialization.

The **Wood Materials and Engineering Laboratory (WMEL)** is an interdisciplinary research facility involving faculty and students from engineering and materials science. It attracts significant funding for research on natural fiber composites development of natural fiber composites (e.g. wood-plastics), nondestructive evaluation techniques, and novel building design and construction techniques. For more information visit: wmel.wsu.edu.

The **Center for the Design of Analog-Digital Integrated Circuits** is an NSF-sponsored industry-university research consortium in integrated circuitry that addresses electronics industry problems in the field of mixed signal design. Emphasis is on research in low-voltage circuits, wireless communication, and design for high-performance data converters and associated simulation, modeling, and layout tools. cdadic.com

The **Power Systems Engineering Research Center (PSERC)** is a multi-university collaborative research center supported by the National Science Foundation and the Electrical Power Research Institute. The PSERC supports research on the practical problems and particularly those associated with a restructured deregulated power industry. WSU was invited to join PSERC because of its strong power engineering program.

The **Albrook Hydraulic Laboratory** provides engineering services to government and industry in hydraulics and water resources. For more than four decades, it has helped solve hydroelectric power problems, salmon fish recovery efforts,

facilities construction, flood mitigation, land-based hazardous waste management, hydrology, and engineered wetlands. Visit ce.wsu.edu/Hydraulics/hwOverview.htm

The **Laboratory for Atmospheric Research** is recognized worldwide for its pioneering role in the development of regional and national emission inventories, tracer methods to measure air and ground gas pollution of all kinds, worldwide methane emissions surveys, windblown dust, and photo-chemical air contamination in the Northwest. Investigations include Spokane and Puget Sound health hazard research on small air particulates, ozone concentration in the Puget Sound region, and improved understanding of global warming by measuring biogenic hydrocarbons released from vegetation. Visit lar.wsu.edu for more information

Murrow College of Communication

The **Virtual Reality and Computer Integrated Manufacturing Laboratory** performs fundamental and applied research in computer-aided design, virtual reality knowledge representations, and sustainability considerations in product lifestyles.

The **Center for Media & Health Promotion Research** in the Murrow College of Communication develops and evaluates health communication strategies that make use of a full range of media platforms that affect social development and quality of life. Studies involve health messaging that targets young people and their families, including media regarding alcohol abuse and tobacco prevention.

College of Arts and Sciences

AccessNorthwest strives to increase access to and use of government information, particularly by disenfranchised populations. The group hopes to enhance civic engagement and to build a more informed electorate for a stronger democracy.

The **Digital Recording Studio** was established in 2003 to serve the programmatic needs of the Music Program within the School of Music and Theater Arts. Located in Kimbrough Music Building, the studio provides an ideal acoustic setting for limited scope recordings in the studio, and processing of on-location recordings from other venues. The recording studio is equipped with a Fazioli Concert Grand Piano and the most current versions of the requisite digital recording, editing, and processing equipment.

The **Hearing and Speech Clinic**, located in the Health Sciences Building on the WSU Spokane campus, is operated jointly by the WSU Department of Speech and Hearing Sciences and the Eastern Washington University Communications Disorders Department. The Hearing and Speech Clinic is a state-of-the-art facility that serves the Department of Speech and Hearing Sciences' tripartite missions in teaching, research and service. The Clinic provides a full

range of assessment and rehabilitation services to the community in the areas of speech, voice, language, and hearing. Graduate students gain valuable clinical experiences with patients across the lifespan under supervision of nationally certified and state licensed faculty. Clinic clientele are invited to participate in master's thesis research approved by the WSU and EWU Institutional Research Boards (IRB).

The **Humanities Research Center** was established in 1980 to provide shared facilities, equipment, and consulting services in support of humanistic research. The facilities and services of the Center are available to all faculty in the College subject to a schedule of project priorities. Computer support is predominantly in the area of text processing (production of books, articles, and dissertations) and photocomposition of scholarly journals, as well as new visual media communications.

The **Language-Learning Resource Center (LLRC)** was established in 1912 by the Department of Foreign Languages and Cultures as a teaching resource center. Since its inception, the Center has been a focal point within the Department for exploring the use of technology in the teaching of languages. Today, the LLRC is engaged in managing and maintaining two computer-based language learning labs offering undergraduate and graduate students access to course specific online language learning tools and resources. Additionally, the Center manages and maintains a departmental web server and a streaming audio/video server that together provides students with 24-hour access to a wealth of language related educational and informational resources. The LLRC also maintains equipment (such as audio and video tape players) for accessing its extensive collection of traditional audio and video resources.

The **Human Psychophysiology Teaching Laboratory** combines the standard E-prime computer software for testing of cognition and behavior along with equipment for the examination of central nervous system activity responsible for cognition and behavior. The laboratory provides state of the art technology for measurement of brain activity by means of electroencephalograph (EEG). Also included are devices for peripheral physiological measurement of skin conductance response (SCR) and cardiovascular activity.

The **Sociological Data Processing Center** and the **Social Science Computing Laboratory** are important resources for graduate students in the sociology program. They serve many functions, including provision of the following: Internet access and email, access to the campus Zzsis system, data manipulation and analysis programs, and graphics and image processing software. While the Sociological Data Processing Center is reserved exclusively for graduate students and faculty, the Social science Computing Laboratory is used primarily for graduate students and faculty course instruction in the College of Arts and Sciences.

The Writing Center, established in 1983 by the Department of English, is an instructional resource center serving students and faculty who want assistance with writing. The Center offers several courses, an on-line writing component, and is a consulting resource for instructors who want assistance in incorporating writing into their courses.

The Thomas S. Foley Institute for Public Policy and Public Service, established in 1995, supports congressional and legislative studies, public policy research, voter education, and community outreach. The Institute also provides opportunities for public service internships in Congress, state legislatures, and other governmental and non-profit organizations.

The **Division of Governmental Studies and Services** employs graduate students on research projects related to government and public affairs, administers an internship program to provide practical experience in government, and maintains a collection of specialized government publications.

The **Franceschi Microscopy and Imaging Center**, located in Science Hall, is available for training and research in science and technology. Washington State University students, staff, and faculty members have access to the facilities for training consultation and service work. Formal courses in electron microscopy are offered by the Center, which maintains three transmission electron microscopes (including an analytical TEM equipped with STEM and EDX), a scanning electron microscope, also with EDX, a confocal microscope, and a full complement of ancillary equipment and facilities. The Center has a skilled staff experienced in handling a wide range of research problems in electron microscopy.

The **Environmental Research Center** is closely integrated with the academic program in Environmental Science and Regional Planning and is the focal point for university development of interdisciplinary research on problems related to the environment.

The **James Richard Jewett Observatory** is the gift of Mr. and Mrs. George F. Jewett of Spokane and is named in honor of Mr. Jewett's father, a former professor of ancient languages at Harvard University. The Observatory houses a 12-inch refractor with a visual lens and a 25-foot revolving dome. The University **Planetarium** is located in Sloan Hall 231. Information about open house and group tours of either the Observatory or Planetarium can be obtained by contacting the Program in Astronomy.

The **Center for Nuclear Magnetic Resonance Spectroscopy** (NMR) is in the Chemistry Synthesis Building and houses three high-field superconducting NMR instruments. The prime purpose of the instruments is to characterize structures of biological samples as solids or in solution for faculty and students in the sciences, agriculture, veterinary medicine, and

pharmacy. The facility is open for users who acquire appropriate training.

The **Institute for Shock Physics** is a multi-disciplinary research organization with an emphasis on understanding condensed matter response at extreme conditions. Research activities involve examining and understanding physical and chemical changes in solids and liquids under very rapid and large compressions. WSU is a leader in shock wave and high pressure research. The Institute's Applied Sciences Laboratory, a multidisciplinary contract research organization, undertakes a broad range of applied research activities of interest to industry and government agencies; it is located at WSU Spokane.

The **Laboratory of Bioanalysis and Biotechnology (LBB)** has three units with closely related but distinct functions. LBB I provides protein and DNA sequencing as well as peptide and oligonucleotide synthesis and also has gene chip analyzers for genomics research. LBB II houses four mass spectrometers to do proteomics and high resolution analysis of biological macromolecules. LBB III provides amino acid analysis of peptides and other biological material.

The **Center for Materials Research** was established as an interdisciplinary unit to serve the scientific community, assist the University in attracting and conducting research, and strengthen the educational capabilities of the University. The Center promotes interaction between researchers, provides mechanisms to improve educational programs in materials science, and provides a focal point for the purchase and construction of shared equipment and the development of other resources.

The **Center for Reproductive Biology** is an inter-institutional program involving 18 departments and seven colleges at WSU and the University of Idaho and is one of the largest reproductive biology centers in the world. The Center has 109 faculty who actively participate in reproductive biology research as well as more than 400 students, postdoctoral fellows, and staff. The objectives of the Center are to foster research of the highest quality and promote collaborative interactions among Center members; enhance opportunities for extramural funding with an emphasis on multi-investigator grants; and to enhance the training and education programs of advanced undergraduate, graduate and postdoctoral fellows with an interest in the biology of reproduction. Additionally, the Center operates 11 Core Laboratories that provides high-tech centralized services to members. These cores enhance faculty research capabilities and improve opportunities to compete for federal and industry research grants and contracts. For more information on the Center, visit: crb.wsu.edu/

College of Veterinary Medicine

Since its creation in 1974, the **Washington Animal Disease Diagnostic Laboratory (WADDL)** has provided essential laboratory services in bacteriology, parasitology, pathology, serology, toxicology, and virology. The Laboratory is an integral part of a network of tax-supported state diagnostic reference facilities throughout the United States dedicated to the betterment of animal and human health. WADDL has a responsibility to provide appropriate, timely results to safeguard the health of livestock, pets, poultry, and fish in the Pacific Northwest and to protect the public from zoonotic diseases. Advice and consultation is provided to practicing veterinarians, animal industry groups, state and federal regulatory officials, and physicians. WADDL also provides centralized service for the College by providing electron microscopy and histology support.

The **Animal Health Research Center (AHRC)** provides oversight of research programs within the College of Veterinary Medicine with an emphasis on diseases of agricultural animals and public health. Center research is divided into core programs that include transmissible spongiform encephalopathies, food borne diseases and antimicrobial resistance, immunology and vaccine development, microbial and host genomics, vector-borne diseases, and lentiviral disease. In conjunction with the College departmental graduate programs, AHRC research programs provide undergraduate research and graduate education opportunities.

The **Center for the Study of Animal Wellbeing** is a joint development between the College of Veterinary Medicine and the Department of Animal Sciences in the College of Agricultural, Human, and Natural Resources. The primary mission of the Center is to generate and disseminate new knowledge to make animal well-being and human-animal interactions better understood. Research areas include indicators of animal well-being, objective assessment of stress and pain, animal behavior and preferences, and the interrelationship of animal health and well-being to production and performance.

The **Center for Teaching, Learning, and Technology** is a central resource for all WSU instructors, including graduate teaching assistants. The CTLT works with faculty to identify and implement strategic methods of incorporating successful teaching approaches into their courses and programs. In addition, the CTLT applies current scholarship on effective teaching and learning to develop a variety of resources to help instructors in their efforts. The CTLT's resources include consultations about course and learning activity design, assessment techniques, and integrating instructional technologies; frequent discussions and workshops; and on-line technologies for learning and assessment. CTLT is located in ITB 2001B and can be reached at 335-1355 or ctlit@wsu.edu.

Student Services and Facilities

Campus Involvement
509-335-9667

getinvolved.wsu.edu

Campus Information
509-335-4636

Career Services
509-335-2546
Lighty 180

careers.wsu.edu

Children's Center
509-335-8847

childrenscenter.wsu.edu

Counseling Services
509-335-4511

counsel.wsu.edu

Access Center
Washington Building 217
509-335-3417

accesscenter.wsu.edu

Employment Office
French Ad 139
509-335-1969

hrs.wsu.edu

Equity and Diversity
509-335-8888

diversity.wsu.edu

Office of Financial Aid and Scholarships
Lighty Student Services 380
509-335-9711 (Financial Aid)
509-335-1059 (Scholarships)

finaid.wsu.edu

Graduate School
French Ad 324
509-335-6424

gradschool.wsu.edu

Graduate and Professional Student Association
CUB 308
509-335-9545

gpsa.wsu.edu

Benefits Services
French Ad 232
509-335-4589

wsu.edu/benefits

Bookie (Student Bookstore)
Located in the CUB
509-335-9444

wsubookie.bncollege.com

Student Legal Services
CUB 305
509-335-9539

Housing, Dining, and Residence Life
Streit-Perham Administration Suite
509-335-4577

housing.wsu.edu/famgrad

Global Campus
Van Doren Hall 104
509-335-3557

online.wsu.edu

Office of Grant and Research Development (OGRD)
Neill Hall 423
509-335-9661

ogrd.wsu.edu

WSU Office of Veterans Affairs
French Ad 346
509-335-1857 or 509-335-1234

va.wsu.edu

Alternatives to Violence on the Palouse
509-332-4357

community.palouse.net/ATVP

Crisis Line
509-332-1505

Information Technology
509-335-HELP (4357)

infotech.wsu.edu

International Programs
Bryan Hall 108
509-335-2541

ip.wsu.edu

Ombudsman's Office
Wilson Hall 2
509-335-1195

wsu.edu/~ombuds

Parking and Transportation
Corner of Colorado and D Street
509-335-PARK (7275)

wsu.edu/parking

Psychology Clinic
Johnson Tower 362
psychologyclinic.wsu.edu/

Speech and Hearing Clinic
509-335-1509

speechandhearing.wsu.edu/research/hearingspeechclinic.html

Center for Advising and Career Development
Lighty 260
509-335-6000

salc.wsu.edu

University Recreation
Student Recreation Center
509-335-873

urec.wsu.edu

Veterans Affairs
509-335-1234
French Ad 346

va.wsu.edu

Women's Resource Center
Wilson Hall 8
509-335-6849

women.wsu.edu

Women's Transit Center
Wilson Hall 8
509-335-6830

Beasley Coliseum
Ticket Information
1-800-325-SEAT

beasley.wsu.edu

University Theatre Ticket Information
Daggy Hall Box Office
509-335-7236

libarts.wsu.edu/theatre/

Departments, Programs, and Courses

Explanation of SYMBOLS

- 2 Figure following course title indicates the hours of credit and the number of lectures per week.
() Hours of lecture and laboratory required each week during the semester, with lecture being the first figure and laboratory the second.
(a/y) Indicates alternate years.
c// Indicates concurrent enrollment.

Courses listed in this catalog are subject to change through normal academic channels. New courses and changes are initiated by the cognizant departments or programs, approved through the appropriate academic dean, the Catalog Subcommittee, the Academic Affairs or Graduate Studies Committees, and the University Senate. Additions to the curriculum for the ensuing year are published each fall in the Catalog Supplement within the Fall Time Schedule. It is the obligation of the student to be acquainted with all the pertinent information in this Catalog and the Graduate School Policies and Procedures Manual to see that all departmental requirements are satisfied.

Accounting – Accounting (Pullman)

Degree offered: Master of Accounting
Faculty working with graduate students: 7
Graduate students: 40
Graduate students receiving assistantships or scholarships: 20%
Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI
Deadline: Fall: January 10
 Spring: July 1

Program Description

The Master of Accounting degree prepares students for careers as professional accountants in financial institutions, government, industry, nonprofit organizations, and public practice. The Master of Accounting degree program is a 32 credit hour general program of study that exposes students to accounting research and theory. The Pullman campus has a focus on audit and assurance while the Vancouver campus has a focus on taxation.

Degree Description

The Master of Accounting Pullman program has an audit and assurance focus. The degree prepares students for careers as professional accountants in financial institutions, government, industry, nonprofit organizations, and public practice. The Master of Accounting degree is a 32 credit hour program that exposes students to technical accounting topics and emphasizes professional accounting research and writing skills.

Training and Professional Development Opportunities

Greater breadth and depth in accounting than is possible in baccalaureate or general business degree programs. Additional preparation for the CPA examination. Additional credit hours targeted to meet the 150 credit hours necessary for CPA examination eligibility. Small class sizes.

Post-Graduate Employment Opportunities

Entry level positions in financial institutions, government, industry, nonprofit organizations, and public accounting firms.

Contact Information

Admissions
Graduate Programs, College of Business
PO Box 644710
Todd Hall 121
Pullman, WA 99164-4710
Telephone: 509-335-7617
Fax: 509-335-4735
E-mail: gpbadmin@wsu.edu

Susan Gill
Associate Professor and Chair
Accounting
242A Todd Hall
PO Box 644729
Pullman, WA 99164-4729
Telephone: 509-335-5633
Fax: 509-335-4275
E-mail: gills@wsu.edu

Faculty

Beau Barnes, Li Brooks, Linda Chen, Susan Gill, Robert Greenberg, Richard Toolson and Bernard Wong-On-Wing.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.
- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.

- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements pass thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.
- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the Master of Accounting program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

B LAW

- 510 Business Law and Ethics 3** Course Prerequisite: Admission to the MBA or Business PhD programs. Legal process and reasoning; commercial, managerial, and employment law; government regulations; contracts, torts, crimes; ethical conflicts and ethical decision making.
- 511 Business Law II 3** Course Prerequisite: Admission to the Master of Accounting program. Law of partnerships, corporations, securities regulations, negotiable instruments, secured transactions, property, insurance and bankruptcy; government regulation of businesses and professions.

Accounting – Accounting (Vancouver)

Degree offered: Master of Accounting

Faculty working with graduate students: 1

Graduate students: 20

Program offered: Vancouver

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The Master of Accounting degree prepares students for careers as professional accountants in financial institutions, government, industry, nonprofit organizations, and public practice. The Master of Accounting degree program is a 32 credit hour general program of study that exposes students to accounting research and theory. The Pullman campus has a focus on audit and assurance while the Vancouver campus has a focus on taxation.

Degree Description

The Master of Accounting Vancouver program has an emphasis in taxation. The degree prepares students for careers as professional accountants in financial institutions, government, industry, nonprofit organizations, and public practice. The Master of Accounting degree is a 32 credit hour program that exposes students to technical tax topics and emphasizes tax and accounting research skills.

Training and Professional Development Opportunities

Greater breadth and depth in taxation and accounting than is

possible in baccalaureate or general business degree programs. Additional preparation for the CPA examination. Additional credit hours targeted to meet the 150 credit hours necessary for CPA examination eligibility. Small class sizes.

Post-Graduate Employment Opportunities

Entry level positions in financial institutions, government, industry, nonprofit organizations, and directly enter tax departments of public accounting firms.

Contact Information

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Accounting
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Vancouver, WA 98686
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Fax: 360-546-9037
E-mail: dsanders@vancouver.wsu.edu

Faculty

Debra Sanders.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.
- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.
- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements passes thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.
- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the Master of Accounting program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

B LAW

510 Business Law and Ethics 3 Course Prerequisite: Admission to the MBA or Business PhD programs. Legal process and reasoning; commercial, managerial, and employment law; government regulations; contracts, torts, crimes; ethical conflicts and ethical decision making.

511 Business Law II 3 Course Prerequisite: Admission to the Master of Accounting program. Law of partnerships, corporations, securities regulations, negotiable instruments, secured transactions, property, insurance and bankruptcy; government regulation of businesses and professions.

Agricultural Economics

Degree offered: Doctor of Philosophy (Agricultural Economics)

Faculty working with graduate students: 24

Graduate students: 10

Graduate students receiving assistantships or scholarships: 30%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10

Requirements

Must successfully complete three preliminary core exams, (end of first year); must complete Agricultural Economics Field; must complete one additional field.

Program Description

This program is designed to provide the student with an excellent foundation in the theory and methods of economic analysis as well as experience in applied analysis of agricultural and/or resource economics problems. Career opportunities for agricultural economists include academia, government, and the private sector.

Degree Description

The PhD in Agricultural Economics is designed to provide the student with an excellent foundation in the theory and methods of economic analysis as well as experience in applied analysis of agricultural, agribusiness, and/or resource economics problems. Career opportunities for agricultural economists also include academia, government, and the private sector. Many academic positions (especially at land grant universities) include salary support for a combination of teaching, research, and/or outreach related to the food and fiber sectors and the natural resource base that supports them.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

Academia, Government and the Private Sector

Post-Graduate Career Placements

Analysis for American Express, Risk Analyst for JP Morgan, Assistant Professor

Contact Information

Dr. Hayley Chouinard
Associate Professor
School of Economic Sciences
PO Box 646210
Hulbert Hall 101
Pullman, WA 99164-6210
Telephone: 509-335-8739
Fax: 509-335-1173
E-mail: chouinard@wsu.edu

Faculty

Raymond Batina, Michael Brady, Kenneth Casavant, Andrew Cassey, Hayley Chouinard, Benjamin Cowan, Ana Espino-la-Arredondo, T Fortenbery, Gregmar Galinato, Rosa Gallardo, Mark Gibson, Bidisha Mandal, Thomas Marsh, Jill McCluskey, Vicki McCracken, R Mittelhammer, Felix Munoz-Garcia, Joseph Neiberger, Robert Rosenman, Jeremy Sage, C Shumway, Philip Wandschneider, Jia Yan and Jonathan Yoder.

ECONS

500 Macroeconomic Theory I 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.

501 Microeconomic Theory I 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.

502 Macroeconomic Theory II 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).

503 Microeconomic Theory II 3 Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).

504 Production and Consumption Economics 3 Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).

505 Economics for Agricultural Decision Making 3 Managerial economics with specific applications to agricultural issues.

- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I 3** Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II 3** Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V 1-2** May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Agriculture

Degree offered: Master of Science in Agriculture

Faculty working with graduate students: 64

Graduate students: 20

Program offered: DDP

Tests required: TOEFL, TOEFLI

Deadline: Fall: November 1 (January 10 international)

Spring: May 1 (July 1 international)

Requirements

MS in Agriculture Thesis Option

Components of the thesis option:-21 hours minimum of graded coursework:15 hours minimum of graded coursework at the 500-level; 4 hours minimum of AGRI 700 credit; 3 hours maximum of seminar courses; 6 hours maximum in non-graduate graded coursework (300 - 400 level only)Preparation of a formal thesis/research paper (AGRI 700 credits)-Two-part final exam: Public seminar where student presents the results of the research project Oral exam that focuses on defense of the research project, attended by all committee members

Program Description

The M.S. in Agriculture program, offered by the College of Agricultural, Human, and Natural Resource Sciences, is designed to provide practitioners and professionals an opportunity to strengthen and diversify their expertise in agriculture-related

disciplines. The program is completely web-based and can be completed anywhere in the world, although students may choose to take courses on the Pullman campus. Outstanding faculty participation from a diverse array of academic disciplines, including animal science, crop and soil sciences, entomology, horticulture and landscape architecture, plant pathology, food science, and economic sciences, makes the program truly interdisciplinary. With support from an advising committee, students have the opportunity to tailor their coursework to meet their personal and professional learning goals.

Degree Description

The M.S. in Agriculture program is designed to provide practitioners and professionals with an opportunity to strengthen and diversify their expertise in agriculture-related disciplines. The program is completely web-based and can be completed from anywhere in the world, although students may choose to take courses on the Pullman campus. Outstanding faculty participation from a diverse array of academic disciplines, including animal science, crop and soil sciences, entomology, horticulture, landscape architecture, plant pathology, food science, and economic sciences, makes the program truly interdisciplinary. With support from an advising committee, students have the opportunity to tailor their coursework to meet their personal and professional learning goals. To enable students to become outstanding educators and practitioners in agricultural disciplines, the program will foster the development of excellent communication and teaching skills, as well as a comprehensive understanding of research approaches used to address agricultural issues. Both thesis (research emphasis) and non-thesis (coursework emphasis) tracks are available to students pursuing the MS in Agriculture degree. In general, the thesis option requires both the successful completion of coursework, and the preparation and oral defense of the thesis based on a research project the student conducted. The thesis option is ideal for people who are interested in pursuing or expanding a professional career involving the scientific aspects of an agricultural discipline. This degree also is suitable for individuals who intend to continue their graduate education. The non-thesis option requires the completion of additional coursework, preparation of an independent project paper, a written comprehensive examination, and an oral defense of concepts discussed in the independent project paper, comprehensive exam, and relevant course work. The non-thesis option provides students who do not intend to develop comprehensive research skills with an opportunity to obtain an advanced degree of similar quality and depth as a thesis-based master's degree program. Additional coursework and the independent project/paper are substituted for the intensive thesis experience. The non-thesis option is designed for students with relevant experience in industry who are interested in expanding their expertise in a particular agricultural discipline. Knowledge acquired through this experience will likely be used by successful candidates to improve performance or expand opportunities for advancement in a current employment situation, or to support a student with redirecting their career opportunities towards a new discipline.

Post-Graduate Employment Opportunities

Graduates may find employment in government agencies, national labs, academia, private business, and agricultural consulting.

Post-Graduate Career Placements

Our alumni occupy positions in business and industry, production

and business management, teaching, extension, federal and state government, community colleges, school administration, and as owners of independent businesses.

Contact Information

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Lisa Lujan
Academic Coordinator
Johnson Hall Graduate Center
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Faculty

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STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 501 Agriculture Master's Practicum V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to graduate program in Master of Science in Agriculture. Course individually designed to provide practical participation/experience under professional supervision in areas related to student's specialization.
- 502 Graduate Seminar** 3 Presentations and discussions of contemporary issues, trends, and recent research and development by graduate students, faculty, and visiting scholars.
- 560 Contemporary Issues in Agricultural Technology and Policy** 3 Contemporary issues in agricultural technology and policy implications.
- 562 Advanced Topics V** 1-3 May be repeated for credit; cumulative maximum 4 hours. Directed group study of selected advanced topics in agriculture and related areas.
- 587 Research and Extension in Agriculture** 3 Ways to effectively communicate research and extension information to diverse audiences; and to plan and assess effective extension programs.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data** 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology** 3 Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.

- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Agriculture

Degree offered: Master of Science in Agriculture – Non Thesis

Faculty working with graduate students: 65

Graduate students: 21

Program offered: DDP

Tests required: TOEFL, TOEFLI

Deadline: Fall: November 1 (January 10 international)

Spring: May 1 (July 1 international)

Requirements

MS in Agriculture Non-Thesis Option

Components of the non-thesis option:-26 hours minimum of graded course work:17 hours minimum of graded course work at the 500-level; 4 hours minimum of AGRI 702; 3 hours maximum of seminar courses; 9 hours maximum of non-graduate graded course work credit (300 - 400 level only)-Independent project and paper (AGRI 702 credits)-Comprehensive exam, which typically consists of two to four questions answered in writing without the aid of notes, books or other reference materials. The comprehensive exam typically takes 4 - 8 hours to complete.-Final oral exam with the committee focusing on comprehensive exam responses, the independent project, and course content.

Program Description

The M.S. in Agriculture program, offered by the College of Agricultural, Human, and Natural Resource Sciences, is designed to provide practitioners and professionals an opportunity to strengthen and diversify their expertise in agriculture-related disciplines. The program is completely web-based and can be completed anywhere in the world, although students may choose to take courses on the Pullman campus. Outstanding faculty

participation from a diverse array of academic disciplines, including animal science, crop and soil sciences, entomology, horticulture and landscape architecture, plant pathology, food science, and economic sciences, makes the program truly interdisciplinary. With support from an advising committee, students have the opportunity to tailor their coursework to meet their personal and professional learning goals.

Degree Description

The M.S. in Agriculture program is designed to provide practitioners and professionals with an opportunity to strengthen and diversify their expertise in agriculture-related disciplines. The program is completely web-based and can be completed anywhere in the world, although students may choose to take courses on the Pullman campus. Outstanding faculty participation from a diverse array of academic disciplines, including animal science, crop and soil sciences, entomology, horticulture and landscape architecture, plant pathology, food science, and economic sciences, makes the program truly interdisciplinary. With support from an advising committee, students have the opportunity to tailor their coursework to meet their personal and professional learning goals. To enable students to become outstanding educators and practitioners in agricultural disciplines, the program will foster the development of excellent communication and teaching skills, as well as a comprehensive understanding of research approaches used to address agricultural issues. Both thesis (research emphasis) and non-thesis (coursework emphasis) tracks are available to students pursuing the MS in Agriculture degree. In general, the thesis option requires both the successful completion of coursework, and the preparation and oral defense of the thesis based on a research project the student conducted. The thesis option is ideal for people who are interested in pursuing or expanding a professional career involving the scientific aspects of an agricultural discipline. This degree also is suitable for individuals who intend to continue their graduate education. The non-thesis option requires the completion of additional coursework, preparation of an independent project paper, a written comprehensive examination, and an oral defense of concepts discussed in the independent project paper, comprehensive exam, and relevant course work. The non-thesis option provides students who do not intend to develop comprehensive research skills with an opportunity to obtain an advanced degree of similar quality and depth as a thesis-based master's degree program. Additional coursework and the independent project/paper are substituted for the intensive thesis experience. The non-thesis option is designed for students with relevant experience in industry who are interested in expanding their expertise in a particular agricultural discipline. Knowledge acquired through this experience will likely be used by successful candidates to improve performance or expand opportunities for advancement in a current employment situation, or to support a student with redirecting their career opportunities towards a new discipline.

Post-Graduate Career Placements

Our alumni occupy positions in business and industry, production and business management, teaching, extension, federal and state government, community colleges, school administration, and as owners of independent businesses.

Contact Information

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Faculty

Preston Andrews, John Baser, Chris Benedict, Margaret Benson, Bhaskar Bondada, Vicki Bradley, Michael Brady, Jay Brunner, Ian Burke, Lynne Carpenter-Boggs, Linda Chalker-Scott, Gary Chastagner, Xianming Chen, Hayley Chouinard, Craig Cogger, Jeffry Culbertson, Joan Davenport, Kefyalew Desta, Amit Dhingra, James Durfey, Katherine Evans, John Fellman, Markus Flury, T Fortenbery, Steven Fransen, Rosa Gallardo, James Harsh, Rita Hummel, Pete Jacoby, William Johnston, Stephen Jones, Markus Keller, Kimberlee Kidwell, Karen Killinger, Norman Knowles, Richard Koenig, Desmond Layne, Virginia Lohr, H Love, Drew Lyon, Vicki McCracken, John McNamara, Carol Miles, Timothy Miller, R Mittelhammer, Michelle Moyer, Kevin Murphy, Joseph Neiberger, John Nelson, Mark Nelson, Nnadozie Oraguzie, William Pan, Chris Pannkuk, Hanu Pappu, Mark Pavcek, R Peters, Barbara Rasco, John Reganold, Carolyn Ross, Richard Rupp, Rodney Saylor, Walter Sheppard, Denise Smith, John Stark and Matthew Whiting.

STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 501 Agriculture Master's Practicum V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to graduate program in Master of Science in Agriculture. Course individually designed to provide practical participation/experience under professional supervision in areas related to student's specialization.
- 502 Graduate Seminar** 3 Presentations and discussions of contemporary issues, trends, and recent research and development by graduate students, faculty, and visiting scholars.
- 560 Contemporary Issues in Agricultural Technology and Policy** 3 Contemporary issues in agricultural technology and policy implications.
- 562 Advanced Topics V** 1-3 May be repeated for credit; cumulative maximum 4 hours. Directed group study of selected advanced topics in agriculture and related areas.
- 587 Research and Extension in Agriculture** 3 Ways to effectively communicate research and extension information to diverse audiences; and to plan and assess effective extension programs.

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- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

American Studies

Degree offered: Doctor of Philosophy (American Studies)

Faculty working with graduate students: 20

Graduate students: 22

Graduate students receiving assistantships or scholarships: 68%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Program Description

The Doctor of Philosophy Degree (Ph.D.) in American Studies at Washington State University requires a previous Master's Degree in American Studies, History, English, Ethnic Studies, Women's Studies, or a related discipline in the social sciences or the humanities. The degree aims to achieve both breadth of knowledge in US cultural history, and depth of knowledge in an interdisciplinary area of specialization.

Degree Description

The Doctor of Philosophy Degree (Ph.D.) in American Studies at Washington State University does not require a previous Master's Degree in American Studies, History, English, Ethnic Studies, Women's Studies, or a related discipline in the social sciences or the humanities. The degree aims to achieve both breadth of knowledge in US cultural history, and depth of knowledge in an interdisciplinary area of specialization. The Program in American Studies requires that the Ph.D. include a total of seventy-two (72) credit hours beyond the BA, including transfer credits (up to 17 from an MA degree), research, and dissertation credits. A minimum total of thirty-four (34) must be graded credit hours in graduate courses.

Training and Professional Development Opportunities

While most of our graduate students enter careers in university and college teaching, an American Studies advanced degree can also be utilized as a useful preparation for community activism, museum and archive work, traditional and electronic publishing, and government service, among other careers.

Post-Graduate Employment Opportunities

Independent contractor for US Park Service and other government and tribal agencies, Census Bureau, museum education/outreach programs, archival researcher, genealogist/historian, humanitarian organizations

Post-Graduate Career Placements

Director, College Assistance Migrant Program; Journal Staff; Administration/Program Directors; Retention Counselor for Asian American Pacific Islanders; Associate Director, Multicultural student Services; Director of Multicultural Heritage Houses

Contact Information

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Faculty

Mary Bloodsworth-Lugo, Kimberly Christen, Patricia Ericsson, Luz-Maria Gordillo, Lisa Guerrero, Linda Heidenreich, Wendy Johnson, C King, David Leonard, Carmen Lugo-Lugo, Laurie Mercier, Judy Meuth, Pavithra Narayanan, Rory Ong, Paula Price, Thomas Reed, Marian Sciachitano, Nishant Shahani, John Streamas and Pamela Thoma.

AM ST

- 470 Literature and Culture of the American West 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Junior standing. Cultural exploration of American West in written texts; outsider and insider versions of reality and imagination of its diverse peoples. (Cross-listed course offered as ENGLISH 470, AMER ST 470).
- 471 Cultural Politics Since World War II 3** American popular culture, politics and culture of the 1960s, or topics in recent cultural politics.
- 472 Ecological Issues and American Nature Writing 3** Course Prerequisite: Junior standing. Representation of nature in American fiction and nonfiction; role of culture in shaping environmental problems and solutions. (Cross-listed course offered as AMER ST 472, ENGLISH 472).

- 473 Arts in American Cultures 3** Course Prerequisite: Junior standing. Exploration of visual culture from fine arts to advertising as a political, sociological, psychological, and philosophical influence in 20th-century American cultures.
- 474 Social Movements and US Culture 3** Course Prerequisite: Junior standing. Cultural impact of selected social movements such as abolition, populism, labor, women's, ethnic power, gay/lesbian and anti-globalization.
- 475 Digital Diversity 3** Course Prerequisite: Junior standing. Cultural impact of electronic media, especially the World-Wide Web; issues of race, class, gender, sexuality online. (Cross-listed course offered as AMER ST 475, DTC 475, ENGLISH 475).
- 500 Colloquium 1** May be repeated for credit; cumulative maximum 12 hours. Current research in American studies.
- 501 Readings in American Studies I 3** May be repeated for credit; cumulative maximum 6 hours. Readings in key texts in American culture, beginnings to 1865.
- 502 Readings in American Studies II 3** May be repeated for credit; cumulative maximum 9 hours. Readings in key texts in American culture, 1865 to present.
- 503 Contemporary Theories of Race and Ethnicity 3** Major theoretical readings and key recent texts in U.S. and transnational ethnic studies scholarship.
- 505 Pro Seminar in American Cultural Studies 3** Critical theoretical engagement within an interdisciplinary field; emphasis on professionalism.
- 506 Frameworks in American Cultural Studies 3** Critical framework for intellectual, theoretical, and political genealogies within American Studies.
- 507 Contemporary Practices in American Cultural Studies 3** Overview of contemporary practices in American cultural studies; important concepts and major insights within the field.
- 513 Theory and Method in American Studies 3** Major theories and methods currently used by American studies scholars; key concepts in cultural analysis. (Cross-listed course offered as AMER ST 513, ENGLISH 513, HISTORY 513).
- 514 Interdisciplinary Research Methods 3** Major methods used in interdisciplinary cultural analysis including critical ethnography, oral history, rhetorical and textual analysis and other qualitative approaches.
- 520 Colonization, Globalization and Decolonization 3** Topics in the critical study of colonialism, neo-colonialism, imperialism, globalization and resistance to these forces.
- 521 Critical Studies in Sexuality 3** Topics in the critical analysis of normative sexualities and forces shaping US and global cultures.
- 522 Digital Cultures, Digital Divides 3** Critical analysis of the social and cultural dimensions of the digital divide and use of digital technologies by dominant and subaltern communities.
- 523 Environmental Justice Cultural Studies 3** Critical analysis of the cultural dimensions of environmental justice and injustice.
- 524 Critical Studies in Popular Culture 3** Interdisciplinary approaches to historical and contemporary trends and issues in US popular culture.
- 525 Social Movements in American Studies 3** Theoretical and historical study of the role of social movement in United States culture.
- 526 Contemporary Theories of Race and Ethnicity 3** Major theoretical readings and key recent texts in U.S. and transnational ethnic studies scholarship.
- 527 Contemporary Feminist Theories and Practices 3** Major theoretical readings and key recent texts in U.S. and transnational feminist scholarship.
- 590 Seminar in American Studies 3** May be repeated for credit; cumulative maximum 9 hours. Interdisciplinary topics in American culture.
- 596 Topics in American Studies 3** May be repeated for credit; cumulative maximum 9 hours. American Studies Summer Institute. (Cross-listed course offered as AMER ST 596, HISTORY 596). Credit not granted for both HISTORY 496 and HISTORY 596.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

American Studies

Degree offered: Master of Arts in American Studies

Faculty working with graduate students: 20

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Program Description

The Doctor of Philosophy Degree (Ph.D.) in American Studies at Washington State University requires a previous Master's Degree

in American Studies, History, English, Ethnic Studies, Women's Studies, or a related discipline in the social sciences or the humanities. The degree aims to achieve both breadth of knowledge in US cultural history, and depth of knowledge in an interdisciplinary area of specialization.

Degree Description

The program for the Master of Arts (M.A.) in American Studies at Washington State University is designed to provide a broad background in American Culture Studies. In consultation with their advisor, candidates are expected to assemble a range of courses and independent study in American ethnic studies, literature, history, women's studies, and related fields that will provide them with a broad knowledge of US culture and of current approaches to cultural interpretation. TRADITIONAL THESIS: Students taking the thesis option write a thesis (typically 75-125 pages) synthesizing material on an American Studies topic they choose in consultation with their degree committee. (Examples of previous theses are available in the Coordinator's office.) Approval of the thesis occurs after a final oral exam conducted by the student's degree committee, and constitutes completion of the degree, presuming all course, exam and language requirements have been met. The M.A. program of study, to be filed with the graduate school, must include a minimum of thirty (30) post-BA credit hours, at least thirty (30) of which must be in graded courses.

Training and Professional Development Opportunities

While most of our graduate students enter careers in university and college teaching, an American Studies advanced degree can also be utilized as a useful preparation for community activism, museum and archive work, traditional and electronic publishing, and government service, among other careers.

Post-Graduate Employment Opportunities

Independent contractor for US Park Service and other government and tribal agencies, Census Bureau, museum education/outreach programs, archival researcher, genealogist/historian, humanitarian organizations

Post-Graduate Career Placements

Director, College Assistance Migrant Program; Journal Staff; Administration/Program Directors; Retention Counselor for Asian American Pacific Islanders; Associate Director, Multicultural student Services; Director of Multicultural Heritage Houses

Contact Information

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Faculty

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AM ST

- 470 Literature and Culture of the American West** 3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Junior standing. Cultural exploration of American West in written texts; outsider and insider versions of reality and imagination of its diverse peoples. (Cross-listed course offered as ENGLISH 470, AMER ST 470).
- 471 Cultural Politics Since World War II** 3 American popular culture, politics and culture of the 1960s, or topics in recent cultural politics.
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- 473 Arts in American Cultures** 3 Course Prerequisite: Junior standing. Exploration of visual culture from fine arts to advertising as a political, sociological, psychological, and philosophical influence in 20th-century American cultures.
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- 500 Colloquium 1** May be repeated for credit; cumulative maximum 12 hours. Current research in American studies.
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- 522 Digital Cultures, Digital Divides 3** Critical analysis of the social and cultural dimensions of the digital divide and use of digital technologies by dominant and subaltern communities.
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- 527 Contemporary Feminist Theories and Practices 3** Major theoretical readings and key recent texts in U.S. and transnational feminist scholarship.
- 590 Seminar in American Studies 3** May be repeated for credit; cumulative maximum 9 hours. Interdisciplinary topics in American culture.
- 596 Topics in American Studies 3** May be repeated for credit; cumulative maximum 9 hours. American Studies Summer Institute. (Cross-listed course offered as AMER ST 596, HISTORY 596). Credit not granted for both HISTORY 496 and HISTORY 596.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

American Studies

Degree offered: Master of Arts in American Studies – Non Thesis

Faculty working with graduate students: 20

Graduate students: 1

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Program Description

The Doctor of Philosophy Degree (Ph.D.) in American Studies at Washington State University requires a previous Master's Degree in American Studies, History, English, Ethnic Studies, Women's Studies, or a related discipline in the social sciences or the humanities. The degree aims to achieve both breadth of knowledge in US cultural history, and depth of knowledge in an interdisciplinary area of specialization.

Degree Description

The program for the Master of Arts (M.A.) in American Studies at Washington State University is designed to provide a broad background in American Culture Studies. In consultation with their

advisor, candidates are expected to assemble a range of courses and independent study in American ethnic studies, literature, history, women's studies, and related fields that will provide them with a broad knowledge of US culture and of current approaches to cultural interpretation. Students who choose the portfolio instead of any of the thesis options must complete the following:

1. One publishable paper based upon graduate level research, preferably a paper which has been presented at a conference. A short cover letter for the paper should identify possible venues for publication as well as locate the paper's relationship to the student's overall academic preparation for presenting such a paper. The paper may be a revised seminar paper from work in core classes, a paper concerning the student's area of emphasis, or a general seminar paper or academic writing project prepared for publication. It is expected that selection and preparation of the paper will be accomplished over time in consultation with members of the student's degree committee, and
2. A position paper of 8-10 pages, written after completing the core courses required of master's students. In the position paper, the student will focus either on an area of emphasis or an area of specialization, not both, and clarify how course work in the core compliments or expands upon the work completed in an area of specialization or emphasis. The non-thesis M.A. program of study, to be filed with the graduate school, must include a minimum of thirty (30) post-BA credit hours, at least thirty (30) of which must be in graded courses.

Training and Professional Development Opportunities

While most of our graduate students enter careers in university and college teaching, an American Studies advanced degree can also be utilized as a useful preparation for community activism, museum and archive work, traditional and electronic publishing, and government service, among other careers.

Post-Graduate Employment Opportunities

Independent contractor for US Park Service and other government and tribal agencies, Census Bureau, museum education/outreach programs, archival researcher, genealogist/historian, humanitarian organizations

Post-Graduate Career Placements

Director, College Assistance Migrant Program; Journal Staff; Administration/Program Directors; Retention Counselor for Asian American Pacific Islanders; Associate Director, Multicultural student Services; Director of Multicultural Heritage Houses

Contact Information

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Faculty

Mary Bloodsworth-Lugo, Kimberly Christen, Patricia Ericsson, Luz-Maria Gordillo, Lisa Guerrero, Linda Heidenreich, Wendy Johnson, C King, David Leonard, Carmen Lugo-Lugo, Laurie Mercier, Judy Meuth, Pavithra Narayanan, Rory Ong, Paula Price, Thomas Reed, Marian Sciachitano, Nishant Shahani, John Streamas and Pamela Thoma.

AM ST

- 470 Literature and Culture of the American West 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Junior standing. Cultural exploration of American West in written texts; outsider and insider versions of reality and imagination of its diverse peoples. (Cross-listed course offered as ENGLISH 470, AMER ST 470).
- 471 Cultural Politics Since World War II 3** American popular culture, politics and culture of the 1960s, or topics in recent cultural politics.
- 472 Ecological Issues and American Nature Writing 3** Course Prerequisite: Junior standing. Representation of nature in American fiction and nonfiction; role of culture in shaping environmental problems and solutions. (Cross-listed course offered as AMER ST 472, ENGLISH 472).
- 473 Arts in American Cultures 3** Course Prerequisite: Junior standing. Exploration of visual culture from fine arts to advertising as a political, sociological, psychological, and philosophical influence in 20th-century American cultures.
- 474 Social Movements and US Culture 3** Course Prerequisite: Junior standing. Cultural impact of selected social movements such as abolition, populism, labor, women's, ethnic power, gay/lesbian and anti-globalization.
- 475 Digital Diversity 3** Course Prerequisite: Junior standing. Cultural impact of electronic media, especially the World-Wide Web; issues of race, class, gender, sexuality online. (Cross-listed course offered as AMER ST 475, DTC 475, ENGLISH 475).
- 500 Colloquium 1** May be repeated for credit; cumulative maximum 12 hours. Current research in American studies.

- 501 Readings in American Studies I** 3 May be repeated for credit; cumulative maximum 6 hours. Readings in key texts in American culture, beginnings to 1865.
- 502 Readings in American Studies II** 3 May be repeated for credit; cumulative maximum 9 hours. Readings in key texts in American culture, 1865 to present.
- 503 Contemporary Theories of Race and Ethnicity** 3 Major theoretical readings and key recent texts in U.S. and transnational ethnic studies scholarship.
- 505 Pro Seminar in American Cultural Studies** 3 Critical theoretical engagement within an interdisciplinary field; emphasis on professionalism.
- 506 Frameworks in American Cultural Studies** 3 Critical framework for intellectual, theoretical, and political genealogies within American Studies.
- 507 Contemporary Practices in American Cultural Studies** 3 Overview of contemporary practices in American cultural studies; important concepts and major insights within the field.
- 513 Theory and Method in American Studies** 3 Major theories and methods currently used by American studies scholars; key concepts in cultural analysis. (Cross-listed course offered as AMER ST 513, ENGLISH 513, HISTORY 513).
- 514 Interdisciplinary Research Methods** 3 Major methods used in interdisciplinary cultural analysis including critical ethnography, oral history, rhetorical and textual analysis and other qualitative approaches.
- 520 Colonization, Globalization and Decolonization** 3 Topics in the critical study of colonialism, neo-colonialism, imperialism, globalization and resistance to these forces.
- 521 Critical Studies in Sexuality** 3 Topics in the critical analysis of normative sexualities and forces shaping US and global cultures.
- 522 Digital Cultures, Digital Divides** 3 Critical analysis of the social and cultural dimensions of the digital divide and use of digital technologies by dominant and subaltern communities.
- 523 Environmental Justice Cultural Studies** 3 Critical analysis of the cultural dimensions of environmental justice and injustice.
- 524 Critical Studies in Popular Culture** 3 Interdisciplinary approaches to historical and contemporary trends and issues in US popular culture.
- 525 Social Movements in American Studies** 3 Theoretical and historical study of the role of social movement in United States culture.
- 526 Contemporary Theories of Race and Ethnicity** 3 Major theoretical readings and key recent texts in U.S. and transnational ethnic studies scholarship.
- 527 Contemporary Feminist Theories and Practices** 3 Major theoretical readings and key recent texts in U.S. and transnational feminist scholarship.
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- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Animal Sciences

Degree offered: Doctor of Philosophy (Animal Sciences)

Faculty working with graduate students: 20

Graduate students: 31

Graduate students receiving assistantships or scholarships: 93%

Tests required: GRE (Combined), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Degree requirements are specific to the discipline in which the student is studying.

Program Description

The Department of Animal Sciences is an interdisciplinary department, bringing together expertise from different disciplines for the solution of problems in animal biology and animal production. Research in the department covers a continuum from basic to applied with an emphasis on animal biology. Students may choose to focus on the areas of: nutrition-environmental sciences, reproductive physiology-endocrinology, genetics, animal

breeding, muscle biology, meat science, cell biology, and animal behavior.

Degree Description

Animal Sciences offers graduate work leading to the Doctor of Philosophy degree with a major in animal science. Programs are flexible and designed to meet the needs and interests of the student and, as such, specific degree requirements are determined through individual consultation with an advisor and a special committee. The department maintains herds of dairy cattle, beef cattle, and swine for research and teaching purposes.

Training and Professional Development Opportunities

Graduates from our program are employed in a wide range of careers from applied animal production to teaching and research of molecular mechanisms in domestic and companion animals, as well as humans. Graduate students acquire cutting-edge knowledge and techniques in disciplines that are vital to the improvement of quality of life for animals and humans. Examples of ongoing fundamental research include: the use of mammalian comparative and functional genomics in the search for genes of economic significance including identification of genes involved in disease resistance as well as production traits; understanding molecular events coordinating the physiology of uterine and testis biology using the mouse and domestic ruminants as model organisms; understanding and enhancing skeletal and cardiac muscle growth and development with stem cell and gene therapy approaches; developing deterministic models to evaluate the environmental impact of dairy and beef production systems; and examination of the bovine genome to examine the genetic x nutrition interactions associated with feed efficiency in beef cattle. Examples of important applied research include minimizing the impact of animals on the environment; altering animal nutrition to enhance meat quality; and strategies to understand and enhance animal behavior and well-being. The department's dairy, feedlot, beef cow-calf unit, feed mill, research laboratories, experimental animal building, and meats laboratory provide the foundation for the department's bench-to-application approach. Opportunities: Industry internships NSF IGERT Program: NSPIRE: Nitrogen Systems Policy-oriented Integrated Research and Education

Post-Graduate Employment Opportunities

University faculty, National agricultural laboratories, Postdoctoral positions in prestigious laboratories, Management, allied and agricultural industries ,Extension and technical positions, Teaching positions.

Post-Graduate Career Placements

Research scientist, Agricultural Research Service, Miles City, MT; Research scientist, USDA Human Nutrition Lab, Grand Forks, ND; Faculty Montana State University, Bozeman, MT; Postdoctoral fellow, University of Pennsylvania, Philadelphia; Postdoctoral fellow, EMBRAPA , Concordia, SC, Brazil; International consulting Worldwide Genetic Resources; Technical specialist at Elanco; Research Scientist at Alltech, Inc; International and Biotechnology Postdoctoral fellows; Teaching positions at 4-yr colleges and universities; Animal behavior scientist at Nestle Purina;

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E-mail: neibergs@wsu.edu

Faculty

Margaret Benson, Jan Busboom, Judith Capper, Michael Dodson, Min Du, Lawrence Fox, Joseph Harrison, Zihua Jiang, Kristen Johnson, Donald Llewellyn, Derek McLean, John McNamara, Holly Neibergs, Donald Nelson, Mark Nelson, Ruth Newberry, James Pru, Buel Rodgers, Thomas Spencer and Raymond Wright.

Animal Sciences

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- 501 Milk, Meat, and Methane: Contemporary Animal Production Issues 3** Provides knowledge and understanding of livestock issues that affect contemporary livestock production.
- 504 Special Topics V 1-4** May be repeated for credit; cumulative maximum 12 hours.
- 507 Advanced Nutrient Metabolism 3** Advanced topics in metabolic regulation of carbohydrate, fat and amino acid use by animals.
- 510 Digestion and Nutrient Utilization in Animals 3 (2-3)** Gastrointestinal physiology, rate of passage, feed intake regulation, measures of digestibility, starch, fat and nonstarch polysaccharide, and digestion and utilization of nutrients.
- 513 Mineral and Vitamin Metabolism 4** Absorption, excretion, metabolism, dietary requirements and interactions of minerals and vitamins in animals and humans.
- 520 Preparation of Scientific Literature in Animal Sciences 2** Preparation of grant proposals, manuscripts, and literature reviews on research topics.
- 528 Topics in Animal Breeding 2** May be repeated for credit; cumulative maximum 4 hours. Systems of selection and mating for genetic improvement in farm animals.
- 551 Endocrine Physiology 3** Anatomy, physiology, and biochemistry of endocrine systems and hormone action; emphasis on comparative, veterinary, and biomedical models. Credit not granted for both ANIM SCI 451 and ANIM SCI 551.
- 558 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).

- 581 Stem Cell Biology, Therapeutics and Regenerative Medicine** 3 Provides information on the latest cutting edge research in the areas of stem cell biology and tissue regeneration; covers stem cell therapeutics, gene transfer vectors and methods for isolating, characterizing, and generating stem cells. (Course offered as PHARMSCI 581, ANIM SCI 581).
- 582 Seminar in Reproductive Biology** 1 Current developments in reproductive biology.
- 588 Perspectives in Biotechnology** 3 Theory and application of biotechnology in agriculture, industry, and medicine; methodological, environmental, social, and economic concerns. Credit not granted for both ANIM SCI 488 and ANIM SCI 588.
- 598 Advanced Topics in Animal Sciences** V 1-2 May be repeated for credit. Recent research in various disciplines of animal sciences.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Animal Sciences**
- STAT**
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data** 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology** 3 Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists** 3 Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models** 3 (2-2) The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models** 3 Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis** 3 Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
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- 544 Applied Stochastic Processes** 3 Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory** 3 Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.

- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
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Animal Sciences

Degree offered: Master of Science in Animal Sciences

Faculty working with graduate students: 20

Graduate students: 31

Graduate students receiving assistantships or scholarships: 93%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10

Spring: July 1

Requirements

Students considering graduate study in the Department of Animal Sciences should major in animal science, biology, zoology, or closely related fields.

Program Description

The Department of Animal Sciences is an interdisciplinary department, bringing together expertise from different disciplines for the solution of problems in animal biology and animal production. Research in the department covers a continuum from basic to applied with an emphasis on animal biology. Students may choose to focus on the areas of: nutrition-environmental

sciences, reproductive physiology-endocrinology, genetics, animal breeding, muscle biology, meat science, cell biology, and animal behavior.

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Animal Sciences offers graduate work leading to the Master of Science degree with a major in animal science. Programs are flexible and designed to meet the needs and interests of the student and, as such, specific degree requirements are determined through individual consultation with an advisor and a special committee. The department maintains herds of dairy cattle, beef cattle, and swine for research and teaching purposes.

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Graduates from our program are employed in a wide range of careers from applied animal production to teaching and research of molecular mechanisms in domestic and companion animals, as well as humans. Graduate students acquire cutting-edge knowledge and techniques in disciplines that are vital to the improvement of quality of life for animals and humans. Examples of ongoing fundamental research include: the use of mammalian comparative and functional genomics in the search for genes of economic significance including identification of genes involved in disease resistance as well as production traits; understanding molecular events coordinating the physiology of uterine and testis biology using the mouse and domestic ruminants as model organisms; understanding and enhancing skeletal and cardiac muscle growth and development with stem cell and gene therapy approaches; developing deterministic models to evaluate the environmental impact of dairy and beef production systems; and examination of the bovine genome to examine the genetic x nutrition interactions associated with feed efficiency in beef cattle. Examples of important applied research include minimizing the impact of animals on the environment; altering animal nutrition to enhance meat quality; and strategies to understand and enhance animal behavior and well-being. The department's dairy, feedlot, beef cow-calf unit, feed mill, research laboratories, experimental animal building, and meats laboratory provide the foundation for the department's bench-to-applications approach.

Post-Graduate Employment Opportunities

National agricultural laboratories; management, allied and agricultural industries; Extension and technical positions; teaching positions,

Post-Graduate Career Placements

Research technologist, University of Washington, Seattle, WA; Ph.D. students at other prestigious universities; Research technologist, Human Nutrition Lab; Associate in Animal Sciences research, Washington State University; Teaching positions; Animal behavioral scientists at zoos;

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- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Anthropology

Degree offered: Doctor of Philosophy (Anthropology)

Faculty working with graduate students: 25

Graduate students: 34

Graduate students receiving assistantships or scholarships: 58%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Requirements

Each Anthropology Graduate Program has its own minimum number of required grade credit hours for a PhD
 Archaeology: 56 graded credits
 Cultural Anthropology: 37 graded credits
 Evolutionary Anthropology: 52 graded credits.

Program Description

Anthropology is the study of human diversity in the broadest sense. We ask and attempt to address the most basic questions about the nature or culture, the origins humans, and human variability. Anthropologists study the interactions between our biological heritage and our learned cultural heritages. Anthro-

pologists are important components of management projects that deal with landscape development, human impact studies, cultural resource use, crime scene investigations, and internationalization projects. In addition, anthropologists investigate the unwritten human past that accounts for over 99% of all human existence. Through world class research and instruction the anthropology department at Washington State University seeks to inform the public, students, and the profession on these aspects of human diversity. Many of our students go on to make careers in one of the sub disciplines of anthropology (bioanthropology, archaeology, cultural anthropology, and linguistics). However, many of our students that did not later pursue careers in anthropology tell us that their experiences here greatly enriched their perspectives on life and learning in other fields. Our goal is to continue to pursue an understanding of and to foster a holistic sense of the complex human condition in all of its diversity.

Degree Description

Doctor of Philosophy degrees in Anthropology are offered in archaeology, cultural anthropology and evolutionary anthropology. The Cultural Anthropology program also offers a Peace Corps Master's International Program in Public Health. Our program emphasizes a four-field approach through a series of core classes that all our graduates take in order to establish a solid foundation in Anthropology. Each program area offers specialized courses in methodological, theoretical and regional areas. Please see our departmental website for more information such as application requirements and deadlines, course requirements, and faculty research interests.

<http://libarts.wsu.edu/anthro/Graduate%20Studies/gradstudies.html>

Contact Information

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ANTH

- 500 Field Methods V 2** (0-6) to 8 (0-24) Course Prerequisite: By instructor permission. Training in gathering and analyzing field data.
- 501 Verification of Catalog Number** 3 Verification of Catalog Number

- 504 Tribal Peoples and Development** 3 Global and historic perspectives on the complex issues surrounding the problem of tribal peoples and development.
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- 539 Prehistory of the Southwest** 3 Prehistory of the American Southwest; emphasis on Pueblo, Mogollon and Hohokam traditions and relationships to historic native groups.
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- 546 Complexity in Small Scale Societies** 3 Seminar focused on classic literature and current issues relevant to complexity in small scale societies, predominately covering hunter-gatherer systems. Recommended preparation: ANTH 530.
- 547 Models and Simulation** 3 Models and model-building as an anthropological approach to present and past cultures.

- 548 Hunters and Gatherers: Past and Present** 3 Introduction to hunter-gatherer studies in anthropology and archaeology exploring uses of evolutionary approaches to modeling and reconstructing hunter-gatherer behavior in contemporary and prehistoric contexts.
- 549 Settlement and Agro-Pastoralism** 3 Development of settled communities and food production through evaluation of their social, economic and spatial configurations. Recommended preparation: ANTH 530.
- 550 Descriptive Linguistics** 3 Introduction to analysis and description of natural languages; phonological, syntactic, and semantic analysis of data from a variety of languages. (Cross-listed course offered as ANTH 450, FOR LANG 450).
- 554 Anthropological Field Methods Seminar** 3 Elicitation, recording techniques and analysis of sociocultural and linguistic field data. Recommended preparation: ANTH 450 or 550.
- 561 Current Trends in Physical Anthropology** 3 May be repeated for credit. Intensive review of major current trends in physical anthropology. Recommended preparation: ANTH 465.
- 562 Evolutionary Method and Theory in Anthropology and Archaeology** 3 A graduate-level seminar-based course focusing on the evolutionary analysis of past and present human behavior.
- 563 Anthropology of Life and Death** 3 Demography, dynamics of evolution, human ecology, and their relationships to the biology of living, historical, and archaeological populations. Credit not granted for both ANTH 463 and ANTH 563. Recommended preparation: ANTH 260.
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- 567 Primate Behavioral Ecology** 3 Seminar-based course focusing on evolutionary analysis of primate behavior, morphology and ecology.
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- 593 Publishing and Professional Communication** 3 Preparation of original research reports; survey of types of professional communication, and of standards and techniques.
- 596 IPEM Seminar** 1 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
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Anthropology

Degree offered: Master of Arts in Anthropology

Faculty working with graduate students: 24

Graduate students: 25

Graduate students receiving assistantships or scholarships: 60%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Program Description

Anthropology is the study of human diversity in the broadest sense. We ask and attempt to address the most basic questions about the nature or culture, the origins humans, and human

variability. Anthropologists study the interactions between our biological heritage and our learned cultural heritages. Anthropologists are important components of management projects that deal with landscape development, human impact studies, cultural resource use, crime scene investigations, and internationalization projects. In addition, anthropologists investigate the unwritten human past that accounts for over 99% of all human existence. Through world class research and instruction the anthropology department at Washington State University seeks to inform the public, students, and the profession on these aspects of human diversity. Many of our students go on to make careers in one of the sub disciplines of anthropology (bioanthropology, archaeology, cultural anthropology, and linguistics). However, many of our students that did not later pursue careers in anthropology tell us that their experiences here greatly enriched their perspectives on life and learning in other fields. Our goal is to continue to pursue an understanding of and to foster a holistic sense of the complex human condition in all of its diversity.

Degree Description

Master of Arts degrees in Anthropology are offered in archaeology, cultural anthropology and evolutionary anthropology. The Cultural Anthropology program also offers a Peace Corps Master's International Program in Environmental Anthropology and another in Public Health. Our program emphasizes a four-field approach through a series of core classes that all our graduates take in order to establish a solid foundation in Anthropology. Each program area offers specialized courses in methodological, theoretical and regional areas. Please see our departmental website for more information such as application requirements and deadlines, course requirements, and faculty research interests. <http://libarts.wsu.edu/anthro/Graduate%20Studies/gradstudies.html>

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- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Apparel, Merchandising, Design, and Textiles

Degree offered: Master of Arts in Apparel, Merchandising, Design, and Textiles

Faculty working with graduate students: 5

Graduate students: 10

Graduate students receiving assistantships or scholarships: 60%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

For students doing a thesis, a minimum of 24 graded credit hours are required. For students doing a project, a minimum of 30

graded credits are required.

Program Description

Washington State University offers a dynamic Master of Arts Program in Apparel, Merchandising, and Textiles. Opportunities available with the AMDT Master's program include individualized, in-depth programs of study; nationally and internationally recognized faculty; faculty research grants to support students; publications in refereed research journals; designs and creative work in juried exhibits; competitive assistantships; and graduate internships. The master's program provides students with opportunities to pursue research through the completion of a thesis or project. Research areas for a thesis or project include Apparel Product Development; Consumer Studies; Creative Scholarship and Design; and Merchandising. Graduates compete in a dynamic and expanding marketplace. The state of Washington is ranked fourth in the nation in apparel and textile industry productivity, which creates considerable opportunity for industry-related scholarship and career development (Enterprise Seattle). The AMDT Master's program helps students become more competitive when entering the apparel and textile industry and for those students interested in continuing on to a doctoral program a strong research foundation is created.

Degree Description

Graduate Program Specifics General Program Timeline: Semester 1: The area of study and major professor are chosen; Semester 2: The Program of Study and AMDT Graduate Committee are chosen and thesis or project work begins; Semester 3: Thesis or project work continues; Semester 4: Thesis or project is finalized, you defend your work to your committee and a manuscript is prepared for possible publication WSU graduate requirements include a minimum of 30 credits of which 21 credits for thesis or 26 credits for project are graded courses. The program may also include up to 10 credits of supporting coursework and no more than 6 credits of 300-400 level courses for thesis work, 9 credits for project work or a total of 10 credits for transfer work. Timing varies per student but averages two years. Students taking background courses may take longer. Typically students complete 10-18 credit hours per semester (the average is 12, which is also a required minimum for international students). The courses listed below are areas of study that graduate students must show competency (through an undergraduate degree or industry experience) in order to earn their degree. Option Course Title Hours Semester All AMT 210 Textile Specifications All AMT 314 Fashion Forecasting Design AMT 311 Draping and Flat Pattern Design AMT 312 Fitting and Human Form Merch AMT 450 Strategy Planning and Decision Making Required Core: 19 credits AMT 508, 3 credit, Theoretical Frameworks Underlying Scholarship**AMT 517, 3 credit, Critical Perspectives on Appearance**AMT 518, 3 credit, Apparel Merchandising Analysis AMT 519, 3 credit, Research Methods**AMT 520, 3 credit, Aesthetic Analysis of Fashion Design ED PSY 508, 4 credit, Educational Statistics Complete Master's Scholarship: 5 credits minimum*AMT 700 Master's Research, Thesis, and/or Examination or*AMT 702 Master's Special Problems, Directed Study and/or Examination Select 2-7 additional credits to reach minimum total of 21 (thesis) or 26 (project) graded credits and cumulative total of 30 credits. *Washington State University supports both the master's thesis option and master's project option. Please refer to graduate school regulations when choosing an option. Anyone considering additional graduate study as in a doctoral degree, is expected to

select the thesis option.**These courses are offered every two years.

Post-Graduate Employment Opportunities

<http://amdt.wsu.edu/graduate-alumni/>See a list of current alumni

Post-Graduate Career Placements

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Contact Information

AMDT Graduate Program
Apparel, Merchandising, Design and Textiles
PO Box 642020
Pullman, WA 99164-2020
Telephone: 509-335-1233
Fax: 509-335-7299
E-mail: amdt@wsu.edu

Washington State University
PO Box 642020
Pullman, WA 99164-2020
Telephone: 509-335-1233
E-mail: joan.ellis@wsu.edu

Faculty

Catherine Black, Linda Bradley, Ting Chi, Joan Ellis and Carol Salusso.

STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 508 Theoretical Frameworks Underlying Scholarship** 3 Exploration of current topics through readings in apparel, merchandising, and textiles.
- 512 Apparel Design Graduate Studio** 3 Course Prerequisite: AMDT 508. Integration of consumer demand target market research with the development, application, and testing of prototype products for specific end uses.
- 517 Theory and Methods of Culture, Gender and Dress** 3 Exploration of appearance issues, theory, and research from the perspective of social science, feminist theory, post-modern and poststructural discourses.
- 518 Apparel Merchandising Analysis** 3 Analysis of marketing and retailing strategies, trends and technological developments in relation to business and consumer aspects within a global context.
- 519 Research Methods** 3 Course Prerequisite: AMDT 508 or concurrent enrollment. Analysis and understanding of research methods, exploration of thesis topic as applicable to the fields of apparel, merchandising, design and textiles.
- 520 Aesthetic Analysis of Fashion Design** 3 In-depth analysis of apparel fashion design provided through exploration of aesthetic and human perception theories within a socio-historic context.

- 596 Advanced Instructional Practicum 3** Information and direction for graduate student teaching assistants seeking professional development in classroom teaching.
- 598 Topics in Apparel and Textiles V 1-3** May be repeated for credit; cumulative maximum 8 hours. Current topics in apparel and textile theory and research.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.

- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Apparel, Merchandising, Design, and Textiles

Degree offered: Master of Arts in Apparel, Merchandising, Design, and Textiles – Non Thesis

Faculty working with graduate students: 8

Graduate students: 10

Graduate students receiving assistantships or scholarships: 70%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

Washington State University offers a dynamic Master of Arts Program in Apparel, Merchandising, and Textiles. Opportunities available with the AMDT Master's program include individualized, in-depth programs of study; nationally and internationally recognized faculty; faculty research grants to support students; publications in refereed research journals; designs and creative work in juried exhibits; competitive assistantships; and graduate internships. The master's program provides students with opportunities to pursue research through the completion of a thesis or project. Research areas for a thesis or project include Apparel Product Development; Consumer Studies; Creative Scholarship and Design; and Merchandising. Graduates compete in a dynamic and expanding marketplace. The state of Washington is ranked fourth in the nation in apparel and textile industry productivity, which creates considerable opportunity for industry-related scholarship and career development (Enterprise Seattle). The AMDT Master's program helps students become more competitive when entering the apparel and textile industry and for those students interested in continuing on to a doctoral program a strong research foundation is created.

Degree Description

Students pursue research through the completion of a project.

Contact Information

AMDT Graduate Program
Apparel, Merchandising, Design and Textiles
PO Box 642020
Pullman, WA 99164-2020
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E-mail: amdt@wsu.edu

Faculty

Catherine Black, Linda Bradley, Ting Chi, Meriem Chida, Joan Ellis, Yoo Kwon, Karen Leonas and Carol Salusso.

STAT

- 412 Statistical Methods in Research I 3** Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 508 Theoretical Frameworks Underlying Scholarship 3** Exploration of current topics through readings in apparel, merchandising, and textiles.
- 512 Apparel Design Graduate Studio 3** Course Prerequisite: AMDT 508. Integration of consumer demand target market research with the development, application, and testing of prototype products for specific end uses.
- 517 Theory and Methods of Culture, Gender and Dress 3** Exploration of appearance issues, theory, and research from the perspective of social science, feminist theory, post-modern and poststructural discourses.
- 518 Apparel Merchandising Analysis 3** Analysis of marketing and retailing strategies, trends and technological developments in relation to business and consumer aspects within a global context.
- 519 Research Methods 3** Course Prerequisite: AMDT 508 or concurrent enrollment. Analysis and understanding of research methods, exploration of thesis topic as applicable to the fields of apparel, merchandising, design and textiles.
- 520 Aesthetic Analysis of Fashion Design 3** In-depth analysis of apparel fashion design provided through exploration of aesthetic and human perception theories within a socio-historic context.
- 596 Advanced Instructional Practicum 3** Information and direction for graduate student teaching assistants seeking professional development in classroom teaching.
- 598 Topics in Apparel and Textiles V 1-3** May be repeated for credit; cumulative maximum 8 hours. Current topics in apparel and textile theory and research.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V** 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data** 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology** 3 Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists** 3 Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models** 3 (2-2) The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models** 3 Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis** 3 Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing** 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes** 3 Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory** 3 Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data** 3 Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control** 3 Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability** 3 Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.

- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Applied Economics

Degree offered: Master of Science in Applied Economics

Faculty working with graduate students: 24

Graduate students: 17

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10

Program Description

The M.S. in Applied Economics program provides strong foundations in economic theory, quantitative methods, applications, communication skills, and research analysis. Students can focus their studies in general economics, agribusiness, or agricultural and resource economics by carefully selecting supporting and elective courses.

Degree Description

The M.S. in Applied Economics program provides strong foundations in economic theory, quantitative methods, applications, communication skills, and research analysis. Students can focus their studies in general economics, agribusiness, or agricultural and resource economics by carefully selecting supporting and elective courses. Students can earn an M.S. in Applied Economics to specifically prepare for positions in private corporations and government service as management specialists, policy analysts, forecasters or economic consultants. Two options are offered in the degree--thesis and non-thesis. This degree can be completed by well-prepared students in two years or less.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

Management Specialists, Policy Analysts, Forecasters, Economic Consultants

Post-Graduate Career Placements

Statistician, USDA, Analyst for NTS Communications, Real Estate Economist, Dept. of Housing and Urban Development

Contact Information

Dr. Hayley Chouinard
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School of Economic Sciences
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Pullman, WA 99164-6210
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Faculty

Raymond Batina, Michael Brady, Kenneth Casavant, Andrew Cassey, Hayley Chouinard, Benjamin Cowan, Ana Espinola-Arredondo, T Fortenbery, Gregmar Galinato, Rosa Gallardo, Mark Gibson, Bidisha Mandal, Thomas Marsh, Jill McCluskey, Vicki McCracken, R Mittelhammer, Felix Munoz-Garcia, Joseph Neibergs, Robert Rosenman, Jeremy Sage, C Shumway, Philip Wandschneider, Jia Yan and Jonathan Yoder.

ECONS

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making 3** Managerial economics with specific applications to agricultural issues.

- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I 3** Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II 3** Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V 1-2** May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Applied Economics

Degree offered: Master of Science in Applied Economics – Non Thesis

Faculty working with graduate students: 22

Graduate students: 17

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10

Requirements

Final Oral Examination For non-thesis option, must complete additional graded elective course, Statement of Purpose, 3 letters of recommendation, CV, GRE

Program Description

The M.S. in Applied Economics program provides strong foundations in economic theory, quantitative methods, applications, communication skills, and research analysis. Students can focus their studies in general economics, agribusiness, or agricultural and resource economics by carefully selecting supporting and elective courses.

Degree Description

The M.S. in Applied Economics program provides strong foundations in economic theory, quantitative methods, applications, communication skills, and research analysis. Students can focus their studies in general economics, agribusiness, or agricultural and resource economics by carefully selecting supporting and

elective courses. Students can earn an M.S. in Applied Economics to specifically prepare for positions in private corporations and government service as management specialists, policy analysts, forecasters or economic consultants. Two options are offered in the degree--thesis and non-thesis. This degree can be completed by well-prepared students in two years or less.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

Management Specialists, Policy Analysts, Forecasters, Economic Consultants

Post-Graduate Career Placements

Statistician, USDA, Analyst for NTS Communications, Real Estate Economist, Dept of Housing and Urban Development

Contact Information

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Faculty

Raymond Batina, Kenneth Casavant, Andrew Cassey, Seung Choi, Hayley Chouinard, Benjamin Cowan, Ana Espino-la-Arredondo, Gregmar Galinato, Rosa Gallardo, Mark Gibson, Bidisha Mandal, Thomas Marsh, Jill McCluskey, Vicki McCracken, R Mittelhammer, Felix Munoz-Garcia, Joseph Neibergs, Robert Rosenman, C Shumway, Philip Wandschneider, Jia Yan and Jonathan Yoder.

ECONS

500 Macroeconomic Theory I 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.

501 Microeconomic Theory I 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.

- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making 3** Managerial economics with specific applications to agricultural issues.
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- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I 3** Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II 3** Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V 1-2** May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).

- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Architecture

Degree offered: Master of Architecture

Faculty working with graduate students: 23

Graduate students: 42

Graduate students receiving assistantships or scholarships: 47%

Tests required: TOEFL, TOEFLI

Deadline: :

Fall: January 10

Requirements

Monograph and public presentation of graduate project. Summer internship/ travel/ independent study.

Program Description

The School of Design and Construction offers the Master of Architecture. This degree is the professional degree accredited by the National Architectural Accrediting Board (NAAB), which allows students to take state exams and become licensed architects. Students must successfully complete a four-year undergraduate degree in architecture, or a previous five-year Bachelor of Architecture degree to be eligible for the Master of Architecture program. Students with baccalaureate degrees in disciplines other than architecture are eligible to apply for the 3.5 year Master of Architecture program. Please consult the WSU Graduate Catalog and/or <http://sdc.wsu.edu/> for specific information regarding this degree as well as admission requirements and course descriptions. The architecture curriculum is planned so that foreign study and other off-campus programs can be incorporated. Foreign studies options include WSU sponsored programs, and programs offered by other institutions. Coordination is through the WSU Education Abroad Office.

Degree Description

M.Arch students engage in studio, site design, technology, history and theory. The culmination of graduate study is a two-semester studio project. The project is expected to be based on a defined hypothesis and demonstrate a comprehensive understanding and solution to a particular architectural issue. There are three tracks for completing the M.Arch. Track 1 is 1.5 years for those with a B.S. in architectural studies from WSU or a professional accredited degree (B.Arch) from a university in the U.S. Track 2 is 2.5 years for those with a four-year, pre-professional architecture degree from a U.S. university or equivalent. Track 2 is also for students who need additional courses or studio work. Track 3 is 3.5 years for those with a non-architecture undergraduate degree. Determination for admission is based upon skills demonstrated through the portfolio.

Training and Professional Development Opportunities

Internship; study abroad.

Post-Graduate Employment Opportunities

Employment in the architecture profession as a licensed architect and/or employment options in fields related to architecture

Post-Graduate Career Placements

ALSC Architects; Callison; NBBJ; NAC; Madsen Mitchell; Clark Kjos Architects; Integrus; MulvannyG2; LRS Architects; OMS; Jon Graves Architects and Planners; Copeland Architects; John Lape; BWA Spokane; Nystrom, Olson, Collins; HKP Architects; KDF Architecture; Erickson McGovern; University of Washington Capital Planning; City of Spokane.

Contact Information

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Faculty

John Abell, Kerry Brooks, J Burnett, Rick Cherf, Matthew Cohen, Darrin Griecken, Jason Gruen, David Gunderson, Thomas Heustis, Paul Hirzel, Jolie Kaytes, Bashir Kazimee, Gregory Kessler, William Kirk, Robert Krikac, Matthew Melcher, Taiji Miyasaka, Jason Peschel, Ayad Rahmani, Kathleen Ryan, Ole Sleipness, Judith Theodorson and David Wang.

ARCH

- 510 Architectural Design Studio 6** (0-12) Graduate studio experience researching a single topic of architectural relevance (i.e. geology, material science, biological systems engineering). Field trip required.
- 511 Design VIII/Graduate Design Project 6** (0-12) Course Prerequisite: ARCH 403. Studio course divided between urban design and preliminary design on graduate project.
- 513 Graduate Design Project 6** (0-12) Course Prerequisite: ARCH 511; ARCH 515. Final graduate design studio focusing on individualized topics.
- 515 Research Methods and Programming 3** Exploration of traditional research methods and investigations for architects.
- 520 Directed Topics in Architecture V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics related to areas of emphasis in the program and student specialization.
- 525 History and Theory 3** History and theory of 20th century architecture focusing on cultural and philosophical principles related to design.
- 527 Site and Landscape Design 3** Exploration of issues of site context analysis, topography, planning, and landscape design.
- 530 Philosophies and Theories of the Built Environment 3**
Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).
- 531 Advanced Tectonics 3** Tectonic theory of concrete and metal construction with focus on skin design and technology as formative elements in architecture.
- 540 Research Methods 3** Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).
- 542 Issues in Architecture 3** Course Prerequisite: ARCH 525. Examination of issues in architecture related to society, culture, environment, politics, and philosophy.
- 560 Interdisciplinary Seminar 3** Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).
- 563 Architectural Structures III 3** Course Prerequisite: ARCH 515 or concurrent enrollment. Wind and seismic loads on architectural structures; high-rise systems; reinforced concrete and masonry structures. Credit not granted for both ARCH 463 and ARCH 563.
- 564 Architectural Structures IV 3** Course Prerequisite: ARCH 511 or concurrent enrollment. Deflection theory; classical and computer analysis for statically indeterminate architectural structure systems. Credit not granted for both ARCH 464 and ARCH 564.
- 570 Advanced Architectural Studio/Laboratory 6** (0-12) In-depth study of design problems relating to cultural, environmental, technological and other issues as related to the student's area of emphasis.
- 571 Advanced Architectural Studio II 6** (0-12) Course Prerequisite: ARCH 570. Drawing from architectural historical and theoretical research, urban architectural design case study, research in the arts, humanities and social sciences.
- 573 Ethics and Practice 3** Ethical and professional practice issues related to the business and practice of architecture; investigations into marketing client and business orientation.
- 577 Theories and Methods of Urban Construction 3** Morphology, theoretical concepts, planning and spatial structure of cities and analysis of the transformation of the city core in Europe and America.
- 580 Architecture Internship V** 1-4 May be repeated for credit. Course Prerequisite: Graduate student in M Architecture degree program. Placement in an approved industrial, professional, or governmental situation for specialized or general experience.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination. V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-6 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Bioethics – Cert in Bioethics

Degree offered: Graduate Certificate in Bioethics

Requirements

Please see the program/department for more information.

Contact Information

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Biological and Agricultural Engineering

Degree offered: Doctor of Philosophy (Biological and Agricultural Engineering)

Faculty working with graduate students: 17

Graduate students: 83

Graduate students receiving assistantships or scholarships: 54%

Tests required: TOEFL, TOEFLI, IELTS

Deadline: Fall: January 10
Spring: July 1

Requirements

Two articles, based on doctoral research, must be submitted to a peer reviewed journal. Must present a minimum of two seminars. The first is a brief 25-minute seminar based on the student doctoral research proposal. The second is a 50-minute seminar prior to the final examination.

Program Description

Biological and Agricultural Engineering is a multidisciplinary program that offers students flexibility to accommodate a blend of engineering and science in their programs of study and research projects. Students apply engineering and biological principles to conduct high-quality research and to develop and disseminate knowledge and technologies in the areas of agriculture, food, energy, and natural resource systems. The Department offers Ph.D. and M.S. degrees in Biological and Agricultural Engineering, Ph.D. in Engineering Science, and M.S. in Engineering with four areas of emphasis: a) Food Engineering, b) Bioenergy and Bioproduct Engineering, c) Land, Air, Water Resources and Environmental Engineering, and d) Agricultural Automation Engineering.

Degree Description

The department offers the PhD degree with four research areas of emphasis: Bioenergy and Bioproducts Engineering; Food Engineering; Land, Air, Water Resources and Environmental Engineering; and Agricultural Automation Engineering.

Contact Information

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Faculty

Gustavo Barbosa-Canovas, Shulin Chen, Craig Frear, Manuel Garcia-Perez, Gerrit Hoogenboom, Manoj Karkee, Hanwu Lei, Pius Ndegwa, R Peters, Shyam Sablani, Claudio Stockle, Juming Tang, Jeffrey Ullman, Joan Wu, Bin Yang, Usama Zaher and Qin Zhang.

BSYSE

- 512 Research and Teaching Methods 3** (2-3) Graduate research with an emphasis on biological systems engineering and college instruction.
- 530 Machine Vision for Biological Systems 3** Image analysis techniques as applied to machine vision applications integrated into autonomous equipment used in specialty crops.
- 532 Electrohydraulic Systems Control 3** Fluid power transmission, E/H control, control systems and controller design.
- 550 Soil and Water Conservation Engineering 3** Land, water and air conservation emphasizing on soil and water engineering concepts, state of science solution techniques, and engineering design.
- 551 Advanced Biological Systems Engineering Topics V 1-4** May be repeated for credit; cumulative maximum 6 hours. Directed group study of selected advanced topics in biological systems engineering.
- 552 Advanced Biological Systems Engineering Topics V 1-4** May be repeated for credit. Directed group study of selected advanced topics in biological systems engineering.
- 554 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 555 Natural Treatment Systems 3** Principles and design procedures of natural systems for wastewater treatment for agricultural and non-agricultural applications. (Cross-listed course offered as CE 555, BSYSE 555).

- 556 Surface Hydrologic Processes and Modeling 3** (2-3) Fundamental hydrologic processes, governing equations and solution methods, GIS techniques commonly used in hydrology, class project on modeling surface hydrology.
- 557 Nutrient Cycling and Transport 3** Cycling of carbon, nitrogen and phosphorus at global and watershed scales; modeling of transportation and transport in agricultural systems
- 558 Groundwater Flow and Contaminant Transport 4** (3-3) Physics of flow and contaminant transport in saturated porous media including governing equations, well hydraulics and computer modeling.
- 560 Aquatic Chemistry 3** Chemical principles as applied to natural environmental system, water supply and pollution and control engineering. (Cross-listed course offered as CE 583, BSYSE 560).
- 564 Agricultural Waste and Air Quality Management 3** Detailed analyses of agricultural wastes and their potential adverse impacts on the environment; current management systems; reuse and recycle.
- 581 Advanced Physical Properties of Foods 3** Analysis, modeling, and experimental procedures to measure food physical properties for use in food processing system design.
- 582 Food Process Engineering I 3** Design of food processing systems; design and simulation of sterilization and pasteurization processes in foods.
- 583 Food Process Engineering II 3** Design of food separation unit operations including concentration, dehydration, and membrane processes.
- 584 Thermal and Nonthermal Processing of Foods 3** Food preservation methods based on application of thermal and nonthermal processes.
- 585 Food Packaging 3** Properties of packaging materials, manufacturing of packages, shelf-life testing and food packaging interaction.
- 593 Renewable Energy Technologies 3** Thermochemical biorefinery technologies for biofuels and bioproducts; facility operations, analysis, and design of integrated processes for biofuel and bioproduct production
- 594 Design and Analysis of Biomass Conversion Processes and Systems 3** Analysis of bioprocessing and biotreatment processes including energetics, stoichiometry, species competition, process infiltration, product separation and optimization.
- 595 Biosystems Engineering for Fuel and Chemicals 3** Design and optimization of biological systems for industrial functions, modeling and simulation of cell processes, bioreactors and system integration.
- 596 Biomass Thermo-Chemical Conversion 3** Biomass chemistry, analytical thermo-chemistry, torrefaction, pyrolysis, gasification and combustion; characterization and uses of thermochemical products.
- 597 Biomass Biological Process Engineering 3** Technical issues in the biological process engineering field, commercial application and evaluation of new technologies in resource, environment and economic contexts.
- 598 Graduate Seminar 1** May be repeated for credit. Required of all graduate students in biological systems engineering.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Biological and Agricultural Engineering

Degree offered: Master of Science in Biological and Agricultural Engineering

Faculty working with graduate students: 17

Graduate students: 12

Graduate students receiving assistantships or scholarships: 58%

Tests required: IELTS, TOEFL, TOEFLi

Deadline: Fall: January 10

Spring: July 1

Requirements

A written research proposal must be completed by the end of the third semester.

Program Description

Biological and Agricultural Engineering is a multidisciplinary program that offers students flexibility to accommodate a blend of engineering and science in their programs of study and research projects. Students apply engineering and biological principles to conduct high-quality research and to develop and disseminate knowledge and technologies in the areas of agriculture, food, energy, and natural resource systems. The Department offers Ph.D. and M.S. degrees in Biological and Agricultural Engineering, Ph.D. in Engineering Science, and M.S. in Engineering with four areas of emphasis: a) Food Engineering, b) Bioenergy and Bioproduct Engineering, c) Land, Air, Water Resources and Environmental Engineering, and d) Agricultural Automation Engineering.

Degree Description

The department of Biological Systems Engineering integrates the biological sciences and engineering for the development of engineering solutions to agricultural, food and natural systems.

Contact Information

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BSYSE

- 512 Research and Teaching Methods 3 (2-3)** Graduate research with an emphasis on biological systems engineering and college instruction.
- 530 Machine Vision for Biological Systems 3** Image analysis techniques as applied to machine vision applications integrated into autonomous equipment used in specialty crops.
- 532 Electrohydraulic Systems Control 3** Fluid power transmission, E/H control, control systems and controller design.
- 550 Soil and Water Conservation Engineering 3** Land, water and air conservation emphasizing on soil and water engineering concepts, state of science solution techniques, and engineering design.
- 551 Advanced Biological Systems Engineering Topics V 1-4** May be repeated for credit; cumulative maximum 6 hours. Directed group study of selected advanced topics in biological systems engineering.
- 552 Advanced Biological Systems Engineering Topics V 1-4** May be repeated for credit. Directed group study of selected advanced topics in biological systems engineering.
- 554 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 555 Natural Treatment Systems 3** Principles and design procedures of natural systems for wastewater treatment for agricultural and non-agricultural applications. (Cross-listed course offered as CE 555, BSYSE 555).
- 556 Surface Hydrologic Processes and Modeling 3 (2-3)** Fundamental hydrologic processes, governing equations and solution methods, GIS techniques commonly used in hydrology, class project on modeling surface hydrology.
- 557 Nutrient Cycling and Transport 3** Cycling of carbon, nitrogen and phosphorus at global and watershed scales; modeling of transportation and transport in agricultural systems
- 558 Groundwater Flow and Contaminant Transport 4 (3-3)** Physics of flow and contaminant transport in saturated porous media including governing equations, well hydraulics and computer modeling.
- 560 Aquatic Chemistry 3** Chemical principles as applied to natural environmental system, water supply and pollution and control engineering. (Cross-listed course offered as CE 583, BSYSE 560).
- 564 Agricultural Waste and Air Quality Management 3** Detailed analyses of agricultural wastes and their potential adverse impacts on the environment; current management systems; reuse and recycle.
- 581 Advanced Physical Properties of Foods 3** Analysis, modeling, and experimental procedures to measure food physical properties for use in food processing system design.
- 582 Food Process Engineering I 3** Design of food processing systems; design and simulation of sterilization and pasteurization processes in foods.
- 583 Food Process Engineering II 3** Design of food separation unit operations including concentration, dehydration, and membrane processes.
- 584 Thermal and Nonthermal Processing of Foods 3** Food preservation methods based on application of thermal and nonthermal processes.
- 585 Food Packaging 3** Properties of packaging materials, manufacturing of packages, shelf-life testing and food packaging interaction.
- 593 Renewable Energy Technologies 3** Thermochemical biorefinery technologies for biofuels and bioproducts; facility operations, analysis, and design of integrated processes for biofuel and bioproduct production
- 594 Design and Analysis of Biomass Conversion Processes and Systems 3** Analysis of bioprocessing and biotreatment processes including energetics, stoichiometry, species competition, process infiltration, product separation and optimization.
- 595 Biosystems Engineering for Fuel and Chemicals 3** Design and optimization of biological systems for industrial functions, modeling and simulation of cell processes, bioreactors and system integration.
- 596 Biomass Thermo-Chemical Conversion 3** Biomass chemistry, analytical thermo-chemistry, torrefaction, pyrolysis, gasification and combustion; characterization and uses of thermochemical products.
- 597 Biomass Biological Process Engineering 3** Technical issues in the biological process engineering field, commercial application and evaluation of new technologies in resource, environment and economic contexts.
- 598 Graduate Seminar 1** May be repeated for credit. Required of all graduate students in biological systems engineering.

- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Biological and Agricultural Engineering

Degree offered: Master of Science in Biological and Agricultural Engineering - Non Thesis

Faculty working with graduate students: 17

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Program Description

Biological and Agricultural Engineering is a multidisciplinary program that offers students flexibility to accommodate a blend of engineering and science in their programs of study and research projects. Students apply engineering and biological principles to conduct high-quality research and to develop and disseminate knowledge and technologies in the areas of agriculture, food, energy, and natural resource systems. The Department offers Ph.D. and M.S. degrees in Biological and Agricultural Engineering, Ph.D. in Engineering Science, and M.S. in Engineering with four areas of emphasis: a) Food Engineering, b) Bioenergy and Bioproduct Engineering, c) Land, Air, Water Resources and Environmental Engineering, and d) Agricultural Automation Engineering.

Degree Description

The department of Biological Systems Engineering integrates the biological sciences and engineering for the development of engineering solutions to agricultural, food and natural systems.

Training and Professional Development Opportunities

N/A

Contact Information

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BSYSE

- 512 Research and Teaching Methods 3 (2-3)** Graduate research with an emphasis on biological systems engineering and college instruction.
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- 557 Nutrient Cycling and Transport** 3 Cycling of carbon, nitrogen and phosphorus at global and watershed scales; modeling of transportation and transport in agricultural systems
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- 594 Design and Analysis of Biomass Conversion Processes and Systems** 3 Analysis of bioprocessing and biotreatment processes including energetics, stoichiometry, species competition, process infiltration, product separation and optimization.
- 595 Biosystems Engineering for Fuel and Chemicals** 3 Design and optimization of biological systems for industrial functions, modeling and simulation of cell processes, bioreactors and system integration.
- 596 Biomass Thermo-Chemical Conversion** 3 Biomass chemistry, analytical thermo-chemistry, torrefaction, pyrolysis, gasification and combustion; characterization and uses of thermochemical products.
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- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Biology

Degree offered: Master of Science in Biology – Non Thesis

Faculty working with graduate students: 33

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: September 1

Requirements

12 credits of Biol 500 level prefix courses 1 credit of Biol 589 seminar

Program Description

This degree is generally meant for students who wish to pursue careers in education that require graduate degrees but not research experience. Thus, this degree does not require a research thesis.

Degree Description

The plan for the non-thesis MS in Biology is all coursework related. A minimum of 26 graded credits is required.

Contact Information

Andrew Storfer

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School of Biological Sciences

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Faculty

John Bishop, R Black, Jesse Brunner, Jeremiah Busch, Patrick Carter, Asaph Cousins, Erica Crespi, Mark Dybdahl, Gerald Edwards, Raymond Evans, Richard Gomulkiewicz, Hanjo Hellmann, Larry Hufford, Brian Kemp, Michael Knoblauch, Raymond Lee, Norman Lewis, Richard Mack, Jon Mallatt, Andrew McCubbin, Michelle McGuire, Jeb Owen, Christine Portfors, Eric Roalson, Charles Robbins, Hubertus Schwabl, Elissa Schwartz, Michael Skinner, William Snyder, Andrew Storfer, Mechthild Tegeder, Gary Thorgaard and Paul Verrell.

BIOL

- 500 Seminar 1** May be repeated for credit.
- 501 Proposal Defense Seminar 2** Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.
- 504 Experimental Methods in Plant Physiology 3 (2-3)** Advanced techniques and instrumental methods applicable to research in plant physiology.
- 509 Plant Anatomy 4 (2-6)** Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.
- 512 Molecular Mechanisms of Plant Development 3** Physiology of growth; metabolism during development and reproduction.
- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.
- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.
- 533 Modern Methods in Phylogenetics 4 (2-6)** Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3 (2-3)** Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2 (0-6)** Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.

- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)**
Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.
- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.
- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Biotechnology Management – Cert in Biotech Management

Degree offered: Graduate Certificate in Biotechnology Management

Requirements

Please see the program/department for more information.

Contact Information

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Botany

Degree offered: Doctor of Philosophy (Botany)

Faculty working with graduate students: 16

Graduate students: 20

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: September 1

Requirements

Proposal defense Exit seminar

Program Description

The School of Biological Sciences offers a rigorous and competitive degree in Botany. Students who complete this degree are successful in a broad variety of careers, including those in: research universities, teaching colleges, federal and state government and the private sector.

Degree Description

Our botany students generally focus on research in the broad areas of plant physiology, ecology, evolution, systematics, and molecular biology.

Training and Professional Development Opportunities

Our program offers teaching training and grant writing courses. Other professional development opportunities include weekly reading groups, ecolunch meetings, a graduate student research symposium and frequent graduate seminars.

Post-Graduate Employment Opportunities

Most students continue into postdoctoral research positions. Other students pursue careers at community colleges or in Federal or State governments.

Post-Graduate Career Placements

Recent graduates have obtained faculty positions at: Cornell University, University of California- Bakersfield, University of Arizona, Purdue University, and Eastern Washington University. Others hold jobs with: US Forest Service, USDA, Battelle Pacific Northwest Laboratories, the Marine Selby Botanical Gardens and the Florida Museum of Natural History.

Contact Information

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John Bishop, R Black, John Browse, Jeremiah Busch, Lori Carris, Asaph Cousins, Gerald Edwards, Raymond Evans, Hanjo Hellmann, Larry Hufford, Michael Knoblauch, Norman Lewis, Richard Mack, Andrew McCubbin, Eric Roalson and Mechthild Tegeder.

ANTH

- 500 Field Methods V 2** (0-6) to 8 (0-24) Course Prerequisite: By instructor permission. Training in gathering and analyzing field data.
- 501 Verification of Catalog Number 3** Verification of Catalog Number
- 504 Tribal Peoples and Development 3** Global and historic perspectives on the complex issues surrounding the problem of tribal peoples and development.
- 507 Advanced Studies in Culture Theory 3** May be repeated for credit; cumulative maximum 6 hours. Evaluation of major theories and methods and their relationship to problems in cultural-social analysis.
- 510 Fundamentals of Cultural Anthropology 3** Overview of basic concepts and theory in cultural anthropology based on in-depth analysis of selected theoretical and ethnographic materials.
- 513 Lithic Technological Organization 4** (3-3) Methods and theory of lithic technology.
- 514 Ceramic Analysis 4** (3-3) Basic concepts, methods, and approaches used in the analysis of archaeological pottery.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 521 Psychological Anthropology 3** Psychological and anthropological aspects of personhood, self, human development, gender, sexuality, emotion and cognition in various cultures.
- 528 Historical Ethnography 3** May be repeated for credit; cumulative maximum 9 hours. Culture history, ethnography, theoretical, and contemporary problems of selected culture areas.
- 529 Seminar in Ethnography 3** Methodological, stylistic and craft issues in the process and product of ethnography.
- 530 Archaeological Method and Theory 3** History of archaeological method and theory; analysis of current literature.
- 535 Cultural Resource Management 3** Role of archaeology in historic preservation and resource conservation; legal and institutional frameworks; research and interpretation in a CRM context.
- 537 Quantitative Methods in Anthropology 4** (3-3) May be repeated for credit; cumulative maximum 8 hours. Sampling, exploratory data analysis, inferential statistics, and use of SAS in anthropological research with emphasis on archaeology.
- 539 Prehistory of the Southwest 3** Prehistory of the American Southwest; emphasis on Pueblo, Mogollon and Hohokam traditions and relationships to historic native groups.
- 540 Prehistory of the Northwest Coast 3** Prehistoric cultures, chronologies, and interrelationships on the northwest coast of North America.
- 543 Prehistory of the Plateau and Basin 3** Archaeology of the interior Northwest and Great Basin.

- 546 Complexity in Small Scale Societies 3** Seminar focused on classic literature and current issues relevant to complexity in small scale societies, predominately covering hunter-gatherer systems. Recommended preparation: ANTH 530.
- 547 Models and Simulation 3** Models and model-building as an anthropological approach to present and past cultures.
- 548 Hunters and Gatherers: Past and Present 3** Introduction to hunter-gatherer studies in anthropology and archaeology exploring uses of evolutionary approaches to modeling and reconstructing hunter-gatherer behavior in contemporary and prehistoric contexts.
- 549 Settlement and Agro-Pastoralism 3** Development of settled communities and food production through evaluation of their social, economic and spatial configurations. Recommended preparation: ANTH 530.
- 550 Descriptive Linguistics 3** Introduction to analysis and description of natural languages; phonological, syntactic, and semantic analysis of data from a variety of languages. (Cross-listed course offered as ANTH 450, FOR LANG 450).
- 554 Anthropological Field Methods Seminar 3** Elicitation, recording techniques and analysis of sociocultural and linguistic field data. Recommended preparation: ANTH 450 or 550.
- 561 Current Trends in Physical Anthropology 3** May be repeated for credit. Intensive review of major current trends in physical anthropology. Recommended preparation: ANTH 465.
- 562 Evolutionary Method and Theory in Anthropology and Archaeology 3** A graduate-level seminar-based course focusing on the evolutionary analysis of past and present human behavior.
- 563 Anthropology of Life and Death 3** Demography, dynamics of evolution, human ecology, and their relationships to the biology of living, historical, and archaeological populations. Credit not granted for both ANTH 463 and ANTH 563. Recommended preparation: ANTH 260.
- 564 Advances in Evolution and Human Behavior 3** Recent trends in the study of evolution and human behavior.
- 565 Human Evolution 3** Human origins in the light of the fossil record and evolutionary theory. Credit not granted for both ANTH 465 and ANTH 565. Recommended preparation: ANTH 260.
- 567 Primate Behavioral Ecology 3** Seminar-based course focusing on evolutionary analysis of primate behavior, morphology and ecology.
- 569 Evolutionary Cultural Anthropology 3** Evolutionary nature of culture and its interactions with human biology (genes) and ecology.
- 570 Sediments in Geoarchaeology 4 (3-3)** Sediment-forming processes, sedimentological techniques, reconstruction of Quaternary environments, and sedimentology of site-forming processes.
- 573 Zooarchaeology 4 (2-6)** Identification of animal bones from archaeological sites, methodological and theoretical techniques for interpreting faunal remains.
- 576 Palynology 4 (3-3)** Pollen and spore morphology, evolution, production, dispersal, and preservation; index fossils, dating, archaeology, and vegetational history. Field trip required.
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 591 Special Topics in Anthropology 3** May be repeated for credit; cumulative maximum 9 hours. Examination of current areas of anthropological theory and research.
- 593 Publishing and Professional Communication 3** Preparation of original research reports; survey of types of professional communication, and of standards and techniques.
- 596 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 598 Advanced Anthropology Internship V 1-15** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: By instructor permission. Participation as archaeological or cultural anthropological intern in public or private sectors; requires special arrangement with faculty advisor.
- 599 Archaeological Field School V 2-8** Course Prerequisite: By instructor permission. Training in methods of archaeological data recovery and analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- BIOL**
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- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
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- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)** Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
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- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.

- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.
- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- E MIC**
- 586 Special Projects in Electron Microscopy V 2 (0-6) to 3 (0-9)** May be repeated for credit. Practical training in one or more areas of electron microscopy; TEM, SEM, ultramicrotomy, specimen processing; confocal fluorescent microscopy.
- 587 Special Topics in Electron Microscopy 1** May be repeated for credit; cumulative maximum 4 hours.
- Molecular Plant Sciences**
- MPS**
- 515 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 525 Plant Molecular Genetics 3** Introduction to plant genome organization and gene expression while acquiring knowledge of modern molecular techniques and experimental approaches.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 570 Advanced Topics in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 3 hours. Oral presentation of a current research paper.
- 587 Advanced Topics in Plant Biochemistry 3** Course Prerequisite: MBIOS 514. Same as MBIOS 571.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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Natural Resource Sciences

NATRS

- 519 Advanced Topics V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 535 Wildlife Ecology 4 (3-3)** The ecology of wildlife species and the contributing biological processes. Overnight field trip required.
- 550 Conservation Biology 3** Patterns of biological diversity, factors producing changes in diversity, values of diversity, management principles applied to small populations, protected areas, landscape linkages, biotic integrity, restoration, legal issues and funding sources. Credit not granted for both NATRS 450 and NATRS 550.
- 554 Restoration Ecology 3 (2-3)** Ecological principles used to restore biological communities; ecological processes and species on degraded landscapes. Credit not granted for both NATRS 454 and NATRS 554.
- 556 Foraging Ecology of Herbivores 2** Synthesis of foraging behavior concepts including nutritive quality of forages, digestive and metabolic constraints, and diet and habitat selection.
- 560 Watershed Management 3** Principles and practices of management of forest and rangelands for protection, maintenance, and improvement of water resource values. Field trip required. Recommended preparation: NATRS 204 or sufficient background in spreadsheets.
- 564 Landscape Ecology 3 (2-3)** Linkages between spatial patterns and processes in a variety of landscapes and the qualitative tools used in the investigation of these linkages. Credit not granted for both NATRS 464 and NATRS 564.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 595 Seminar in Natural Resource Sciences 1** May be repeated for credit. Literature review; preparation and presentation of reports in natural resource sciences.

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Natural Resource Sciences

SOILS

- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.

- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3 (2-3)** Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Natural Resource Sciences**
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Botany

Degree offered: Master of Science in Botany

Faculty working with graduate students: 16

Graduate students: 6

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: September 1

Requirements

Exit seminar

Program Description

The School of Biological Sciences offers a rigorous and competitive degree in Botany. Students who complete this degree are successful in a broad variety of careers, including those in: research universities, teaching colleges, federal and state government and the private sector.

Degree Description

Our botany students generally focus on research in the broad areas of plant physiology, ecology, evolution, systematics, and molecular biology.

Training and Professional Development Opportunities

Our program offers teaching training and grant writing courses. Other professional development opportunities include weekly reading groups, ecolunch meetings, a graduate student research symposium and frequent graduate seminars.

Post-Graduate Employment Opportunities

Most students continue into PhD positions. Other students pursue careers at community colleges, as secondary teachers, or in Federal or State governments.

Contact Information

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Faculty

John Bishop, R Black, John Browse, Jeremiah Busch, Lori Carris, Asaph Cousins, Gerald Edwards, Raymond Evans, Hanjo Hellmann, Larry Hufford, Michael Knoblauch, Norman Lewis, Richard Mack, Andrew McCubbin, Eric Roalson and Mechthild Tegeder.

ANTH

- 500 Field Methods V 2** (0-6) to 8 (0-24) Course Prerequisite: By instructor permission. Training in gathering and analyzing field data.
- 501 Verification of Catalog Number** 3 Verification of Catalog Number
- 504 Tribal Peoples and Development** 3 Global and historic perspectives on the complex issues surrounding the problem of tribal peoples and development.
- 507 Advanced Studies in Culture Theory** 3 May be repeated for credit; cumulative maximum 6 hours. Evaluation of major theories and methods and their relationship to problems in cultural-social analysis.
- 510 Fundamentals of Cultural Anthropology** 3 Overview of basic concepts and theory in cultural anthropology based on in-depth analysis of selected theoretical and ethnographic materials.
- 513 Lithic Technological Organization** 4 (3-3) Methods and theory of lithic technology.
- 514 Ceramic Analysis** 4 (3-3) Basic concepts, methods, and approaches used in the analysis of archaeological pottery.
- 519 International Development and Human Resources** 3 History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 521 Psychological Anthropology** 3 Psychological and anthropological aspects of personhood, self, human development, gender, sexuality, emotion and cognition in various cultures.
- 528 Historical Ethnography** 3 May be repeated for credit; cumulative maximum 9 hours. Culture history, ethnography, theoretical, and contemporary problems of selected culture areas.
- 529 Seminar in Ethnography** 3 Methodological, stylistic and craft issues in the process and product of ethnography.
- 530 Archaeological Method and Theory** 3 History of archaeological method and theory; analysis of current literature.
- 535 Cultural Resource Management** 3 Role of archaeology in historic preservation and resource conservation; legal and institutional frameworks; research and interpretation in a CRM context.
- 537 Quantitative Methods in Anthropology** 4 (3-3) May be repeated for credit; cumulative maximum 8 hours. Sampling, exploratory data analysis, inferential statistics, and use of SAS in anthropological research with emphasis on archaeology.
- 539 Prehistory of the Southwest** 3 Prehistory of the American Southwest; emphasis on Pueblo, Mogollon and Hohokam traditions and relationships to historic native groups.
- 540 Prehistory of the Northwest Coast** 3 Prehistoric cultures, chronologies, and interrelationships on the northwest coast of North America.
- 543 Prehistory of the Plateau and Basin** 3 Archaeology of the interior Northwest and Great Basin.
- 546 Complexity in Small Scale Societies** 3 Seminar focused on classic literature and current issues relevant to complexity in small scale societies, predominately covering hunter-gatherer systems. Recommended preparation: ANTH 530.
- 547 Models and Simulation** 3 Models and model-building as an anthropological approach to present and past cultures.
- 548 Hunters and Gatherers: Past and Present** 3 Introduction to hunter-gatherer studies in anthropology and archaeology exploring uses of evolutionary approaches to modeling and reconstructing hunter-gatherer behavior in contemporary and prehistoric contexts.
- 549 Settlement and Agro-Pastoralism** 3 Development of settled communities and food production through evaluation of their social, economic and spatial configurations. Recommended preparation: ANTH 530.
- 550 Descriptive Linguistics** 3 Introduction to analysis and description of natural languages; phonological, syntactic, and semantic analysis of data from a variety of languages. (Cross-listed course offered as ANTH 450, FOR LANG 450).
- 554 Anthropological Field Methods Seminar** 3 Elicitation, recording techniques and analysis of sociocultural and linguistic field data. Recommended preparation: ANTH 450 or 550.
- 561 Current Trends in Physical Anthropology** 3 May be repeated for credit. Intensive review of major current trends in physical anthropology. Recommended preparation: ANTH 465.
- 562 Evolutionary Method and Theory in Anthropology and Archaeology** 3 A graduate-level seminar-based course focusing on the evolutionary analysis of past and present human behavior.

- 563 Anthropology of Life and Death 3** Demography, dynamics of evolution, human ecology, and their relationships to the biology of living, historical, and archaeological populations. Credit not granted for both ANTH 463 and ANTH 563. Recommended preparation: ANTH 260.
- 564 Advances in Evolution and Human Behavior 3** Recent trends in the study of evolution and human behavior.
- 565 Human Evolution 3** Human origins in the light of the fossil record and evolutionary theory. Credit not granted for both ANTH 465 and ANTH 565. Recommended preparation: ANTH 260.
- 567 Primate Behavioral Ecology 3** Seminar-based course focusing on evolutionary analysis of primate behavior, morphology and ecology.
- 569 Evolutionary Cultural Anthropology 3** Evolutionary nature of culture and its interactions with human biology (genes) and ecology.
- 570 Sediments in Geoarchaeology 4 (3-3)** Sediment-forming processes, sedimentological techniques, reconstruction of Quaternary environments, and sedimentology of site-forming processes.
- 573 Zooarchaeology 4 (2-6)** Identification of animal bones from archaeological sites, methodological and theoretical techniques for interpreting faunal remains.
- 576 Palynology 4 (3-3)** Pollen and spore morphology, evolution, production, dispersal, and preservation; index fossils, dating, archaeology, and vegetational history. Field trip required.
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 591 Special Topics in Anthropology 3** May be repeated for credit; cumulative maximum 9 hours. Examination of current areas of anthropological theory and research.
- 593 Publishing and Professional Communication 3** Preparation of original research reports; survey of types of professional communication, and of standards and techniques.
- 596 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 598 Advanced Anthropology Internship V 1-15** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: By instructor permission. Participation as archaeological or cultural anthropological intern in public or private sectors; requires special arrangement with faculty advisor.
- 599 Archaeological Field School V 2-8** Course Prerequisite: By instructor permission. Training in methods of archaeological data recovery and analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- BIOL**
- 500 Seminar 1** May be repeated for credit.
- 501 Proposal Defense Seminar 2** Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.
- 504 Experimental Methods in Plant Physiology 3 (2-3)** Advanced techniques and instrumental methods applicable to research in plant physiology.
- 509 Plant Anatomy 4 (2-6)** Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.
- 512 Molecular Mechanisms of Plant Development 3** Physiology of growth; metabolism during development and reproduction.
- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.
- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.

- 533 Modern Methods in Phylogenetics 4** (2-6) Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3** (2-3) Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2** (0-6) Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4** (3-3) Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.
- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.

- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
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- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

E MIC

- 586 Special Projects in Electron Microscopy V 2 (0-6) to 3 (0-9)** May be repeated for credit. Practical training in one or more areas of electron microscopy; TEM, SEM, ultramicrotomy, specimen processing; confocal fluorescent microscopy.
- 587 Special Topics in Electron Microscopy 1** May be repeated for credit; cumulative maximum 4 hours.

Natural Resource Sciences

NATRS

- 519 Advanced Topics V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 535 Wildlife Ecology 4 (3-3)** The ecology of wildlife species and the contributing biological processes. Overnight field trip required.
- 550 Conservation Biology 3** Patterns of biological diversity, factors producing changes in diversity, values of diversity, management principles applied to small populations, protected areas, landscape linkages, biotic integrity, restoration, legal issues and funding sources. Credit not granted for both NATRS 450 and NATRS 550.

- 554 Restoration Ecology 3 (2-3)** Ecological principles used to restore biological communities; ecological processes and species on degraded landscapes. Credit not granted for both NATRS 454 and NATRS 554.
- 556 Foraging Ecology of Herbivores 2** Synthesis of foraging behavior concepts including nutritive quality of forages, digestive and metabolic constraints, and diet and habitat selection.
- 560 Watershed Management 3** Principles and practices of management of forest and rangelands for protection, maintenance, and improvement of water resource values. Field trip required. Recommended preparation: NATRS 204 or sufficient background in spreadsheets.
- 564 Landscape Ecology 3 (2-3)** Linkages between spatial patterns and processes in a variety of landscapes and the qualitative tools used in the investigation of these linkages. Credit not granted for both NATRS 464 and NATRS 564.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 595 Seminar in Natural Resource Sciences 1** May be repeated for credit. Literature review; preparation and presentation of reports in natural resource sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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Natural Resource Sciences

SOILS

- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
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- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
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- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
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- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Business Administration – Accounting

Degree offered: Doctor of Philosophy (Accounting)

Faculty working with graduate students: 12

Graduate students: 9

Graduate students receiving assistantships or scholarships: 100%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Research Tool Requirements include 12 hours or ANOVA, Regression/Econometrics, Psychometric Theory and Multivariate Statistics. See below for a full list of available courses. 1 credit professional development seminar. 24 credit requirement for Ph.D. research. An Area Research Paper is required in the second year and a written field examination is required in the third year.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The goal of the doctoral program in accounting is to provide rigorous instruction in behavioral accounting theory, empirical methods, and the application of quantitative tools to accounting research.

Training and Professional Development Opportunities

Students are introduced to contemporary accounting research literature in the department's doctoral seminars and also take graduate course work outside the department to support their research interests (e.g., in statistics, psychology, finance). In the accounting research workshops, doctoral students are exposed to faculty members' and visiting scholars' research. Faculty members work closely with students and assist them in developing and publishing research projects.

Post-Graduate Employment Opportunities

Upon completion, graduates will have a comprehensive background in the theories, research paradigms, tools, and methods of behavioral accounting research, and will be prepared to enter careers at the research university level.

Post-Graduate Career Placements

Oklahoma State University, University of Missouri at Kansas City, Montana State University, Bozeman, Loyola Marymount, Kent State University, California State University-Sacramento, East Carolina University, Bowling Green State University

Contact Information

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Faculty

Beau Barnes, Li Brooks, Linda Chen, Jane Cote, Susan Gill, Robert Greenberg, Claire Latham, Debra Sanders, Richard Toolson, Bernard Wong-On-Wing, Li Xu and Dong Yu.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.
- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.
- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements pass thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.

- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the Master of Accounting program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

B A

- 501 Foundations in Marketing V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.
- 504 Foundations in Finance V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.

- 520 Resources, Stakeholders and Competitive Advantage 3** Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

MGTOP

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.

- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- MKTG**
- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.

- 561 New Product Marketing** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing** 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- PSYCH**
- 502 Research Design** V 1-3 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations** 3 Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology** V 1-3 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology** 1 May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology** V 1-3 May be repeated for credit.
- 510 Introduction to Online Instruction** 1 Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design** 3 Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design** 3 Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design** 3 May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics** 3 Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data** 3 Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software** 3 Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy** 3 Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues** 3 Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology** 3 Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.

- 534 Clinical Psychopharmacology** 3 Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis** 3 Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment** 3 Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment** 3 Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology** 3 Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy** 3 Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions** 3 Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum** 3 (0-9) May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum** V 1-3 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship** V 1-3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology** 3 Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology** 3 Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology** 3 Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology** 3 Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology** 3 Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior** 3 Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning** 3 Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior** 3 Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology** V 2-16 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

STAT

508 Environmental Spatial Statistics 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.

510 Topics in Probability and Statistics 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.

512 Analysis of Variance of Designed Experiments 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.

516 Time Series 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.

519 Applied Multivariate Analysis 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.

520 Statistical Analysis of Qualitative Data 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

522 Biostatistics and Statistical Epidemiology 3 Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

523 Statistical Methods for Engineers and Scientists 3 Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.

530 Applied Linear Models 3 (2-2) The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.

533 Theory of Linear Models 3 Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.

535 Regression Analysis 3 Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.

536 Statistical Computing 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.

544 Applied Stochastic Processes 3 Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.

548 Statistical Theory I 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.

549 Statistical Theory II 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.

556 Introduction to Statistical Theory 3 Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.

565 Analyzing Microarray and Other Genomic Data 3 Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.

572 Quality Control 3 Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.

573 Reliability 3 Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.

590 Statistical Consulting Practicum V 1-2 May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Business Administration – Finance

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 9

Graduate students: 11

Graduate students receiving assistantships or scholarships: 100%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Requirements

Research Tool Requirements include classes in micro economics, macroeconomics, and advanced econometrics. See below for a full list of available courses. 1 credit professional development seminar. 24 credit requirement for Ph.D. research. An Area Research Paper is required in the second year and a written field examination is required in the third year.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The doctorate in business administration with an emphasis in finance at Washington State University is designed to prepare graduates for careers in research and teaching. The primary goal of the finance doctoral program is to train academics for placements at AACSB-accredited universities throughout the United States and abroad. The program encompasses a variety of formal and informal interactions and projects with faculty and others, as well as course work, comprehensive exams, teaching experience and dissertation research. It enables students to develop substantial competencies in the theory, practice, and research methodology essential to the advancement of finance knowledge, while accommodating individual backgrounds, expe-

riences, and objectives. Course work covers topics associated with the scholarly pursuit of finance as well as topics from supporting fields of inquiry such as economics, accounting, and psychology. Extensive coverage of research methods and statistics associated with finance research is a large component of the program. In addition to specific coursework, the finance doctoral program also provides an environment in which students can develop research competencies in close association with the finance faculty and other graduate students.

Post-Graduate Career Placements

Gonzaga University, Curtin Tech (Australia), Eastern Washington University, Eastern Montana College, Marist College (New York), University Mexico, Marquette University, Washington State University, Loyola Maramount, Drake University, Western Illinois University, Concordia University (Montreal), Nakai University (China), Brock University (Ontario), University of St. Thomas, University of Southern Mississippi, Illinois State University, University of Wyoming, University of Toledo, Central Michigan University, Oregon State University

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Faculty

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Business Administration

B A

501 Foundations in Marketing V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.

502 Foundations in Operations Management V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.

503 Foundations in Business Law V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.

504 Foundations in Finance V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.

514 Business Analytics: Transforming Data into Decisions 3
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.

- 520 Resources, Stakeholders and Competitive Advantage 3** Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

FIN

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 521 Interest Rates and Financial Markets 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
- 525 Advanced Financial Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Theory of financial management; quantitative analysis of financial problems of the firm; empirical studies on financing modern corporations.
- 526 Financial Management 3** Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.
- 528 Portfolio Theory and Financial Engineering 3** Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.

- 581 International Finance 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 595 Advanced Topics in Resource and Production Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- MATH**
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.

- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.

- 571 Mathematical Foundations of Continuum Mechanics II 3**
Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18**
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- MGTOP**
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.

- 590 Strategy Formulation and Organizational Design** 3 Course
Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions** 3 Course
Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity** 3 Course
Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

MKTG

- 505 Survey of Marketing** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing** 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.

- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Business Administration – Hospitality and Tourism

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 5

Graduate students: 3

Graduate students receiving assistantships or scholarships: 100%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Research Tool Requirements include 12 hours or ANOVA, Regression/Econometrics, Psychometric Theory and Multivariate Statistics. See below for a full list of available courses. 1 credit professional development seminar. 24 credit requirement for Ph.D. research. An Area Research Paper is required in the second year and a written field examination is required in the third year.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman,

Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The PhD in business administration with an emphasis in hospitality and tourism management is designed to prepare graduates for careers in research and teaching at institutions throughout the United States and abroad. Applicants with strong hospitality and tourism business background are preferred. Incoming students are expected to have both good written and oral communication skills, as well as good analytical skills to facilitate the mastery of research methods and statistics. The course of study requires a battery of hospitality and tourism business management courses as well as a group of research design and statistics courses. Students are also expected to take courses from supporting fields of inquiry such as psychology, sociology, management, marketing, etc. The degree normally takes four years to complete and involves taking courses, developing an area (2nd-year) paper, passing a comprehensive exam, and the completion of a doctoral dissertation.

Training and Professional Development Opportunities

Coursework in the area of specialization is intended to provide necessary skills and knowledge to conduct research in a chosen field. Courses must be related to an area of study selected by the student and approved by the doctoral student's committee. Supporting doctoral level coursework may be selected from areas such as (but not limited to) research seminars in anthropology, psychology, sociology, economics, management, international business, information systems, marketing, communication, etc. Additional coursework in Hospitality and Tourism Business Management may also be taken, with approval from the doctoral student's committee. Annual Review and Comprehensive Exams. The goal of the annual reviews and comprehensive exams is to assess the candidate's overall mastery of the core body of knowledge in the field and the degree of preparation to undertake research independently or with minimal supervision. The Ph.D. Program director and committee along with appropriate advisors will annually review the progress of the students in terms of publications and research effort. This may entail a qualifying exam each year depending on the program committee's review of the candidate. The Comprehensive Exam (scheduled sometime during the third year in the program) will test the candidate's knowledge in five areas: 1. Hospitality and tourism major field requirements: Hospitality and Tourism core knowledge includes a thorough understanding of hospitality and tourism, and behavioral research methods. 2. Business electives: The student should be able to demonstrate an appropriate level of understanding of theories and research methods aligned with those business disciplines chosen for further study, including finance, information systems, international business, management & operations, and/or marketing. 3. Hospitality and tourism research: The student should be able to demonstrate a thorough understanding of hospitality and tourism research, including explanatory theories and past research findings. In addition, the candidate is expected to demonstrate command over the relevant literature from his/her supporting field. 4. Hospitality and tourism research methods and statistics: The student should also have an extensive knowledge of statistics and the research methodologies that can be employed to study hospitality and tourism phenomena from a behavioral standpoint. 5. Oral and written communication skills: Given the program's focus on producing hospitality and tourism

scholars who can be successful at other accredited, peer or better research universities, the student is also expected to show a high level of written and oral communication skills exhibited in the written and oral comprehensive exams, research presentations at national/international conferences, and publications in hospitality & tourism journals.

Contact Information

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Faculty

Christina Chi, Dogan Gursoy, Hyun Kim, Dennis Reynolds and Nancy Swanger.

Business Administration

B A

- 501 Foundations in Marketing V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.
- 504 Foundations in Finance V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3**
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.
- 520 Resources, Stakeholders and Competitive Advantage 3**
Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.

- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

ECONS

- 500 Macroeconomic Theory I** 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I** 3 Microeconomic theory, multivariate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II** 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II** 3 Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).

- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making 3** Managerial economics with specific applications to agricultural issues.
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I 3** Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II 3** Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V 1-2** May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- FIN**
- 500 Macroeconomic Theory I** 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I** 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II** 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II** 3 Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics** 3 Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 510 Statistics for Economists** 3 Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I** 3 Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II** 3 Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 521 Interest Rates and Financial Markets** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
- 525 Advanced Financial Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Theory of financial management; quantitative analysis of financial problems of the firm; empirical studies on financing modern corporations.
- 526 Financial Management** 3 Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.
- 528 Portfolio Theory and Financial Engineering** 3 Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.
- 581 International Finance** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).

- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 595 Advanced Topics in Resource and Production Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Hospitality Business Management

HBM

- 535 International Tourism Strategy and Planning 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Tourism components; social, economic, and cultural effects on societies; the management of tourism businesses.
- 581 Services Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and management of service systems in hospitality operations; control of customer interaction, personnel activities and inventory.
- 582 Hospitality Operations Analysis 3** Yield/revenue management and managerial accounting concepts within the hospitality industry.

- 591 Service Management Seminar 3** Course Prerequisite: Admission to PhD programs in business. Survey of selected concepts, frameworks, theory, issues and empirical research in service management.
- 592 Current Issues in Travel and Tourism 3** Course Prerequisite: Admission to PhD programs in business. Current issues, practices, principles and theory, research and methodologies that govern travel and tourism behavior.
- 597 Special Topics 3** Course Prerequisite: Admission to PhD programs in business. Strategic business policy, concepts, and practices in hospitality management.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Hospitality Business Management

I BUS

- 580 International Business Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Decision making in the international environment; political, cultural, and economic risk management.
- 582 International Marketing Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international marketing, marketing decision making in international environments, problems of adapting marketing programs to international markets.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

Hospitality Business Management

MGTOP

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.

- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T₂ and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Management Information Systems**
- MIS**
- 557 Designing Business Intelligence Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.
- 572 Database Management Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.

- 574 Telecommunications and Networking in Business 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.
- 580 Information Systems Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations 3** Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods 3** Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics 3** Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development 3** Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MKTG

- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

PSYCH

- 502 Research Design V** 1-3 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V** 1-3 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V** 1-3 May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3** May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.

- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Management Information Systems**
- SOC**
- 510 Development of Social Theory 3** Examination of the foundations of social theory.
- 517 Seminar in Contemporary Sociological Theory 3** Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 520 Research Methods in Sociology 3** Methodology of social research at the professional level.
- 521 Regression Models 3** Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.

- 522 Advanced Sociological Methodology 3** May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.
- 523 Qualitative Methods Practicum 3** Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.
- 525 Practicum in Survey Research 3** Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.
- 526 Experimental Methods 3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.
- 530 Demography 3** Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.
- 531 Human Ecology 3** Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.
- 532 Environmental Sociology 3** Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.
- 535 Technology and Society 3** Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.
- 536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.
- 542 Social Stratification: Class, Race and Gender Inequalities 3** Theoretical and empirical research in both classic stratification literature and recent scholarship on class, race/ethnicity and gender.
- 545 Sociology of Community 3** Community stability and change: interaction processes; decision making; societal linkages; effects on well-being.
- 553 Social Organization and the Family 3** The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.
- 554 Social Psychology of the Family 3** The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.
- 556 Sociology of Aging and the Life Course 3** Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.
- 574 Labor Market Inequality 3** Overview of research on the causes and consequences of inequality in U.S. work organizations.
- 580 Sociology of Race Relations 3** Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.
- 582 Social Movements 3** Theories and methods in social movement studies.
- 590 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 591 The Sociology Profession 1** May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.
- 592 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 593 Special Topics in Sociology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Management Information Systems**
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Business Administration – Information Systems

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 6

Graduate students: 12

Graduate students receiving assistantships or scholarships: 100%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Students must take a minimum of 12 credits of statistics, which should cover topics such as design of experiments, ANOVA, multivariate analysis, regression, psychometric theory, and SEM. The Psych 511-514 series is the most recommended. 1 credit professional development seminar. 24 credit requirement for Ph.D. research. An Area Research Paper is required in the second year and a written field examination is required in the third year.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The Ph.D. in IS at WSU focuses on behavioral issues in MIS, enabling students to develop critical skills in both research and teaching, and therefore compete for, and succeed in, the best academic jobs in the country.

Post-Graduate Career Placements

University of Delaware, University of San Francisco Towson University, University of Nevada, Las Vegas, University of Virginia, University of Montana, University of North Texas

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Faculty

Paul Clay, Mauricio Featherman, Kshiti Joshi, Saonee Sarker, Suprateek Sarker and Joe Valacich.

Business Administration

B A

- 501 Foundations in Marketing V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.

504 Foundations in Finance V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.

514 Business Analytics: Transforming Data into Decisions 3
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.

520 Resources, Stakeholders and Competitive Advantage 3
Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.

579 MBA Capstone 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).

596 Doctoral Topics V 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.

598 Research and Professional Development 1 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

COM

500 Communication Colloquium 1 May be repeated for credit; cumulative maximum 8 hours. Written and oral presentation of research topics in Communication; college colloquium.

- 501 Theory Building in Communication** 3 Relationship of research to theory development; evaluation of current theory and research; planning and executing research within specified theoretical frameworks.
- 502 Consumer Analysis and Brand Development** 3 Consumer analysis and brand development; skills to make strategic communication campaigns successful.
- 504 Instructional Practicum** 1 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: By interview only.
- 506 Persuasion and Social Influence** 3 Theories, concepts strategies and processes of persuasion and social influence.
- 507 Communication Ethics Seminar** 3 Topics in communication ethics.
- 509 Quantitative Research** 3 Introduction to quantitative research in communication; hypothesis development, testing; basic statistics, interpretation; field surveys, laboratory and field experiments, content analysis.
- 514 Health Communication Theories and Campaigns** 3 Health communication theories with a focus on campaign construction and evaluation.
- 516 Health Communication and Society** 3 3 Reviews, critiques and applications of research regarding the impact of social and cultural environments on health communication.
- 517 Health Communication and Social Development** 3 Explores and tests role of mediated communication in the causes of and solutions for health problems, particularly among young people.
- 521 Foundational Perspectives in Intercultural Communication** 3 Overview of three current foundational research perspectives in intercultural communication; functionalist (post-positivist), interpretive and critical.
- 522 Theoretical Perspectives on Intercultural Communication** 3 Advanced readings in intercultural communication theory and methods; paradigms in current theorizing.
- 524 Intercultural/International Communication and Social Change** 3 Application of communication theory, research and technologies aimed at fostering social change in intercultural and international contexts.
- 526 Current Topics in Intercultural Communication** 3 Topics in current intercultural communication research.
- 535 Organizational Communication Theory** 3 May be repeated for credit; cumulative maximum 6 hours. Traditional and emerging theories in organizational communication.
- 537 Organization and Society** 3 Historical foundations, theoretical developments, contemporary issues and practical implications of communicative processes of organizations within society.
- 540 Risk Communication** 3 Research and practice in risk communication.
- 550 Media Processes and Effects: Theory and Practice** 3 Physiological, psychological and social effects of media messages and technologies upon individuals and societies.
- 552 Current Issues in Media Processes and Effects** 3 Current issues in media processes and effects.
- 561 Multimedia Content Creation** 3 Exploration and application of strategies to communicate ideas clearly, concisely, and effectively through multimedia content.
- 562 Crisis Communication in Global Contexts** 3 Prepare, plan, and execute crisis communication and management to protect the continuity of an organization's image and mission.
- 563 Ethics for Professionals** 3 The understanding, discussion, and application of key theories of individual and institutional ethics; the articulation and defense of ethical reasoning.
- 564 Research Methods for Professionals** 3 Understanding the role of research in media and related organizations and its application to organizational decision making through quantitative and qualitative research methods including research design, questionnaire construction, sampling, data collection techniques, and variable measurement.
- 570 Communication Theory** 3 Relevant theories and research from mass and interpersonal communication.
- 571 Theoretical Perspectives on Media and Society** 3 Theories explaining the social and cultural environments of communication processes emphasizing in mass communication.
- 572 Mass Media, Social Control, and Social Change** 3 Study of the forces that influence the media's role as an agent of social control or social change.
- 573 Media and Public Discourse** 3 Historical and contemporary concepts, questions and dynamics constituting the role of media and discourse among various publics.
- 580 Topics in Communication** 3 May be repeated for credit; cumulative maximum 12 hours. Contemporary, specialized, or technical topics in communication.
- 591 Qualitative Research Methods** 3 Historical, textual, and legal methodologies for theory-based evaluative and discourse studies in communication.
- 599 Seminar in Communication** 3 May be repeated for credit; cumulative maximum 6 hours. Special topics in rhetoric, communication, and public address.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: By interview only. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MIS

- 557 Designing Business Intelligence Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.
- 572 Database Management Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.
- 574 Telecommunications and Networking in Business 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.
- 580 Information Systems Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations 3** Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.

- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods 3** Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics 3** Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development 3** Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MKTG

- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.

- 565 Seminar in Marketing 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

PSYCH

- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3** May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.

- 535 Personality Assessment and Diagnosis** 3 Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment** 3 Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment** 3 Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology** 3 Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy** 3 Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions** 3 Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum** 3 (0-9) May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum** V 1-3 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship** V 1-3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology** 3 Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology** 3 Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology** 3 Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology** 3 Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology** 3 Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior** 3 Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning** 3 Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior** 3 Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology** V 2-16 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

SOC

510 Development of Social Theory 3 Examination of the foundations of social theory.

517 Seminar in Contemporary Sociological Theory 3 Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.

519 International Development and Human Resources 3 History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).

520 Research Methods in Sociology 3 Methodology of social research at the professional level.

521 Regression Models 3 Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.

522 Advanced Sociological Methodology 3 May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.

523 Qualitative Methods Practicum 3 Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.

525 Practicum in Survey Research 3 Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.

526 Experimental Methods 3 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.

530 Demography 3 Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.

531 Human Ecology 3 Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.

532 Environmental Sociology 3 Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.

535 Technology and Society 3 Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.

536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9) May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.

542 Social Stratification: Class, Race and Gender Inequalities 3 Theoretical and empirical research in both classic stratification literature and recent scholarship on class, race/ethnicity and gender.

545 Sociology of Community 3 Community stability and change: interaction processes; decision making; societal linkages; effects on well-being.

553 Social Organization and the Family 3 The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.

554 Social Psychology of the Family 3 The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.

556 Sociology of Aging and the Life Course 3 Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.

574 Labor Market Inequality 3 Overview of research on the causes and consequences of inequality in U.S. work organizations.

580 Sociology of Race Relations 3 Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.

582 Social Movements 3 Theories and methods in social movement studies.

590 Special Topics in Sociology 3 May be repeated for credit; cumulative maximum 9 hours.

591 The Sociology Profession 1 May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.

592 Special Topics in Sociology 3 May be repeated for credit; cumulative maximum 9 hours.

593 Special Topics in Sociology V 1-3 May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration – Management

Degree offered: Doctor of Philosophy (Business Administration)

Faculty working with graduate students: 9

Graduate students: 7

Graduate students receiving assistantships or scholarships: 100%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Research Tool Requirements include 12 hours of ANOVA, Regression/Econometrics, Psychometric Theory and Multivariate Statistics. See below for a full list of available courses. 1 credit professional development seminar. 24 total credit requirement for Ph.D. research. An Area Research Paper is required in the second year and a written field examination is required in the third year.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The PhD in Management requires an understanding of the content of management and the ability to conduct scientific research using tools of statistical analysis and research design. As such, the course of study requires a battery of management courses as well as a group of research design and statistics courses. The degree normally takes four years to complete and involves taking courses, developing an area (2nd-year) paper, passing a comprehensive exam, and the completion of a doctoral dissertation. Candidates who are able to defend their dissertation proposal before the fourth year are afforded a fifth year of

support (if desired).

Training and Professional Development Opportunities

Conference funding is generally available for students presenting a paper if the budget allows for it.

Post-Graduate Employment Opportunities

None.

Post-Graduate Career Placements

University of Wisconsin, Milwaukee , Boise State University , University of Idaho, National Sun Yat Sen, Taiwan, University of North Dakota, Wichita State University, University of Idaho, University of Alaska, Anchorage, Chinese University-Hong Kong, College of St. Benedict, Western Illinois University, University of Wisconsin, White Water, St. Ambrose University, Bryant College, Central Washington University, University of Mississippi, US Army War College, Carlisle, PA, Cleveland State University, Private Industry (Samsung), Chapman University, Los Angeles, Fort Hays State University, Kansas, University of North Texas, James Madison University

Contact Information

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Management

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Faculty

Jonathan Arthurs, Kenneth Butterfield, John Cullen, Jerry Goodstein, Kristine Kuhn, Rebecca Portnoy, Arrvind Sahaym, Paul Skilton and Thomas Tripp.

Business Administration

B A

501 Foundations in Marketing V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.

502 Foundations in Operations Management V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.

503 Foundations in Business Law V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.

504 Foundations in Finance V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.

514 Business Analytics: Transforming Data into Decisions 3
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.

- 520 Resources, Stakeholders and Competitive Advantage 3** Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

ECONS

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making 3** Managerial economics with specific applications to agricultural issues.
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.

- 526 Master's Microeconomic Analysis I** 3 Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II** 3 Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods** V 1-2 May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics** 3 Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy** 3 International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics** 3 Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making** 3 Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics** V 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar** 1 May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics** 3
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- MGTOP**
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.

- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- PSYCH**
- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.

- 508 Special Topics in Psychology V** 1-3 May be repeated for credit.
- 510 Introduction to Online Instruction** 1 Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design** 3 Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design** 3 Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design** 3 May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics** 3 Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data** 3 Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software** 3 Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy** 3 Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues** 3 Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology** 3 Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology** 3 Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis** 3 Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment** 3 Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment** 3 Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology** 3 Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy** 3 Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions** 3 Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum** 3 (0-9) May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V** 1-3 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V** 1-3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology** 3 Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology** 3 Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology** 3 Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.

- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- SOC**
- 510 Development of Social Theory 3** Examination of the foundations of social theory.
- 517 Seminar in Contemporary Sociological Theory 3** Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 520 Research Methods in Sociology 3** Methodology of social research at the professional level.
- 521 Regression Models 3** Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.
- 522 Advanced Sociological Methodology 3** May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.
- 523 Qualitative Methods Practicum 3** Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.
- 525 Practicum in Survey Research 3** Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.
- 526 Experimental Methods 3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.
- 530 Demography 3** Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.
- 531 Human Ecology 3** Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.
- 532 Environmental Sociology 3** Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.
- 535 Technology and Society 3** Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.
- 536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.
- 542 Social Stratification: Class, Race and Gender Inequalities 3** Theoretical and empirical research in both classic stratification literature and recent scholarship on class, race/ethnicity and gender.
- 545 Sociology of Community 3** Community stability and change: interaction processes; decision making; societal linkages; effects on well-being.
- 553 Social Organization and the Family 3** The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.

- 554 Social Psychology of the Family 3** The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.
- 556 Sociology of Aging and the Life Course 3** Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.
- 574 Labor Market Inequality 3** Overview of research on the causes and consequences of inequality in U.S. work organizations.
- 580 Sociology of Race Relations 3** Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.
- 582 Social Movements 3** Theories and methods in social movement studies.
- 590 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 591 The Sociology Profession 1** May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.
- 592 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 593 Special Topics in Sociology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

STAT

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.

- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Business Administration – Marketing

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 8

Graduate students: 11

Graduate students receiving assistantships or scholarships: 90%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Requirements: Research Tool Requirements include 12 hours or ANOVA, Regression/Econometrics, Psychometric Theory and Multivariate Statistics. See below for a full list of available courses. 1 credit professional development seminar. 24 credit requirement for Ph.D. research. An Area Research Paper is required in the second year and a written field examination is required in the third year.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The doctorate in business administration with an emphasis in marketing at Washington State University is designed to prepare graduates for careers in research and teaching. The primary goal of the marketing doctoral program is to train academics for placements at AACSB-accredited peer institutions (preferably with a doctoral program of their own) throughout the United States and abroad. Those with a completed master's degree in a business discipline can complete the doctorate in four years of full-time resident study. The program encompasses a variety of formal and informal interactions and projects with faculty and others, as well as course work, comprehensive exams, and dissertation research. It enables students to develop substantial competencies in the theory, practice, and research methodology essential to the advancement of marketing knowledge, while accommodating individual backgrounds, experiences, and objectives. Course work covers topics associated with the scholarly pursuit of marketing as well as topics from supporting fields of

inquiry such as psychology, sociology, and management. Extensive coverage of research methods and statistics associated with the social sciences also is a large component of the program. In addition to specific coursework, the marketing doctoral program also provides an environment in which students can develop research competencies in close association with the marketing faculty and other graduate students.

Post-Graduate Employment Opportunities

Academic Settings

Post-Graduate Career Placements

Colorado State University Michigan State University Kuwait University Northern Kentucky University Sabanci University (Istanbul) University of Houston-Victoria

Contact Information

Dr. Darrel Muehling
Department Chair and Acting PhD Coordinator
Marketing
E-mail: darrel@wsu.edu

Faculty

Babu John Mariadoss, Jeffrey Joireman, Ioannis Kareklas, Darrel Muehling, Eric Spangenberg, David Sprott, Patriya Tansuhaj and Uchila Umesh.

Business Administration

B A

- 501 Foundations in Marketing V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.
- 504 Foundations in Finance V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3**
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.
- 520 Resources, Stakeholders and Competitive Advantage 3**
Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).

- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

ECONS

- 500 Macroeconomic Theory I** 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I** 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II** 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).

- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making 3** Managerial economics with specific applications to agricultural issues.
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I 3** Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II 3** Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V 1-2** May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).

- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- MGTOP**
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.

- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

MKTG

- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.

- 577 Promotional Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

PSYCH

- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.

- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3** May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.

- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- SOC**
- 510 Development of Social Theory 3** Examination of the foundations of social theory.
- 517 Seminar in Contemporary Sociological Theory 3** Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 520 Research Methods in Sociology 3** Methodology of social research at the professional level.
- 521 Regression Models 3** Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.
- 522 Advanced Sociological Methodology 3** May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.
- 523 Qualitative Methods Practicum 3** Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.
- 525 Practicum in Survey Research 3** Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.
- 526 Experimental Methods 3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.
- 530 Demography 3** Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.
- 531 Human Ecology 3** Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.
- 532 Environmental Sociology 3** Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.
- 535 Technology and Society 3** Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.
- 536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.
- 542 Social Stratification: Class, Race and Gender Inequalities 3** Theoretical and empirical research in both classic stratification literature and recent scholarship on class, race/ethnicity and gender.
- 545 Sociology of Community 3** Community stability and change: interaction processes; decision making; societal linkages; effects on well-being.

- 553 Social Organization and the Family 3** The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.
- 554 Social Psychology of the Family 3** The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.
- 556 Sociology of Aging and the Life Course 3** Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.
- 574 Labor Market Inequality 3** Overview of research on the causes and consequences of inequality in U.S. work organizations.
- 580 Sociology of Race Relations 3** Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.
- 582 Social Movements 3** Theories and methods in social movement studies.
- 590 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 591 The Sociology Profession 1** May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.
- 592 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 593 Special Topics in Sociology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

STAT

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.

- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Business Administration – MBA (Online)

Degree offered: Master of Business Administration

Faculty working with graduate students: 12

Graduate students: 45

Program offered: DDP, DDP

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall 1: August 8

Fall 2: October 3

Spring 1: December 22

Spring 2: February 19

Summer 1: April 25

Summer 2: June 13

Requirements

The MBA program consists of 12 courses. Nine core courses provide students with skill development in Strategic Leadership, Management of Innovation and in Functional Business Areas including Accounting, Finance, Services Management and Marketing. Three electives are offered at intervals for degree completion. The final project for this program is a unique comprehensive business plan.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

Washington State University's MBA online program exposes students to broad-ranging coursework that helps to hone entrepreneurial instincts and skills that can lead to significant commercial impact. The program is designed for students to learn how to successfully drive the execution and delivery of business initiatives as well as refine and improve upon existing opportunities. Washington State University produces MBA online graduates who are equipped with the tools and intellect to lead across geographic boundaries and negotiate complex business challenges.

Contact Information

Online MBA Admissions
omba.wsu.edu for live chat with advisor
Telephone: 1-877-960-2029 x3608
Fax: 1-866-563-8901
E-mail: info@wsumba.com

Faculty

Sung Ahn, Jonathan Arthurs, Kenneth Butterfield, Yany Gregoire, Dogan Gursoy, Joseph Harris, Robert Jenefsky, Velle Kolde, Donna Paul, Ronald Pike, Suprateek Sarker and David Sprott.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.
- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.
- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements passes thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.

- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.
- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the Master of Accounting program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

B A

- 501 Foundations in Marketing V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.

- 504 Foundations in Finance V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3**
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.
- 520 Resources, Stakeholders and Competitive Advantage 3**
Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Business Administration

ENTRP

- 501 Technology Entrepreneurship 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Basic business concepts and processes applied to technology commercialization and venture creation.

- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

Business Administration

FIN

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multivariate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.

- 511 Econometrics I** 3 Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II** 3 Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 521 Interest Rates and Financial Markets** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
- 525 Advanced Financial Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Theory of financial management; quantitative analysis of financial problems of the firm; empirical studies on financing modern corporations.
- 526 Financial Management** 3 Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.
- 528 Portfolio Theory and Financial Engineering** 3 Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.
- 581 International Finance** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 595 Advanced Topics in Resource and Production Economics** V 1-6 May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics** V 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Hospitality Business Management**
- HBM**
- 535 International Tourism Strategy and Planning** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Tourism components; social, economic, and cultural effects on societies; the management of tourism businesses.
- 581 Services Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and management of service systems in hospitality operations; control of customer interaction, personnel activities and inventory.
- 582 Hospitality Operations Analysis** 3 Yield/revenue management and managerial accounting concepts within the hospitality industry.
- 591 Service Management Seminar** 3 Course Prerequisite: Admission to PhD programs in business. Survey of selected concepts, frameworks, theory, issues and empirical research in service management.
- 592 Current Issues in Travel and Tourism** 3 Course Prerequisite: Admission to PhD programs in business. Current issues, practices, principles and theory, research and methodologies that govern travel and tourism behavior.
- 597 Special Topics** 3 Course Prerequisite: Admission to PhD programs in business. Strategic business policy, concepts, and practices in hospitality management.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Hospitality Business Management

MGTOP

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.

- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MIS

- 557 Designing Business Intelligence Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.
- 572 Database Management Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.
- 574 Telecommunications and Networking in Business 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.
- 580 Information Systems Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations 3** Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.

- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods 3** Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics 3** Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development 3** Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MKTG

- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.

- 565 Seminar in Marketing 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Business Administration – MBA (Pullman)

Degree offered: Master of Business Administration

Faculty working with graduate students: 7

Graduate students: 40

Graduate students receiving assistantships or scholarships: 50%

Program offered: Pullman, DDP, Pullman, Tri-Cities, Vancouver

Tests required: GMAT, Pearson, TOEFL, IELTS, TOEFLI

Deadline: Fall: May 15

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The full-time MBA program at WSU Pullman features nationally prominent faculty, small cohort groups, and encourages frequent and personal interaction among faculty and students. The MBA program focuses on the management of information and hands-on, real-world experiences, including studying abroad. The program is designed to develop data driven decision making, with a global perspective.

Post-Graduate Career Placements

CEO, CIO, CFO, CMO

Contact Information

Mitch Swanger

Recruitment and Admissions Coordinator

Graduate Programs, College of Business

Todd 121

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Pullman, WA 99164-4710

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Fax: 509-335-4735

E-mail: mba@wsu.edu

Faculty

Kenneth Butterfield, Robert Greenberg, Jean Johnson, Kshiti Joshi, David Knuff, Charles Munson and John Nofsinger.

ACCTG

530 Accounting Theory 3 Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.

532 Contemporary Accounting Cases and Problems 3 Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.

533 Accounting, Performance Measurement and Controls 3 Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.

535 Advanced Taxation 3 Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.

- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements pass thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
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- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Business Administration**
- B A**
- 501 Foundations in Marketing V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.
- 504 Foundations in Finance V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.
- 520 Resources, Stakeholders and Competitive Advantage 3** Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

ENTRP

- 501 Technology Entrepreneurship 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Basic business concepts and processes applied to technology commercialization and venture creation.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

Business Administration

FIN

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.

- 501 Microeconomic Theory I 3** Microeconomic theory, multivariate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 521 Interest Rates and Financial Markets 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
- 525 Advanced Financial Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Theory of financial management; quantitative analysis of financial problems of the firm; empirical studies on financing modern corporations.
- 526 Financial Management 3** Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.

- 528 Portfolio Theory and Financial Engineering 3** Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.
- 581 International Finance 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 595 Advanced Topics in Resource and Production Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

MGTOP

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.

- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 572 Database Management Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.
- 574 Telecommunications and Networking in Business 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.
- 580 Information Systems Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations 3** Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods 3** Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics 3** Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development 3** Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- Management Information Systems**
- MIS**
- 557 Designing Business Intelligence Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MKTG

505 Survey of Marketing 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.

506 Marketing Strategy 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.

507 Consumer Behavior 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.

555 Marketing Analytics 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.

561 New Product Marketing 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.

565 Seminar in Marketing 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.

577 Promotional Management 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.

590 Seminar in Consumer Behavior 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.

591 Seminar in Marketing Management 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.

592 Seminar in Marketing Theory 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.

593 Seminar in Research Design 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration – MBA (Tricities)

Degree offered: Master of Business Administration

Faculty working with graduate students: 6

Graduate students: 55

Program offered: Tri-Cities, Tri-Cities

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall 2013: July 15

Spring 2014: November 30

Requirements

The MBA program at WSU Tri-Cities consists of 7 core courses, 3 elective courses, 7 foundation courses, and two additional credits for the final project and presentation required during the student's last semester. The seven core courses provide students with skill development in strategic leadership, decision making, and in functional business areas including accounting, finance, and marketing. The three electives allow students to concentrate in areas of business interest. The seven foundation courses are designed to accommodate the diversity of entering students with varying academic backgrounds while ensuring a solid foundation in all business areas. These courses will be waived if equivalent coursework has been completed, however, if these courses are needed they must be completed prior to enrollment in the MBA core or elective courses.

Program Description

Graduate Programs in the College of Business at Washington

State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

The MBA program at WSU Tri-Cities is designed as a part-time program for working professionals with broad academic backgrounds and a desire to prepare themselves for leadership responsibilities in today's global economy. The program blends theory with practice to build the technical tools and relational skills demanded of top business leaders while providing experience in identifying, analyzing and interpreting data relevant to management decisions.

Training and Professional Development Opportunities

Opportunities to earn 6-sigma green or black belts

Post-Graduate Employment Opportunities

Any field of business

Post-Graduate Career Placements

Some have started their own businesses, some have been promoted within their current companies, and still others have moved on to changing their career path. We had a mining engineer who started the program with the goal of going into hospital administration. Within three months of completing his degree, he had the job he wanted with a hospital.

Contact Information

Melanie Casciato
Coordinator
Professional Programs
2710 Crimson Way
Richland, WA 99354
Telephone: 509-372-7360
E-mail: mba@tricity.wsu.edu

Faculty

Nancy Ashley, Timothy Baker, Jesus Bravo, Sheen Liu, Paul Skilton and Li Xu.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.

- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.
- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements passes thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.
- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- FIN**
- 500 Macroeconomic Theory I** 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I** 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II** 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II** 3 Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics** 3 Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 510 Statistics for Economists** 3 Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I** 3 Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II** 3 Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 521 Interest Rates and Financial Markets** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
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- 526 Financial Management** 3 Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.
- 528 Portfolio Theory and Financial Engineering** 3 Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.
- 581 International Finance** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).

- 595 Advanced Topics in Resource and Production Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- MGTOP**
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.

- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MIS

- 557 Designing Business Intelligence Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.
- 572 Database Management Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.
- 574 Telecommunications and Networking in Business 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.

- 580 Information Systems Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations 3** Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods 3** Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics 3** Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development 3** Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Management Information Systems

MKTG

- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.

- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Business Administration – MBA (Vancouver)

Degree offered: Master of Business Administration

Faculty working with graduate students: 7

Graduate students: 50

Program offered: Vancouver, Vancouver

Tests required: GMAT, TOEFL

Deadline: Fall: January 10

Spring: October 1 (July 1 international)

Summer: January 10

Requirements

All Professional MBA students conduct a final 2-credit oral presentation/exam

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Degree Description

Apply to the only AACSB-accredited, stakeholder-focused MBA program offered anywhere, and watch your career take off. Washington State University Vancouver's MBA program was honored among the Aspen Institute's "Beyond Grey Pinstripes Global 100" top alternative business schools in 2009 for its nationally recognized and respected faculty and globally relevant stakeholder focus. WSU Vancouver's MBA program integrates a stakeholder focus throughout all courses. You will come away with a clear understanding of the interdependence between a business and its stakeholders-employees, investors, customers, suppliers, and public constituencies. You will learn to apply theory to practice and adopt an executive-level perspective that empowers you to make decisions and take action.

Contact Information

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Faculty

Jane Cote, Joseph Cote, Ronald Delisle, Jerry Goodstein, Thomas Tripp, Uchila Umesh and Wilfred Wu.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.
- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.
- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.
- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements passes thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.
- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the Master of Accounting program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration**B A**

- 501 Foundations in Marketing V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.
- 502 Foundations in Operations Management V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.
- 504 Foundations in Finance V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3**
Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.
- 520 Resources, Stakeholders and Competitive Advantage 3**
Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration**FIN**

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).

- 521 Interest Rates and Financial Markets 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
- 525 Advanced Financial Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Theory of financial management; quantitative analysis of financial problems of the firm; empirical studies on financing modern corporations.
- 526 Financial Management 3** Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.
- 528 Portfolio Theory and Financial Engineering 3** Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.
- 581 International Finance 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 595 Advanced Topics in Resource and Production Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management

MGMT

- 584 Seminar in Entrepreneurship 3** Course Prerequisite: Admission to the Ph.D. in Business Administration. Advanced, doctoral-level topics in entrepreneurship.
- 585 Advanced Negotiation Skills 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Bargaining skills in multi-stakeholder settings; experiential work.
- 594 Seminar in Organizational Theory 3** Course Prerequisite: Admission to the Ph.D. in Business Administration. Advanced, doctoral-level topics in organizational theory.
- 595 Seminar in Strategic Management 3** Course Prerequisite: Admission to the Ph.D. in Business Administration. Advanced, doctoral-level topics in Strategic Management.
- 597 Seminar in International Management 3** Course Prerequisite: Admission to the Ph.D. in Business Administration. Advanced, doctoral-level topics in International Management.
- 599 Seminar in Management (Organizational Behavior) 3** Course Prerequisite: Admission to PhD programs in business. Advanced doctoral-level topics in organizational behavior.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

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Management

MGTOP

516 Time Series 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.

519 Applied Multivariate Analysis 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.

540 Deterministic Business Models 3 Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.

556 Advanced Business Modeling 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.

581 Operations Management 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.

582 Personnel and Human Resource Management 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.

587 Professional Ethics and Practice in Business 3 Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.

588 Management of Innovation 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).

589 Seminar in Management 3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.

590 Strategy Formulation and Organizational Design 3 Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.

591 Statistical Analysis for Business Decisions 3 Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.

593 Managerial Leadership and Productivity 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.

596 Doctoral Topics V 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.

597 Doctoral Topics 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.

598 Research and Professional Development 1 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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Management Information Systems

MIS

- 557 Designing Business Intelligence Systems** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.
- 572 Database Management Systems** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.
- 574 Telecommunications and Networking in Business** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.
- 580 Information Systems Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations** 3 Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.
- 596 Doctoral Topics** 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods** 3 Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics** 3 Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development** 3 Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.

- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MKTG

- 505 Survey of Marketing** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 555 Marketing Analytics** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing** 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management** 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior** 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.

- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration – MBA-Executive (Online)

Degree offered: Master of Business Administration

Faculty working with graduate students: 13

Graduate students: 25

Program offered: DDP, DDP

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: August 8
 Spring: December 13
 Summer: April 25
 Fall: August 6

Requirements

Students will complete a unique, viable business plan as their final project.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of

Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also available online.

Contact Information

EMBA Enrollment Advising
 chat live with an advisor at embaonline.wsu.edu
 Graduate Programs, College of Business
 Telephone: 1-877-960-2029 x3609
 E-mail: admissions@wsuemba.com

Faculty

Jonathan Arthurs, Joseph Cote, Joseph Harris, Kshiti Joshi, Velle Kolde, John Nofsinger, Fredrick Peterson, Jerman Rose, Raul Sanchez, Saonee Sarker, David Sprott, Uchila Umesh and Jeanne Yamamura.

ACCTG

- 530 Accounting Theory 3** Course Prerequisite: Admission to the Master of Accounting program. Recent developments with respect to the determination of income and the valuation of assets.
- 532 Contemporary Accounting Cases and Problems 3** Course Prerequisite: Admission to the Master of Accounting program. Accounting theory applied to external financial reporting practices.
- 533 Accounting, Performance Measurement and Controls 3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Managerial evaluation of budgeting, cost accounting, and financial analysis techniques; their utilization in control of operations.
- 535 Advanced Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Federal income tax impact on corporations, S corporations, partnerships, estates, trusts and their beneficial owners.
- 537 Professional Research 3** Course Prerequisite: Admission to the Master of Accounting program. Methodology used by accounting professionals to research applied problems in taxation, accounting, and auditing; communicate results.
- 538 Seminar in Cost/Managerial Accounting 3** Course Prerequisite: Admission to the Master of Accounting program. Cost concepts, cost and managerial accounting systems; current issues and research in cost and managerial accounting.
- 539 Seminar in Public Accounting and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Public accounting and auditing to present; current issues including statistical sampling and computers.
- 540 Corporate Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Application of federal tax provisions and rules pertaining to corporations, including S corporations; tax planning and consequences of corporate decisions.

- 541 Flow Through Entities 3** Course Prerequisite: Admission to the Master of Accounting program. Tax law and preparation requirements for entities in which tax elements passes thorough to the owner's individual income tax return.
- 542 Gifts, Estates and Trusts 3** Course Prerequisite: Admission to the Master of Accounting program. Estate and gift tax law.
- 543 Special Topics in Accounting 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Master of Accounting program. Critical topics in accounting including new developments.
- 544 Advanced Accounting Systems and Auditing 3** Course Prerequisite: Admission to the Master of Accounting program. Advanced topics in accounting systems, auditing and controls.
- 545 International Taxation 3** Course Prerequisite: Admission to the Master of Accounting program. Tax issues for international transactions of businesses and individuals.
- 546 Accounting for Income Taxes 3** Comprehensive coverage of accounting income taxes.
- 550 Introduction to Financial and Managerial Accounting V 2-3** Course Prerequisite: Admission to the MBA or Business PhD programs only. Fundamentals of financial and managerial accounting; primarily for graduate students who wish to meet the MBA core requirements in accounting.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in accounting.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the Master of Accounting program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 502 Foundations in Operations Management V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.
- 503 Foundations in Business Law V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.
- 504 Foundations in Finance V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.
- 514 Business Analytics: Transforming Data into Decisions 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.
- 520 Resources, Stakeholders and Competitive Advantage 3** Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.
- 579 MBA Capstone 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

B A

- 501 Foundations in Marketing V 2-3** May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.

Business Administration

ENTRP

- 501 Technology Entrepreneurship 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Basic business concepts and processes applied to technology commercialization and venture creation.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

Business Administration

FIN

- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).

- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 521 Interest Rates and Financial Markets 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Real and nominal interest rates; bond pricing; term and risk structure of interest rates; investment and commercial banking; financial futures.
- 525 Advanced Financial Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Theory of financial management; quantitative analysis of financial problems of the firm; empirical studies on financing modern corporations.
- 526 Financial Management 3** Course Prerequisite: Admission to the MBA or Business Ph.D. programs. Advanced topics in corporate finance, including capital budgeting, cost of capital, capital structure, pay-out policy, and enterprise valuation.
- 527 Investment Analysis 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. A decision-making approach to the problems of asset management for personal and business portfolio.
- 528 Portfolio Theory and Financial Engineering 3** Course Prerequisite: FIN 527; admission to the MBA, Master of Accounting, or Business PhD programs. The theory of portfolio management and the use of derivative securities in portfolio risk management.
- 581 International Finance 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international finance; financial management of multinational corporations; international investments.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).

- 595 Advanced Topics in Resource and Production Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Same as ECONS 595.
- 596 Advanced Topics in Financial Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business, or ECONS 500 and ECONS 501. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration

I BUS

- 580 International Business Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Decision making in the international environment; political, cultural, and economic risk management.
- 582 International Marketing Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Principles of international marketing, marketing decision making in international environments, problems of adapting marketing programs to international markets.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

Business Administration

MGTOP

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.

- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 572 Database Management Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Database management, data modeling, system design and implementation; the application of DBMS technologies to organizational and business problems.
- 574 Telecommunications and Networking in Business 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Business applications of data communications, infrastructure, protocols, topologies and management, the design of wired and wireless solutions, and related research issues.
- 575 Electronic Commerce and the Internet 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technologies underlying electronic commerce and the internet; strategies and implementation plans for managing the implementation of electronic commerce systems.
- 576 Emerging Technologies 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special and advanced topics in MIS.
- 580 Information Systems Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Data processing organization; operations, application development, computer selection, management of computer personnel and systems.
- 582 Systems Analysis and Design 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Research on and application of systems analysis, design, development and management of information systems; systems development life cycle.
- 595 MIS Research Foundations 3** Course Prerequisite: Admission to PhD programs in business. Seminal works in MIS, philosophy of science and theory development.
- 596 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management information systems.
- 597 MIS Research Methods 3** Course Prerequisite: Admission to PhD programs in business. Study and application of research methods used in MIS research.
- 598 MIS Research Topics 3** Course Prerequisite: Admission to PhD programs in business. Major streams of research in MIS.
- 599 MIS Research Proposal Development 3** Course Prerequisite: Admission to PhD programs in business. Seminar on the process of creating a MIS research proposal.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- Management Information Systems**
- MIS**
- 557 Designing Business Intelligence Systems 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Design and use of business intelligence systems, and business performance analytics.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Management Information Systems

MKTG

505 Survey of Marketing 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.

506 Marketing Strategy 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.

507 Consumer Behavior 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.

555 Marketing Analytics 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.

561 New Product Marketing 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.

565 Seminar in Marketing 3 May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.

577 Promotional Management 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.

590 Seminar in Consumer Behavior 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.

591 Seminar in Marketing Management 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.

592 Seminar in Marketing Theory 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.

593 Seminar in Research Design 3 Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Business Administration – Operations

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 4

Graduate students: 8

Graduate students receiving assistantships or scholarships: 87%

Tests required: GMAT, IELTS, MELAB, Pearson, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Research Tool Requirements include 12 hours. 30 additional required hours in major and minor fields. 1-credit professional development seminar. 24-credit requirement for Ph.D. research. Students are required to pass a qualifying exam. The exam is typically taken in June after the first year of study. Only one retake is allowed, typically in the subsequent August.

Program Description

Graduate Programs in the College of Business at Washington State University consist of a PhD in Business Administration with 7 areas of concentration (Accounting, Finance, Hospitality and Tourism, Information Systems, Management, Marketing, and Operations), a Master's of Accounting (MAcc) and Master's of Business Administration (MBA). The PhD is a four year residential program available in Pullman, WA. The MAcc is available in Pullman and Vancouver, WA. The MBA is available in Pullman, Tri-Cities, Vancouver and online with an Executive option also

available online.

Degree Description

The program in Operations and Management Science prepares students for careers in business, industry, or government using expertise garnered in applied problem solving and data analysis. Students receive rigorous fundamental training in statistics, research methods, mathematics, and operations research, followed by theoretical study within their respective fields of interest. All students are expected to produce publishable research for peer-reviewed journals prior to graduation.

Training and Professional Development Opportunities

Six Sigma Green Belt and Six Sigma Black Belt

Post-Graduate Employment Opportunities

University Professor; Management Science Analyst; Statistician

Post-Graduate Career Placements

American University of Sharjah--UAE; Axio Research; Central Washington University; Chapman University; Ching-Yi University--China; Fort Hays State University; Grand Valley State University; KeiMyung University; Marquette University; Microsoft Corporation; Min Chuan University; National Renewable Energy Lab; Northeastern University; Oregon State University; Southeastern Oklahoma State University; Southwestern University of Finance and Economics--China; State University of New York--Geneseo; Tatung Institute of Technology; University of Kansas; University of Michigan--Flint; University of North Texas; University of Tennessee--Martin; University of Washington

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Faculty

Sung Ahn, Timothy Baker, Stergios Fotopoulos and Charles Munson.

MATH

464 Linear Optimization 3 Course Prerequisite: MATH 273 or MATH 283. Linear and integer programming; optimization problems; applications to economic and military strategies; rectangular games; minimax theory.

STAT

443 Applied Probability 3 Course Prerequisite: MATH 172 or MATH 182; MATH 220 or MATH 230. Axioms of probability theory; random variables; expectation; generating function; law of large numbers; central limit theorem; Markov chains. (Cross-listed course offered as STAT 443, MATH 443).

501 Foundations in Marketing V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in marketing for MBA students.

502 Foundations in Operations Management V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in operations management for MBA students.

503 Foundations in Business Law V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in business law for MBA students.

504 Foundations in Finance V 2-3 May be repeated for credit; cumulative maximum 6 hours. Foundation topics in finance for MBA students.

514 Business Analytics: Transforming Data into Decisions 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Advanced decision-making concepts utilizing relevant datasets for data-driven problem-solving and formulating decision analyses to evaluate and recommend management action.

520 Resources, Stakeholders and Competitive Advantage 3 Course Prerequisite: Admission to the MBA program. Creating competitive advantage using resources provided by key stakeholders.

579 MBA Capstone 3 Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analyze, evaluate, and recommend management actions for a specific strategic business project (for an existing organization or new venture).

596 Doctoral Topics V 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in business research and theory.

598 Research and Professional Development 1 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar** 1 May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis** 3 Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis** 3 Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis** 3 Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration** 3 Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra** 3 Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers** 3 May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis** 3 Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra** 3 Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations** 3 Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods** 3 Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology** 3 Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics** 3 Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers** 3 Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics** 1 May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics** 3 Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education** 3 Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing** 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I** 3 Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II** 3 Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory** 3 Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations** 3 Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.

- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V** 1-4 May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.

- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Chemical Engineering

Degree offered: Doctor of Philosophy (Chemical Engineering)

Faculty working with graduate students: 17

Graduate students: 66

Graduate students receiving assistantships or scholarships: 89%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

Through the Voiland School, students may earn either a Master of Science (MS) or a Doctor of Philosophy (PhD) in Chemical Engineering. Within the Chemical Engineering Program we specialize in the development of sustainable energy solutions, understanding environmental systems, and developing systems and devices to improve the health of individuals everywhere. Students may receive chemical engineering degrees working with faculty in Pullman or on the Tri-Cities campus.

Degree Description

Faculty research is broadly focused in three synergistic areas: Sustainable Energy Systems, Bimolecular Engineering, and Biomechanics. Within these areas, projects are focused on: chemical and biological catalysis and kinetics; chemical and biological fuel cells; biofilm engineering; novel sensor technologies; cardiac and reproductive molecular engineering; and molecular, cellular, and musculoskeletal mechanics. Specialized equipment includes a dynamic x-ray diffractometer, a colloidal characterization lab with field scattering capabilities, large scale fermenters, GC, LC, LC/MS chromatographic systems, and Atomic Force and other optical microscopes. The graduate programs are flexible,

allowing students to develop a program that fits individual needs. A master of science is typically completed in 12-15 months, and a doctorate in 3-4 years after completion of the Bachelor of Science degree. Many doctoral students also participate in training programs, such as the NIH-sponsored protein biotechnology training program.

Training and Professional Development Opportunities

The Voiland School offers excellent research facilities, the flexibility to design an individualized academic program, and the ability to work closely with highly engaged faculty. We also offer students the opportunity to participate in an NIH (National Institutes of Health) sponsored training program in protein Biochemistry, and we encourage students to participate in internship programs at partner institutions.

Contact Information

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Nehal Abu-Lail, Birgitte Ahring, Haluk Beyenal, Howard Davis, Wenji Dong, Su Ha, Cornelius Ivory, Alla Kostyukova, David Lin, Jean-Sabin McEwen, Edward Pate, James Petersen, Bernard Vanwie, Anita Vasavada, Yong Wang, Xiao Zhang and Richard Zollars.

CH E

510 Transport Processes 3 Transport of mass, energy, and momentum; unsteady and steady states as applied to chemical processing; macroscopic and microscopic analyses.

527 Chemical Thermodynamics 3 Thermodynamic laws for design and optimization of thermodynamic systems, equations of state, properties of ideal and real fluids and fluid mixtures, stability, phase equilibrium, chemical equilibrium; applications of thermodynamic principles.

529 Chemical Engineering Kinetics 3 Interpretation of kinetic data and design of nonideal chemical reactors; fundamentals of heterogeneous catalysis, catalyst preparation, characterization, and theory.

541 Chemical Engineering Analysis 3 Mathematical analysis of chemical engineering operations and processes; mathematical modeling and computer application.

- 549 Biochemical Conversion Laboratory 2** (1-3) Analytical techniques in biomass characterization; bioproduct/biofuel production from renewable biomass including biochemical processes.
- 560 Biochemical Engineering 3** Chemical engineering applied to biological systems; fermentation processes, biochemical reactor design, downstream processing, transport phenomena in biological systems, biochemical technology.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 581 Advanced Topics in Chemical Engineering V** 1-3 May be repeated for credit; cumulative maximum 9 hours. Filtration, reaction engineering, two-phase flow, non-Newtonian fluids, interfacial phenomena, fluidization, novel separations, biomedical engineering.
- 585 Interfacial Phenomena 3** Chemical and physical nature of the interface including the molecular basis for interfacial forces and resulting macroscopic phenomena.
- 596 Research Methods and Presentation I 2** Establish sound practices for graduate research and presentation of results; techniques used for performing through literature searching and establishing and testing research hypotheses.
- 597 Research Methods and Presentation II 2** Establishing sound practices for presentation of research programs and research results.
- 598 Research Seminar 1** May be repeated for credit. Seminar presentations on current topics in chemical engineering research.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Faculty working with graduate students: 17

Graduate students: 4

Graduate students receiving assistantships or scholarships: 100%

Program offered: Pullman, Tri-Cities

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

Through the Voiland School, students may earn either a Master of Science (MS) or a Doctor of Philosophy (PhD) in Chemical Engineering. Within the Chemical Engineering Program we specialize in the development of sustainable energy solutions, understanding environmental systems, and developing systems and devices to improve the health of individuals everywhere. Students may receive chemical engineering degrees working with faculty in Pullman or on the Tri-Cities campus.

Degree Description

Faculty research is broadly focused in three areas: sustainable energy systems, biomolecular engineering, and biomechanics. Within these areas projects are focused on chemical and biological catalysis and kinetics; chemical and biological fuel cells; biofilm engineering; novel sensor technologies; cardiac and reproductive molecular engineering; and molecular, cellular, and musculoskeletal mechanics. The graduate programs are flexible, allowing students to develop a program that fits individual needs. A Master of Science is typically completed in 12-15 months.

Training and Professional Development Opportunities

The Voiland School offers excellent research facilities, the flexibility to design an individualized academic program, and the ability to work closely with highly engaged faculty. We also offer students the opportunity to participate in an NIH (National Institutes of Health) sponsored training program in protein Biochemistry, and we encourage students to participate in internship programs at partner institutions.

Contact Information

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Chemical Engineering

Degree offered: Master of Science in Chemical Engineering

Faculty

Nehal Abu-Lail, Birgitte Ahring, Haluk Beyenal, Howard Davis, Wenji Dong, Su Ha, Cornelius Ivory, Alla Kostyukova, David Lin, Jean-Sabin McEwen, Edward Pate, James Petersen, Bernard Vanwie, Anita Vasavada, Yong Wang, Xiao Zhang and Richard Zollars.

CHE

- 510 Transport Processes 3** Transport of mass, energy, and momentum; unsteady and steady states as applied to chemical processing; macroscopic and microscopic analyses.
- 527 Chemical Thermodynamics 3** Thermodynamic laws for design and optimization of thermodynamic systems, equations of state, properties of ideal and real fluids and fluid mixtures, stability, phase equilibrium, chemical equilibrium; applications of thermodynamic principles.
- 529 Chemical Engineering Kinetics 3** Interpretation of kinetic data and design of nonideal chemical reactors; fundamentals of heterogeneous catalysis, catalyst preparation, characterization, and theory.
- 541 Chemical Engineering Analysis 3** Mathematical analysis of chemical engineering operations and processes; mathematical modeling and computer application.
- 549 Biochemical Conversion Laboratory 2 (1-3)** Analytical techniques in biomass characterization; bioproduct/biofuel production from renewable biomass including biochemical processes.
- 560 Biochemical Engineering 3** Chemical engineering applied to biological systems; fermentation processes, biochemical reactor design, downstream processing, transport phenomena in biological systems, biochemical technology.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 581 Advanced Topics in Chemical Engineering V 1-3** May be repeated for credit; cumulative maximum 9 hours. Filtration, reaction engineering, two-phase flow, non-Newtonian fluids, interfacial phenomena, fluidization, novel separations, biomedical engineering.
- 585 Interfacial Phenomena 3** Chemical and physical nature of the interface including the molecular basis for interfacial forces and resulting macroscopic phenomena.
- 596 Research Methods and Presentation I 2** Establish sound practices for graduate research and presentation of results; techniques used for performing through literature searching and establishing and testing research hypotheses.
- 597 Research Methods and Presentation II 2** Establishing sound practices for presentation of research programs and research results.
- 598 Research Seminar 1** May be repeated for credit. Seminar presentations on current topics in chemical engineering research.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Chemical Engineering

Degree offered: Master of Science in Chemical Engineering – Non Thesis

Faculty working with graduate students: 17

Program offered: Pullman, Tri-Cities

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

Through the Voiland School, students may earn either a Master of Science (MS) or a Doctor of Philosophy (PhD) in Chemical Engineering. Within the Chemical Engineering Program we specialize in the development of sustainable energy solutions, understanding environmental systems, and developing systems and devices to improve the health of individuals everywhere. Students may receive chemical engineering degrees working with faculty in Pullman or on the Tri-Cities campus.

Degree Description

Faculty research is broadly focused in three areas: sustainable energy systems, biomolecular engineering, and biomechanics. Within these areas projects are focused on chemical and biological catalysis and kinetics; chemical and biological fuel cells; biofilm engineering; novel sensor technologies; cardiac and reproductive molecular engineering; and molecular, cellular, and musculoskeletal mechanics. The graduate programs are flexible, allowing students to develop a program that fits individual needs. A Master of Science is typically completed in 12-15 months.

Post-Graduate Employment Opportunities

Graduates may participate in the design and production of chemically based products or they may engage in research leading to new or improved chemical products, products, and uses. Graduates find rewarding work in plant operation, plant

management, university teaching, sales/service, and other functions requiring chemical engineering training. Many students also use their education in chemical engineering as preparation for other professional degrees such as medicine or law.

Contact Information

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Voiland School of Chemical Engineering and Bioengineering
PO Box 642710
Pullman, WA 99164-2710
Telephone: (509) 335-3811
Fax: (509) 335-4806
E-mail: jnp@wsu.edu

Faculty

Nehal Abu-Lail, Birgitte Ahring, Haluk Beyenal, Howard Davis, Wenji Dong, Su Ha, Cornelius Ivory, Alla Kostyukova, David Lin, Jean-Sabin McEwen, Edward Pate, James Petersen, Bernard Vanwie, Anita Vasavada, Yong Wang, Xiao Zhang and Richard Zollars.

CHE

- 510 Transport Processes 3** Transport of mass, energy, and momentum; unsteady and steady states as applied to chemical processing; macroscopic and microscopic analyses.
- 527 Chemical Thermodynamics 3** Thermodynamic laws for design and optimization of thermodynamic systems, equations of state, properties of ideal and real fluids and fluid mixtures, stability, phase equilibrium, chemical equilibrium; applications of thermodynamic principles.
- 529 Chemical Engineering Kinetics 3** Interpretation of kinetic data and design of nonideal chemical reactors; fundamentals of heterogeneous catalysis, catalyst preparation, characterization, and theory.
- 541 Chemical Engineering Analysis 3** Mathematical analysis of chemical engineering operations and processes; mathematical modeling and computer application.
- 549 Biochemical Conversion Laboratory 2 (1-3)** Analytical techniques in biomass characterization; bioproduct/biofuel production from renewable biomass including biochemical processes.
- 560 Biochemical Engineering 3** Chemical engineering applied to biological systems; fermentation processes, biochemical reactor design, downstream processing, transport phenomena in biological systems, biochemical technology.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 581 Advanced Topics in Chemical Engineering V 1-3** May be repeated for credit; cumulative maximum 9 hours. Filtration, reaction engineering, two-phase flow, non-Newtonian fluids, interfacial phenomena, fluidization, novel separations, biomedical engineering.

- 585 Interfacial Phenomena 3** Chemical and physical nature of the interface including the molecular basis for interfacial forces and resulting macroscopic phenomena.
- 596 Research Methods and Presentation I 2** Establish sound practices for graduate research and presentation of results; techniques used for performing through literature searching and establishing and testing research hypotheses.
- 597 Research Methods and Presentation II 2** Establishing sound practices for presentation of research programs and research results.
- 598 Research Seminar 1** May be repeated for credit. Seminar presentations on current topics in chemical engineering research.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Chemistry

Degree offered: Doctor of Philosophy (Chemistry)

Faculty working with graduate students: 28

Graduate students: 88

Graduate students receiving assistantships or scholarships: 98%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: March 1 (January 15 international)

Spring: October 1

Program Description

The Department of Chemistry offers courses of study leading to the MS and PhD degrees with opportunities for research in seven fields: analytical, environmental, radiochemistry, materials chemistry, inorganic, organic and bioorganic, and physical chemistry. The low student-to-faculty ratio assures students of individual guidance, yet the total size of the department provides excellent facilities for research, including the latest instrumentation. The program of study for graduate students in the Department of Chemistry provides a good balance between formal course work and research experience. In addition to the normal core classes,

first-year graduate students also take a seminar course which provides a forum for the presentation and discussion of current research in chemistry within the department. With this exposure, students are typically comfortable selecting a research adviser by the end of their first semester. Individual divisions also have a weekly seminar program in which graduate students participate, gaining experience in presenting and discussing their own research.

Degree Description

The written PhD thesis is the capstone of your graduate career and will describe a significant body of original scientific research. The adequacy of this work will be judged by your research advisor and committee members as well as the entire graduate faculty. Most successful PhD candidates are already the first author on several papers by the time they reach this stage of their career. Though there is no set number of publications required for completion of the PhD, a typical thesis will be the equivalent of at least two journal articles, with additional introductory material and experimental detail.

Training and Professional Development Opportunities

Divisional seminars within the department, participation in regional and national meetings

Post-Graduate Employment Opportunities

Some of our alumni are heads of international corporations and faculty members in Chemistry Departments around the country.

Post-Graduate Career Placements

Many of our graduates have gotten jobs in the state crime lab, teaching positions and in many industries.

Contact Information

Carrie Giovannini
Department of Chemistry
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Faculty

Paul Benny, Clifford Berkman, James Brozik, Aurora Clark, Sue Clark, Gregory Crouch, Philip Garner, Herbert Hill, Kerry Hipps, James Hurst, Jeffrey Jones, Chulhee Kang, Jeremy Lessmann, Alexander Li, Donald Matteson, Ursula Mazur, Jeanne McHale, Ken Nash, Kirk Peterson, Peter Reilly, Robert Ronald, James Satterlee, James Schenk, Louis Scudiero, Nathalie Wall, Scot Wherland, Ming Xian and Choong-Shik Yoo.

CHEM

- 501 Advanced Inorganic Chemistry I** 3 Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry** V 1-3 May be repeated for credit. Recent significant developments.

- 509 Chemical Group Theory** 3 Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics** 2 Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis** 2 Methods for the measurement of biological compounds.
- 514 Mass Spectrometry** 2 Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography** 2 Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry** 2 Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry** 3 Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers** 2 Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory** 1 (0-3) Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry** 2 Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry** V 1-3 May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I** 3 Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II** 3 Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics** 3 Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry** 3 Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry** V 1-3 May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry** 3 Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.

- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V 1-3** May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

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Chemistry

Degree offered: Master of Science in Chemistry

Faculty working with graduate students: 28

Graduate students: 4

Graduate students receiving assistantships or scholarships: 100%

Program offered: Pullman, Tri-Cities

Tests required: GRE (Combined), TOEFL

Deadline: Fall: March 1 (January 15 international)
Spring: October 1

Program Description

The Department of Chemistry offers courses of study leading to the MS and PhD degrees with opportunities for research in seven fields: analytical, environmental, radiochemistry, materials chemistry, inorganic, organic and bioorganic, and physical chemistry. The low student-to-faculty ratio assures students of individual guidance, yet the total size of the department provides excellent facilities for research, including the latest instrumentation. The program of study for graduate students in the Department of Chemistry provides a good balance between formal course work and research experience. In addition to the normal core classes, first-year graduate students also take a seminar course which provides a forum for the presentation and discussion of current research in chemistry within the department. With this exposure, students are typically comfortable selecting a research adviser by the end of their first semester. Individual divisions also have a weekly seminar program in which graduate students participate, gaining experience in presenting and discussing their own research.

Degree Description

While the WSU Chemistry graduate program emphasizes the Ph.D. degree, we appreciate that there are circumstances which

favor awarding of the M.S. degree. The degree of Master of Science is awarded in recognition of scholarship and contributions to knowledge in the field of Chemistry. The Master's Degree is based on research carried out in the laboratories of the Department and allows students to gain experience in modern experimental techniques and to familiarize themselves with the daily workings of a laboratory. Master's Degree students (on either the thesis or non-thesis track) must carry out a research project under the supervision of a member of the Chemistry Department faculty. Master's students are expected to participate fully in the scientific life of the Department and to attend the various meetings and seminars that take place.

Contact Information

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Faculty

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- 531 Advanced Physical Chemistry I** 3 Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II** 3 Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics** 3 Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry** 3 Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V** 1-3 May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
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- 542 Advanced Organic Chemistry** 3 Synthesis of organic compounds; recent developments from current literature.
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- 544 Advanced Topics in Organic Chemistry V** 1-3 May be repeated for credit. Current research in organic chemistry.
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- 546 Spectroscopic Identification of Organic Compounds** 3 Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.

- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Civil Engineering

Degree offered: Doctor of Philosophy (Civil Engineering)

Faculty working with graduate students: 30

Graduate students: 35

Graduate students receiving assistantships or scholarships: 88%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The graduate programs in Civil Engineering are offered leading to the Master of Science in Civil Engineering degree, the Master of Science in Environmental Engineering degree, and the Doctor of Philosophy Civil Engineering degree. The department also participates in university programs leading to the M.S. in Environmental Science and the Ph.D. in Engineering Science. At the Master's level, specific programs are available within each area.

Degree Description

Students may be accepted into the graduate program with undergraduate degrees in other than Civil Engineering (e.g., related areas such as mechanical engineering, materials science, physics, etc.). These students, however, may need to complete additional courses to cover deficiencies. Courses taken to satisfy deficiencies cannot be included in the program of study. Each student, in consultation with his/her graduate committee, will develop a plan of study. This plan outlines what courses will be required for completion of the degree. To develop a plan of study, students may choose from a variety of graduate and selected undergraduate courses offered in the area of emphasis. In addition, courses may be selected from a number of related courses in other programs in the Department of Civil and Environmental Engineering, as well as in other departments of the University. The doctorate program is individually tailored to each student's need and interest.

Training and Professional Development Opportunities

Opportunities for National Lab internships, federal agency policy analysis internship, or an opportunity to do development work exist on a case-by-case basis.

Post-Graduate Employment Opportunities

Faculty positions, Consulting positions, National Research Lab appointments

Post-Graduate Career Placements

Multiple faculty positions in the US and overseas. Research Lab

assignments Consultants in premier Civil Engineering firms in the US and overseas.

Contact Information

Dr. Balasingam Muhunthan
Graduate Committee Chair

Vicki Ruddick
Graduate Coordinator

Faculty

Jennifer Adam, Michael Barber, Donald Bender, Marc Beutel, Shane Brown, Serena Chung, Candis Claiborn, William Cofer, James Dolan, Karl Englund, Liv Haselbach, Md Hossain, B Jobson, Brian Lamb, Fok-Yan Leung, Heping Liu, David McLean, George Mount, Balasingam Muhunthan, David Pollock, Shelley Pressley, Pizhong Qiao, Shihui Shen, Timothy Vanreken, Joseph Vaughan, Richard Watts, Haifang Wen, Michael Wolcott, Vikram Yadama and David Yonge.

Civil Engineering

Degree offered: Master of Science in Civil Engineering

Faculty working with graduate students: 31

Graduate students: 32

Graduate students receiving assistantships or scholarships: 56%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The graduate programs in Civil Engineering are offered leading to the Master of Science in Civil Engineering degree, the Master of Science in Environmental Engineering degree, and the Doctor of Philosophy Civil Engineering degree. The department also participates in university programs leading to the M.S. in Environmental Science and the Ph.D. in Engineering Science. At the Master's level, specific programs are available within each area.

Degree Description

Students may be accepted into the graduate program with undergraduate degrees in other than Civil Engineering (e.g., related areas such as mechanical engineering, materials science, physics, etc.). These students, however, may need to complete additional courses to cover deficiencies. Courses taken to satisfy deficiencies cannot be included in the program of study. Each student, in consultation with his/her graduate committee, will develop a plan of study. This plan outlines what courses will be required for completion of the degree. To develop a plan of study, students may choose from a variety of graduate and selected undergraduate courses offered in the area of emphasis. In addition, courses may be selected from a number of related courses in other programs in the Department of Civil and Environmental Engineering, as well as in other departments of the University.

Training and Professional Development Opportunities

Opportunities to participate as National Lab internships, federal agency policy analysis internship, or an opportunity to do development work exist on a case-by-case basis.

Post-Graduate Employment Opportunities

Consulting Research labs Federal state agencies.

Post-Graduate Career Placements

Consulting Research labs Federal state agencies.

Contact Information

Dr. Balasingam Muhunthan
Graduate Committee Chair

Vicki Ruddick
Graduate Coordinator

Faculty

Jennifer Adam, Michael Barber, Donald Bender, Marc Beutel, Shane Brown, Serena Chung, Candis Claiborn, William Cofer, James Dolan, Karl Englund, Liv Haselbach, Md Hossain, B Jobson, Brian Lamb, Fok-Yan Leung, Heping Liu, David McLean, George Mount, Balasingam Muhunthan, David Pollock, Shelley Pressley, Pizhong Qiao, Shihui Shen, Timothy Vanreken, Joseph Vaughan, Richard Watts, Haifang Wen, Michael Wolcott, Vikram Yadama, David Yonge and Jinwen Zhang.

Civil Engineering

Degree offered: Master of Science in Civil Engineering – Non Thesis

Faculty working with graduate students: 30

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The graduate programs in Civil Engineering are offered leading to the Master of Science in Civil Engineering degree, the Master of Science in Environmental Engineering degree, and the Doctor of Philosophy Civil Engineering degree. The department also participates in university programs leading to the M.S. in Environmental Science and the Ph.D. in Engineering Science. At the Master's level, specific programs are available within each area.

Degree Description

Students may be accepted for this degree with undergraduate degrees in other than Civil Engineering (e.g., related areas such as mechanical engineering, materials science, physics, etc.). These students, however, may need to complete additional courses to cover deficiencies. Courses taken to satisfy deficiencies cannot be included in the program of study. The students doing the non-thesis option either take courses only with a final oral exam or a project option (with no thesis). The graded course work requirements vary as specified in the graduate handbook of Civil Engineering.

Contact Information

Balasingam Muhunthan
Graduate Committee Chair
www.ce.wsu.edu/Grads/ceGradProg.htm

Faculty

Jennifer Adam, Michael Barber, Donald Bender, Marc Beutel, Phillip Butterfield, Serena Chung, Candis Claiborn, William Cofer, James Dolan, Karl Englund, Liv Haselbach, Md Hossain, B Jobson, Brian Lamb, Fok-Yan Leung, Heping Liu, David McLean, George Mount, Balasingam Muhunthan, David Pollock, Shelley Pressley, Pizhong Qiao, Shihui Shen, Timothy Vanreken, Joseph Vaughan, Richard Watts, Haifang Wen, Michael Wolcott, Vikram Yadama and David Yonge.

Communication

Degree offered: Doctor of Philosophy (Communication)

Faculty working with graduate students: 18

Graduate students: 24

Graduate students receiving assistantships or scholarships: 87%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: December 31

Requirements

In addition to the core courses (15 credits), students must complete 6-12 credits of research methods, 15 or more credits in a major concentration area, 9 or more credits in a supporting academic area, and 21-30 dissertation credits. Additional information about the degree requirements can be found on the college web site:

<http://www.communication.wsu.edu/gradstudies/doctoral/docprogreq.htm>

Program Description

The Edward R. Murrow College of Communication's master's and doctorate programs provide flexible study in communication studies in a research-based curriculum. Areas of concentration include media, health and social issues, organizations and culture. Students develop unique programs of study in consultation with lead faculty. Criteria for study are based on individual academic interests. The Murrow College is nationally and internationally recognized for its excellence in scholarship and faculty-student interaction. As one of few colleges in the country that incorporates communication studies and mass communication, the Murrow Program provides graduate students the opportunity to work closely with diverse faculty whose research is far-reaching. Students of The Edward R. Murrow College of Communication will graduate with a thorough understanding of theoretical and practical issues related to their chosen concentration along with opportunities to learn from industry leaders. Graduates are prepared for careers in teaching, research, and public service. Potential employers include colleges and universities, private industry, and governmental agencies.

Degree Description

The Edward R. Murrow College of Communication is nationally

and internationally recognized for its excellence in scholarship and close faculty-student interaction. As one of few colleges in the country incorporating communication studies and mass communication, the Murrow Program provides graduate students the opportunity to work closely with faculty from a wide range of disciplines. With multiple nationally-ranked programs of study, The Murrow College's Graduate Program provides students the opportunity to take classes and perform research with leading scholars. Our students consistently present papers at regional, national, and international conferences, and frequently publish articles with faculty.

Post-Graduate Employment Opportunities

Graduates of The Edward R. Murrow College of Communication graduate program are prepared for careers in teaching, research, and public service. Potential employers of program graduates include colleges and universities, private industry, and governmental agencies.

Post-Graduate Career Placements

Associate Professor at University of Arizona, Assistant Professor at Ohio University, Assistant Professor, Virginia Tech, Instruction Design Coordinator, Assistant Professor at Oregon State University, Instructor at City University, Associate Professor at Zhejiang University

Contact Information

Graduate Coordinator
Student Services
The Edward R. Murrow College of Communication
Murrow East 226, PO Box 642520
Pullman, WA 99164-2520
Telephone: 509-335-7333
Fax: 509-335-3739
E-mail: grad.communication@wsu.edu

Faculty

Erica Austin, Michael Beam, Frederick Busselle, Prabu David, David Demers, Jolanta Drzewiecka, Douglas Hindman, Elizabeth Hindman, Stacey Hust, Parul Jain, E James, Todd Norton, Jeffery Peterson, Bruce Pinkleton, Lawrence Pintak, Michael Salvador, Alexis Tan and Changmin Yan.

COM

- 500 Communication Colloquium 1** May be repeated for credit; cumulative maximum 8 hours. Written and oral presentation of research topics in Communication; college colloquium.
- 501 Theory Building in Communication 3** Relationship of research to theory development; evaluation of current theory and research; planning and executing research within specified theoretical frameworks.
- 502 Consumer Analysis and Brand Development 3** Consumer analysis and brand development; skills to make strategic communication campaigns successful.
- 504 Instructional Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: By interview only.

- 506 Persuasion and Social Influence 3** Theories, concepts strategies and processes of persuasion and social influence.
- 507 Communication Ethics Seminar 3** Topics in communication ethics.
- 509 Quantitative Research 3** Introduction to quantitative research in communication; hypothesis development, testing; basic statistics, interpretation; field surveys, laboratory and field experiments, content analysis.
- 514 Health Communication Theories and Campaigns 3** Health communication theories with a focus on campaign construction and evaluation.
- 516 Health Communication and Society 3 3** Reviews, critiques and applications of research regarding the impact of social and cultural environments on health communication.
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- 522 Theoretical Perspectives on Intercultural Communication 3** Advanced readings in intercultural communication theory and methods; paradigms in current theorizing.
- 524 Intercultural/International Communication and Social Change 3** Application of communication theory, research and technologies aimed at fostering social change in intercultural and international contexts.
- 526 Current Topics in Intercultural Communication 3** Topics in current intercultural communication research.
- 535 Organizational Communication Theory 3** May be repeated for credit; cumulative maximum 6 hours. Traditional and emerging theories in organizational communication.
- 537 Organization and Society 3** Historical foundations, theoretical developments, contemporary issues and practical implications of communicative processes of organizations within society.
- 540 Risk Communication 3** Research and practice in risk communication.
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- 562 Crisis Communication in Global Contexts 3** Prepare, plan, and execute crisis communication and management to protect the continuity of an organization's image and mission.
- 563 Ethics for Professionals 3** The understanding, discussion, and application of key theories of individual and institutional ethics; the articulation and defense of ethical reasoning.
- 564 Research Methods for Professionals 3** Understanding the role of research in media and related organizations and its application to organizational decision making through quantitative and qualitative research methods including research design, questionnaire construction, sampling, data collection techniques, and variable measurement.
- 570 Communication Theory 3** Relevant theories and research from mass and interpersonal communication.
- 571 Theoretical Perspectives on Media and Society 3** Theories explaining the social and cultural environments of communication processes emphasizing in mass communication.
- 572 Mass Media, Social Control, and Social Change 3** Study of the forces that influence the media's role as an agent of social control or social change.
- 573 Media and Public Discourse 3** Historical and contemporary concepts, questions and dynamics constituting the role of media and discourse among various publics.
- 580 Topics in Communication 3** May be repeated for credit; cumulative maximum 12 hours. Contemporary, specialized, or technical topics in communication.
- 591 Qualitative Research Methods 3** Historical, textual, and legal methodologies for theory-based evaluative and discourse studies in communication.
- 599 Seminar in Communication 3** May be repeated for credit; cumulative maximum 6 hours. Special topics in rhetoric, communication, and public address.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Communication

Degree offered: Master of Arts in Communication

Faculty working with graduate students: 19

Graduate students: 10

Graduate students receiving assistantships or scholarships: 80%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: :

Fall: December 31

Requirements

In addition to the core courses (9 credits), students completing the Thesis Option must complete 18 credits of conceptual courses from inside and outside the college, and 4-6 thesis credits. In the final semester of a student's course work or after a student has successfully completed all required graded credit hours in the program, he/she must write and defend a prospectus. The purpose of the prospectus is to provide the student's committee members with a clear description of the proposed thesis to determine the soundness of preparation and conceptualization of the planned thesis. The actual format of the prospectus is developed in consultation with the student's committee chair.

Program Description

The Edward R. Murrow College of Communication's master's and doctorate programs provide flexible study in communication studies in a research-based curriculum. Areas of concentration include media, health and social issues, organizations and culture. Students develop unique programs of study in consultation with lead faculty. Criteria for study are based on individual academic interests. The Murrow College is nationally and internationally recognized for its excellence in scholarship and faculty-student interaction. As one of few colleges in the country that incorporates communication studies and mass communication, the Murrow Program provides graduate students the opportunity to work closely with diverse faculty whose research is far-reaching. Students of The Edward R. Murrow College of Communication will graduate with a thorough understanding of theoretical and practical issues related to their chosen concentration along with opportunities to learn from industry leaders. Graduates are prepared for careers in teaching, research, and public service. Potential employers include colleges and universities, private industry, and governmental agencies.

Degree Description

The M. A. in Communication at Washington State University is designed for individuals seeking higher-level and focused understanding of communication theory, processes and phenomena, whether their intent is to prepare for doctoral-level study in pursuit of an academic career or a communication-related career in business, government, education, research, or the communications industry. Successful completion of the program normally requires two academic years of full time study and results in the granting of the Master of Arts in Communication. Our program centers on:* Media, Health, & Social Issues focuses broadly on relations between media and the issues and problems that face society today, such as health, poverty, and crime. This includes social level analysis of mainstream and alternative media as products of and influences on society; individual level analysis of psy-

chological and physiological processes through which knowledge, attitudes and behaviors are shaped; and the creation of messages related to health and social well-being, as well as how strategic messages campaigns can influence decision making and social development.* Communication, Organizations, & Culture focuses on the role of communication in creating, maintaining and transforming socially collective groups ranging from for-profit businesses and corporations to non-profit community organizations and social movements. Because culture is central to social change and stasis, the study of intercultural communication is an integral scholarly component. Students focus on how meanings surrounding race, gender, ethnicity, and nationality are created and challenged through communicative practices.

Post-Graduate Employment Opportunities

Graduates of The Edward R. Murrow College of Communication graduate program are prepared for careers in teaching, research, and public service. Potential employers of program graduates include colleges and universities, private industry, and governmental agencies.

Post-Graduate Career Placements

Instructor, Southern Illinois University Carbondale; Pursuing doctoral degrees at Michigan State University and Arizona State University; Communication Coordinator in health industry; Doctoral Fellow at University of North Carolina, Chapel Hill; Non-Profit organizations; Account Manager at Consensus Inc.; Professional training coach; Assistant Professor; Assistant Director of Communication WSU Foundation; Event Planning Coordinator at Northwest Harvest; Faculty at La Trobe University; Director of Communication, WSU College of Nursing.

Contact Information

Graduate Coordinator
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Student Services
PO Box 642520
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E-mail: grad.communication@wsu.edu

Faculty

Erica Austin, Michael Beam, Frederick Busselle, Prabu David, David Demers, Jolanta Drzewiecka, Douglas Hindman, Elizabeth Hindman, Stacey Hust, Parul Jain, E James, Todd Norton, Jeffery Peterson, Bruce Pinkleton, Lawrence Pintak, Michael Salvador, Patricia Sias, Alexis Tan and Changmin Yan.

COM

- 500 Communication Colloquium 1** May be repeated for credit; cumulative maximum 8 hours. Written and oral presentation of research topics in Communication; college colloquium.
- 501 Theory Building in Communication 3** Relationship of research to theory development; evaluation of current theory and research; planning and executing research within specified theoretical frameworks.

- 502 Consumer Analysis and Brand Development 3** Consumer analysis and brand development; skills to make strategic communication campaigns successful.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Communication

Degree offered: Master of Arts in Communication - Non Thesis

Faculty working with graduate students: 19

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: December 31

Spring: July 1

Requirements

In addition to the core courses (9 credits), students completing the Non-Thesis Option must complete 27 credits of conceptual courses from inside and outside the college, and 4 credits of Master's Thesis/Examination. Upon completion of the required course work, students will take the written comprehensive examination (6 hours). Upon successful completion of the written exam, the student's committee will schedule an oral examination. The examinations aim at the integration of the student's previous experience and study into consistent, mature understanding and expression suitable for advanced teaching, research, and writing in the chosen area of study.

Program Description

The Edward R. Murrow College of Communication's master's and doctorate programs provide flexible study in communication studies in a research-based curriculum. Areas of concentration include media, health and social issues, organizations and culture. Students develop unique programs of study in consultation with lead faculty. Criteria for study are based on individual academic interests. The Murrow College is nationally and internationally recognized for its excellence in scholarship and faculty-student interaction. As one of few colleges in the country that incorporates communication studies and mass communication, the Murrow Program provides graduate students the opportunity to work closely with diverse faculty whose research is far-reaching. Students of The Edward R. Murrow College of Communication will graduate with a thorough understanding of theoretical and practical issues related to their chosen concentration along with opportunities to learn from industry leaders. Graduates are prepared for careers in teaching, research, and public service. Potential employers include colleges and universities, private industry, and governmental agencies.

Degree Description

The M. A. in Communication at Washington State University is designed for individuals seeking higher-level and focused understanding of communication theory, processes and phenomena, whether their intent is to prepare for doctoral-level study in pursuit of an academic career or a communication-related career in business, government, education, research, or the communications industry. Successful completion of the program normally requires

two academic years of full time study and results in the granting of the Master of Arts in Communication. Our program centers on:* Media, Health, & Social Issues focuses broadly on relations between media and the issues and problems that face society today, such as health, poverty, and crime. This includes social level analysis of mainstream and alternative media as products of and influences on society; individual level analysis of psychological and physiological processes through which knowledge, attitudes and behaviors are shaped; and the creation of messages related to health and social well-being, as well as how strategic messages campaigns are can influence decision making and social development.* Communication, Organizations, & Culture focuses on the role of communication in creating, maintaining and transforming socially collective groups ranging from for-profit businesses and corporations to non-profit community organizations and social movements. Because culture is central to social change and stasis, the study of intercultural communication is an integral scholarly component. Students focus on how meanings surrounding race, gender, ethnicity, and nationality are created and challenged through communicative practices. Thesis and non-thesis options are available in the M. A. program. In general, those interested in pursuing doctoral work choose the thesis option while those planning other career options choose the non-thesis option.

Post-Graduate Employment Opportunities

Graduates of The Edward R. Murrow College of Communication graduate program are prepared for careers in teaching, research, and public service. Potential employers of program graduates include colleges and universities, private industry, and governmental agencies.

Contact Information

Graduate Program Coordinator
Student Services
The Edward R. Murrow College of Communication
PO Box 642520
Murrow East 226
Pullman, WA 99164-2520
Telephone: 509-335-7333
Fax: 509-335-3739
E-mail: grad.communication@wsu.edu

Faculty

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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Computer Engineering

Degree offered: Master of Science in Computer Engineering

Faculty working with graduate students: 36

Graduate students: 9

Graduate students receiving assistantships or scholarships: 11%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10th
Spring: July 1st

Program Description

The School of Electrical Engineering and Computer Science offers an outstanding education, providing first-rate preparation for careers in Electrical Engineering, Computer Engineering and Computer Science. US News and World Report ranks WSU's Electrical Engineering graduate program 68th among nearly 180 PhD granting EE programs in the U.S.

Degree Description

The School of Electrical Engineering and Computer Science offers an outstanding education, providing first-rate preparation for careers in Electrical Engineering, Computer Engineering and Computer Science. US News and World Report ranks WSU's Electrical Engineering graduate program 68th among nearly 180 PhD granting EE programs in the U.S. The program must consist of 30 or more hours of credit including 21 or more hours of coursework for which a grade of A-F is given and nine or more credits of thesis research (EE 700).

Training and Professional Development Opportunities

Computer engineering is a field of study that encompasses the fundamental principles, methods, and modern tools for the design and implementation of computing systems. Advances in technology are yielding smaller and higher-performance computer systems permeating into a wide range of applications, from communication systems to consumer products and common household appliances. The computer engineering program provides a balanced perspective of both hardware and software elements of computing systems, and of their relative design trade-offs and applications. Computer engineering builds upon fundamental courses in mathematics, science, and the engineering disciplines to achieve a sound knowledge foundation and to develop breadth. Laboratory experiences are emphasized to provide students with background on experimental design and simulation techniques. Since core course sequences are completed in the junior year, students are able to pursue their career objectives with opportunities to select from a broad spectrum of elective courses. These include a wide range of computer engineering topics such as hardware design, VLSI design,

embedded systems, computer architecture, networking, and operating systems.

Post-Graduate Employment Opportunities

Research Positions in National Labs, Positions in Teaching EECS, Positions in Industry for EECS, and Technical positions in major leading companies across the country and world.

Post-Graduate Career Placements

Recent Graduates are working at Boeing, Hewlett Packard, Transmarket Group, Microsoft, Expedia, Verizon, Amazon, PNNL, Intel, and SEL

Contact Information

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Faculty

Roger Alexander, David Bakken, Benjamin Belzer, Anjan Bose, Shira Broschat, Diane Cook, Zhe Dang, Jose Delgado-Frias, Thomas Fischer, Carl Hauser, Deuk Heo, Lawrence Holder, Scott Hudson, Christopher Hundhausen, Sankar Jayaram, Anantharaman Kalyanaraman, Min Kim, George Larue, Robert Lewis, Chen-Ching Liu, John Miller, Robert Olsen, Mohamed Osman, Partha Pande, Patrick Pedrow, John Ringo, Sandip Roy, Ali Saberi, John Schneider, Behrooz Shirazi, Krishnamoorthy Sivakumar, Wenzhan Song, Anurag Srivastava, Li Tan, Vaithianath Venkatasubramanian and Kung-Chi Wang.

Electrical Engineering

E E

- 501 Linear System Theory 3** Dynamic systems from the state variable approach; observability, controllability, stability, and sensitivity of differential and nondifferential systems.
- 502 Linear Multivariable Control 3** Course Prerequisite: E E 501. Optimal linear feedback control, optimal stochastic observers, LQG/LTR design methodology, modern Wiener-Hopf design, robust controllers.
- 503 Structure, Dynamics and Control of Large-scale Networks 3** Course Prerequisite: E E 501; E E 507. Introduction and development of computational and analytical methods required to characterize large-scale networks.
- 504 Modern Optics 3** Diffraction theory, Fourier transforming and imaging properties of lenses, spatial filtering, holography, temporal and spatial coherence, imaging through random media.
- 505 Nonlinear System Theory 3** Course Prerequisite: E E 501. Overview of nonlinear phenomena, Lyapunov stability, input-output stability, periodic orbits, singular perturbation, differential geometric methods, bifurcations and complex behaviors.

- 507 Random Processes in Engineering 3** Functions of random variables; random sequences; stochastic processes; mean-square stochastic calculus; ergodicity; spectral density; linear transformations, filtering, dynamic systems.
- 508 Estimation Theory for Signal Processing, Communications, and Control 3** Course Prerequisite: E E 501; E E 507. Principles of statistical estimation; LLSE; Kalman filtering; smoothing; prediction; maximum-likelihood and Bayesian estimation.
- 509 Adaptive Control 3** Course Prerequisite: E E 501. Model reference adaptive systems (MRAS), adaptive observers, adaptive control, on-line identification, robustness issues, and self-tuning regulators.
- 511 Protection of Power Systems II 3** Protection of electrical equipment as related to electric power systems with emphasis on digital algorithms.
- 518 Advanced Electromagnetic Theory I 3** Electromagnetic waves, electromagnetic theorems and concepts, solutions to the wave equation in rectangular, cylindrical and spherical coordinates.
- 520 Plasma Engineering 3** Electromagnetics, kinetic theory, and fluid mechanics of plasmas in space, arcs, plasma processing, coronas, and fusion reactors.
- 521 Analysis of Power Systems 3** Concepts and practices of modern power engineering, including steady-state and dynamic analysis, economics and control design.
- 523 Power Systems Stability and Control 3** Dynamic analysis of interconnected electric power system; modeling of synchronous generators, loads and transmission network; small-signal stability and transient stability analysis; dynamic stability controls.
- 524 Advanced Computer Architecture 3** Instruction set architectures, pipelining and super pipelining, instruction level parallelism, superscalar and VLIW processors, cache memory, thread-level parallelism and VLSI.
- 525 Power System Applications of Power Electronics 3** Course Prerequisite: E E 521. Power electronic converters in modern power systems, FACTS devices, HVDC, compensation; microgrids and integration renewable energy resources; modeling and control.
- 527 Antenna Theory and Design 3** Antenna fundamentals, analytical techniques, characteristics and design procedures for selected types of wire, broadband, and aperture antennas.
- 528 Advanced Topics in Electromagnetics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topics of current interest in wave propagation (electromagnetics, acoustics, or optics).
- 530 Digital Signal Processing II 3** Course Prerequisite: E E 507. Frequency selective digital filtering, least-squares filtering, adaptive filtering, multirate signal processing.
- 535 Numerical Solutions to EM Problems 3** Theory and use of finite-difference time-domain; numeric dispersion; absorbing boundary conditions; scattering; radiation; time-domain vs. frequency-domain.
- 536 Power Systems Economics and Electricity Markets 3** Economic dispatch and optimal power flow; electricity market; short-term load forecasting; electricity price forecasting; price-based unit commitment; arbitrage in electricity markets; market power analysis.
- 545 Data Compression 3** Course Prerequisite: E E 507. Source coding with a fidelity criterion; quantization theory; predictive, transform and subband coding; noiseless source codes.
- 548 Information Theory and Channel Coding 3** Course Prerequisite: E E 507. Information theory; entropy, mutual information, source and channel coding theorems, channel capacity, Gaussian channels; channel coding: block and convolutional codes.
- 551 Data Communication Systems 3** Course Prerequisite: E E 507. Digital communications; multi-amplitude/phase signal constellations; probability of error performance; cutoff rate; Viterbi algorithm; trellis coded modulation.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 571 Advanced Wireless Integrated Circuits and Systems 3** Analysis and design methodologies of state-of-the-art wireless integrated circuits and systems.
- 576 Analog Integrated Circuits 3** Analysis and design of analog integrated circuits in CMOS and BiCMOS technologies; current mirrors, gain stages, operational amplifiers, frequency response, and compensation.
- 581 Advanced Topics in Power Systems V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E E 521. Power system operations including AGC, economic dispatch and security; power system dynamics; intelligent systems applications.
- 582 Advanced Topics V 1-3** May be repeated for credit.
- 586 VLSI Systems Design 3** VLSI models, layout algorithms, design methodologies, simulation and layout tools, algorithm design for VLSI implementation.
- 587 System on Chip (SoC) Design and Test 3** System on Chip (SoC) and sub-micron integrated circuit design and testing.
- 595 Directed Study in Electrical Engineering V 1 (0-3) to 3 (0-9)** May be repeated for credit. Current topics in electrical engineering.
- 596 Advanced Analog Integrated Circuits 3** MOS and BiCMOS technologies; MOS and BiCMOS operational amplifiers; A/D, D/A converters; switched-capacitor filters; continuous-time filters.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
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Computer Engineering

Degree offered: Master of Science in Computer Engineering – Non Thesis

Faculty working with graduate students: 36

Graduate students: 5

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10th
Spring: July 1st

Program Description

The School of Electrical Engineering and Computer Science offers an outstanding education, providing first-rate preparation for careers in Electrical Engineering, Computer Engineering and Computer Science. US News and World Report ranks WSU's Electrical Engineering graduate program 68th among nearly 180 PhD granting EE programs in the U.S.

Degree Description

The School of Electrical Engineering and Computer Science offers an outstanding education, providing first-rate preparation for careers in Electrical Engineering, Computer Engineering and Computer Science. US News and World Report ranks WSU's Electrical Engineering graduate program 68th among nearly 180 PhD granting EE programs in the U.S. Under the non-thesis option, the student is required to take at least 28 credits of graduate level course work (non P/F and non S/F) plus two credits of EE 702. Of the 30 credits of course work, at least 18 must be in Electrical Engineering and must satisfy the program requirements

Contact Information

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Faculty

Roger Alexander, David Bakken, Benjamin Belzer, Anjan Bose, Shira Broschat, Diane Cook, Zhe Dang, Jose Delgado-Frias, Thomas Fischer, Carl Hauser, Deuk Heo, Lawrence Holder, Scott Hudson, Christopher Hundhausen, Sankar Jayaram, Anantharaman Kalyanaraman, Min Kim, George Larue, Robert Lewis, Chen-Ching Liu, John Miller, Robert Olsen, Mohamed Osman, Partha Pande, Patrick Pedrow, John Ringo, Sandip Roy, Ali Saberi, John Schneider, Behrooz Shirazi, Krishnamoorthy Sivakumar, Wenzhan Song, Anurag Srivastava, Li Tan, Vaithianath Venkatasubramanian and Kung-Chi Wang.

Electrical Engineering

E E

- 501 Linear System Theory 3** Dynamic systems from the state variable approach; observability, controllability, stability, and sensitivity of differential and nondifferential systems.
- 502 Linear Multivariable Control 3** Course Prerequisite: E E 501. Optimal linear feedback control, optimal stochastic observers, LQG/LTR design methodology, modern Wiener-Hopf design, robust controllers.
- 503 Structure, Dynamics and Control of Large-scale Networks 3** Course Prerequisite: E E 501; E E 507. Introduction and development of computational and analytical methods required to characterize large-scale networks.
- 504 Modern Optics 3** Diffraction theory, Fourier transforming and imaging properties of lenses, spatial filtering, holography, temporal and spatial coherence, imaging through random media.
- 505 Nonlinear System Theory 3** Course Prerequisite: E E 501. Overview of nonlinear phenomena, Lyapunov stability, input-output stability, periodic orbits, singular perturbation, differential geometric methods, bifurcations and complex behaviors.
- 507 Random Processes in Engineering 3** Functions of random variables; random sequences; stochastic processes; mean-square stochastic calculus; ergodicity; spectral density; linear transformations, filtering, dynamic systems.
- 508 Estimation Theory for Signal Processing, Communications, and Control 3** Course Prerequisite: E E 501; E E 507. Principles of statistical estimation; LLSE; Kalman filtering; smoothing; prediction; maximum-likelihood and Bayesian estimation.
- 509 Adaptive Control 3** Course Prerequisite: E E 501. Model reference adaptive systems (MRAS), adaptive observers, adaptive control, on-line identification, robustness issues, and self-tuning regulators.
- 511 Protection of Power Systems II 3** Protection of electrical equipment as related to electric power systems with emphasis on digital algorithms.

- 518 Advanced Electromagnetic Theory I** 3 Electromagnetic waves, electromagnetic theorems and concepts, solutions to the wave equation in rectangular, cylindrical and spherical coordinates.
- 520 Plasma Engineering** 3 Electromagnetics, kinetic theory, and fluid mechanics of plasmas in space, arcs, plasma processing, coronas, and fusion reactors.
- 521 Analysis of Power Systems** 3 Concepts and practices of modern power engineering, including steady-state and dynamic analysis, economics and control design.
- 523 Power Systems Stability and Control** 3 Dynamic analysis of interconnected electric power system; modeling of synchronous generators, loads and transmission network; small-signal stability and transient stability analysis; dynamic stability controls.
- 524 Advanced Computer Architecture** 3 Instruction set architectures, pipelining and super pipelining, instruction level parallelism, superscalar and VLIW processors, cache memory, thread-level parallelism and VLSI.
- 525 Power System Applications of Power Electronics** 3 Course Prerequisite: E E 521. Power electronic converters in modern power systems, FACTS devices, HVDC, compensation; microgrids and integration renewable energy resources; modeling and control.
- 527 Antenna Theory and Design** 3 Antenna fundamentals, analytical techniques, characteristics and design procedures for selected types of wire, broadband, and aperture antennas.
- 528 Advanced Topics in Electromagnetics** 3 May be repeated for credit; cumulative maximum 6 hours. Advanced topics of current interest in wave propagation (electromagnetics, acoustics, or optics).
- 530 Digital Signal Processing II** 3 Course Prerequisite: E E 507. Frequency selective digital filtering, least-squares filtering, adaptive filtering, multirate signal processing.
- 535 Numerical Solutions to EM Problems** 3 Theory and use of finite-difference time-domain; numeric dispersion; absorbing boundary conditions; scattering; radiation; time-domain vs. frequency-domain.
- 536 Power Systems Economics and Electricity Markets** 3 Economic dispatch and optimal power flow; electricity market; short-term load forecasting; electricity price forecasting; price-based unit commitment; arbitrage in electricity markets; market power analysis.
- 545 Data Compression** 3 Course Prerequisite: E E 507. Source coding with a fidelity criterion; quantization theory; predictive, transform and subband coding; noiseless source codes.
- 548 Information Theory and Channel Coding** 3 Course Prerequisite: E E 507. Information theory; entropy, mutual information, source and channel coding theorems, channel capacity, Gaussian channels; channel coding: block and convolutional codes.
- 551 Data Communication Systems** 3 Course Prerequisite: E E 507. Digital communications; multi-amplitude/phase signal constellations; probability of error performance; cutoff rate; Viterbi algorithm; trellis coded modulation.
- 555 Computer Communication Networks** 3 Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 562 Fault Tolerant Computer Systems** 3 Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 571 Advanced Wireless Integrated Circuits and Systems** 3 Analysis and design methodologies of state-of-the-art wireless integrated circuits and systems.
- 576 Analog Integrated Circuits** 3 Analysis and design of analog integrated circuits in CMOS and BiCMOS technologies; current mirrors, gain stages, operational amplifiers, frequency response, and compensation.
- 581 Advanced Topics in Power Systems** V 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E E 521. Power system operations including AGC, economic dispatch and security; power system dynamics; intelligent systems applications.
- 582 Advanced Topics** V 1-3 May be repeated for credit.
- 586 VLSI Systems Design** 3 VLSI models, layout algorithms, design methodologies, simulation and layout tools, algorithm design for VLSI implementation.
- 587 System on Chip (SoC) Design and Test** 3 System on Chip (SoC) and sub-micron integrated circuit design and testing.
- 595 Directed Study in Electrical Engineering** V 1 (0-3) to 3 (0-9) May be repeated for credit. Current topics in electrical engineering.
- 596 Advanced Analog Integrated Circuits** 3 MOS and BiCMOS technologies; MOS and BiCMOS operational amplifiers; A/D, D/A converters; switched-capacitor filters; continuous-time filters.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Computer Science

Degree offered: Doctor of Philosophy (Computer Science)

Faculty working with graduate students: 36

Graduate students: 44

Graduate students receiving assistantships or scholarships: 90%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10th
Spring: July 1st

Requirements

Minimum of [1 accepted journal paper] OR [2 accepted peer-reviewed conference papers AND a journal submission] (the publication venues (journal or conference))

Program Description

As the largest unit within this College, the School of Electrical Engineering and Computer Science is instrumental in determining competencies and preparing students at all levels (B.S., M.S., and Ph.D.) for technological productivity. The success of our graduate students in industry and higher education reflects the excellence of the School of EECS and its programs. In industry, our graduate degree holders are presidents, CEOs, CIOs, vice presidents, directors, and division and department managers. Some have founded at least one company and initiated and promoted new technologies, operations and sales strategies. Others have excelled as senior designers, project managers, senior scientists, and lead engineers. In higher education, they are professors, deans, and research directors. Graduate degrees have enriched their lives and careers, while affecting positively the economy of the state and nation. All are excellent role models for their peers and our students.

Degree Description

As the largest unit within this College, the School of Electrical Engineering and Computer Science is instrumental in determining competencies and preparing students at all levels (B.S., M.S., and Ph.D.) for technological productivity. The success of our graduate students in industry and higher education reflects the excellence of the School of EECS and its programs. In industry, our graduate degree holders are presidents, CEOs, CIOs, vice presidents, directors, and division and department managers. Some have founded at least one company and initiated and promoted new technologies, operations and sales strategies. Others have excelled as senior designers, project managers, senior scientists, and lead engineers. In higher education, they are professors, deans, and research directors. Graduate degrees have enriched their lives and careers, while affecting positively the economy of the state and nation. All are excellent role

models for their peers and our students. The program of study should consist of approximately 35 credits of graded course work plus 30 or more research credits (Cpt S 800). A maximum of 6 credits of Directed Study (CptS 595) may be included. A maximum of 9 credits of 400 level graded course work approved by the EECS GSC may be included. In general, undergraduate courses REQUIRED for the BS/CS, BS/EE or BA/CS and undergraduate courses listed as pre-requisite for admission into the MS/PhD in CPT SCI program will NOT BE allowed.

Training and Professional Development Opportunities

Research positions in National Laboratories, positions in teaching, positions at top companies across the country.

Post-Graduate Employment Opportunities

In industry, our graduate degree holders are presidents, CEOs, CIOs, vice presidents, directors, and division and department managers. Some have founded at least one company and initiated and promoted new technologies, operations and sales strategies. Others have excelled as senior designers, project managers, senior scientists, and lead engineers. In higher education, they are professors, deans, and research directors.

Post-Graduate Career Placements

Western Digital, Telecom, Hewlett Packard, PNNL, SEL, WSUPJM Interconnection, LLC, Transmarket Group, Microsoft, Intel, Carnegie Institution for Sci. California ISO, Expedia, Verizon and Amazon

Contact Information

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Faculty

Roger Alexander, David Bakken, Benjamin Belzer, Anjan Bose, Shira Broschat, Diane Cook, Zhe Dang, Jose Delgado-Frias, Thomas Fischer, Carl Hauser, Deuk Heo, Lawrence Holder, Scott Hudson, Christopher Hundhausen, Sankar Jayaram, Anantharaman Kalyanaraman, Min Kim, George Larue, Robert Lewis, Chen-Ching Liu, John Miller, Robert Olsen, Mohamed Osman, Partha Pande, Patrick Pedrow, John Ringo, Sandip Roy, Ali Saberi, John Schneider, Behrooz Shirazi, Krishnamoorthy Sivakumar, Wenzhan Song, Anurag Srivastava, Li Tan, Vaithianath Venkatasubramanian and Kung-Chi Wang.

CPT S

- 500 Proseminar 1** Faculty research interests, departmental computer systems, computer science research, report preparation.
- 516 Algorithmics 3** Discrete structures, automata, formal languages, recursive functions, algorithms, and computability.

- 527 Computer Security 3** Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CPT S 427 and CPT S 527.
- 530 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 531 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 534 Neural Network Design and Application 3** Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534.
- 538 Scientific Visualization 3** Data taxonomy; sampling; plotting; using and extending a visualization package; designing visualizations; domain-specific techniques.
- 540 Artificial Intelligence 3** An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540.
- 542 Computer Graphics 3** Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542.
- 543 Human-Computer Interaction 3** Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543.
- 548 Advanced Computer Graphics 3** Solid modeling, visual realism, light and color models, advanced surface generation techniques.
- 550 Parallel Computation 3** Parallel machine models, principles for the design of parallel algorithms, interconnection networks, systolic arrays, computational aspects to VLSI. Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 557 Advanced Computer Networks 3** ATM networks, optical WDM networks, and wireless/mobile networks; access, transport, and routing protocols.
- 560 Operating Systems 3** Structure of multiprogramming and multiprocessing; efficient allocation of systems resources; design implementation and performance measurement.
- 561 Computer Architecture 3** Parallel and distributed processors; multiprocessors; interconnection topologies; language-directed architecture; special-purpose architecture.
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 564 Distributed Systems Concepts and Programming 3** Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564.
- 566 Embedded Systems 3 (2-3)** The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566.
- 570 Machine Learning 3** Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 571 Computational Genomics 3** Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571.
- 572 Numerical Methods in Computational Biology 3** Computational methods for solving scientific problems related to information processing in biological systems at the molecular and cellular levels.
- 573 Bioinformatics Software Development 3** Provides programming skills needed to address current computational problems in bioinformatics; emphasis on mathematical development and software design.
- 580 Advanced Topics in Computer Science 3** May be repeated for credit.
- 595 Directed Study in Computer Science V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 6 hours. Current topics in computer science.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Computer Science

Degree offered: Master of Science in Computer Science

Faculty working with graduate students: 36

Graduate students: 43

Program offered: Pullman, Tri-Cities

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10th

Spring: July 1st

Requirements

The program must consist of 33 or more hours of credit including 24 or more hours of coursework for which a grade of A-F is given and 9 or more credits of thesis research (EE or Cpt S 700).

Program Description

As the largest unit within this College, the School of Electrical Engineering and Computer Science is instrumental in determining competencies and preparing students at all levels (B.S., M.S., and Ph.D.) for technological productivity. The success of our graduate students in industry and higher education reflects the excellence of the School of EECS and its programs. In industry, our graduate degree holders are presidents, CEOs, CIOs, vice presidents, directors, and division and department managers. Some have founded at least one company and initiated and promoted new technologies, operations and sales strategies. Others have excelled as senior designers, project managers, senior scientists, and lead engineers. In higher education, they are professors, deans, and research directors. Graduate degrees have enriched their lives and careers, while affecting positively the economy of the state and nation. All are excellent role models for their peers and our students.

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Training and Professional Development Opportunities

With 36 tenure-track faculty members, 8 full-time instructors, 130 graduate students, more than 550 undergraduates, and \$2.6M (3-yr running average) in annual research expenditures, the School of Electrical Engineering and Computer Science (EECS) consistently ranks among the top 100 electrical and computer engineering schools nationally by U.S. News and World Report.

Post-Graduate Employment Opportunities

Research Positions in National Laboratories, Positions in Leading Companies across the country. Faculty positions at universities.

Post-Graduate Career Placements

Intel, PNNL, Microsoft, SEL, Hewlett Packard, Amazon, Telecom, Expedia,

Contact Information

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- 530 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.

- 531 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 534 Neural Network Design and Application 3** Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534.
- 538 Scientific Visualization 3** Data taxonomy; sampling; plotting; using and extending a visualization package; designing visualizations; domain-specific techniques.
- 540 Artificial Intelligence 3** An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540.
- 542 Computer Graphics 3** Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542.
- 543 Human-Computer Interaction 3** Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543.
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- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 557 Advanced Computer Networks 3** ATM networks, optical WDM networks, and wireless/mobile networks; access, transport, and routing protocols.
- 560 Operating Systems 3** Structure of multiprogramming and multiprocessing; efficient allocation of systems resources; design implementation and performance measurement.
- 561 Computer Architecture 3** Parallel and distributed processors; multiprocessors; interconnection topologies; language-directed architecture; special-purpose architecture.
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 564 Distributed Systems Concepts and Programming 3** Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564.
- 566 Embedded Systems 3 (2-3)** The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566.
- 570 Machine Learning 3** Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 571 Computational Genomics 3** Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571.
- 572 Numerical Methods in Computational Biology 3** Computational methods for solving scientific problems related to information processing in biological systems at the molecular and cellular levels.
- 573 Bioinformatics Software Development 3** Provides programming skills needed to address current computational problems in bioinformatics; emphasis on mathematical development and software design.
- 580 Advanced Topics in Computer Science 3** May be repeated for credit.
- 595 Directed Study in Computer Science V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 6 hours. Current topics in computer science.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Computer Science – Vancouver

Degree offered: Master of Science in Computer Science

Faculty working with graduate students: 7

Graduate students: 12

Graduate students receiving assistantships or scholarships: 41%

Program offered: Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

Students also must complete nine credit hours of CS 700 Master's Research and Examination. Two CS 700 credits must be taken in the semester during which the student intends to defend the thesis.

Program Description

The Master of Science in Computer Science program in the School of ENCS is a thesis program and requires 30 credit hours, including 21 hours of graded course work and 9 credits of thesis research (CS 700). The coursework and research are in the general areas of software engineering, artificial intelligence, computer networks and computer graphics. Sophisticated facilities are available for instruction and research. Teaching and research assistantships are available for qualified students. Before undertaking graduate study in computer science, the student should have completed a baccalaureate degree substantially similar to the BSCS degree described below in the BSCS schedule of studies. Students from other academic disciplines are encouraged to apply, however such students will be required to take or have taken the equivalent of the following courses: CS 317, CS 360 and CS 450, including all prerequisites for these courses. An undergraduate grade point average of 3.0 is a minimum for admission to the MS program.

Degree Description

The Master of Science in Computer Science program in the School of ENCS is a thesis program and requires 30 credit hours, including 21 hours of graded course work and 9 credits of thesis research (CS 700). The coursework and research are in the general areas of software engineering, artificial intelligence, computer networks and computer graphics. Sophisticated facilities are available for instruction and research. Teaching and research assistantships are available for qualified students. Before undertaking graduate study in computer science, the student should have completed a baccalaureate degree substantially similar to the BSCS degree described below in the BSCS schedule of studies. Students from other academic disciplines are encouraged

to apply, however such students will be required to take or have taken the equivalent of the following courses: CS 317, CS 360 and CS 450, including all prerequisites for these courses. An undergraduate grade point average of 3.0 is a minimum for admission to the MS program. The WSU Vancouver MS in Computer Science is designed and administered separately from the MS program in Pullman. If you designate the WSU Pullman program as your main objective, you will not be automatically considered by the Vancouver program unless you submit the specific documentation requested on our "How to Apply" web page (<http://encs.vancouver.wsu.edu/how-apply>). Except in rare cases, only those who indicate WSU Vancouver as their main objective will be prompted to submit any missing documentation so our Selection Committee can review their completed applications.

Contact Information

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Faculty

David Chiu, Wayne Cochran, Thanh Dang, Charles Lang, Sarah Mocas, Scott Wallace and Xinghui Zhao.

Computer Science – Vancouver

CS

- 425 Digital Forensics** 3 Course Prerequisite: CS 360 with a C or better. Use of computers in the investigation of criminal and civil incidents in which computers or computer technology play a significant or interesting role.
- 427 Computer Security** 3 Course Prerequisite: CS 216 with a C or better; CS 360 with a C or better. Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CS 427 and CS 527.
- 440 Artificial Intelligence** 3 Course Prerequisite: CS 320 with a C or better; STAT 360 with a C or better or MATH 212 with a C or better. Knowledge representation and automated problem solving; theory and application of agent programming.
- 442 Computer Graphics** 3 Course Prerequisite: CS 223 with a C or better; CS 320 with a C or better; MATH 220 with a C or better. Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CS 442 and CS 542.
- 443 Human-Computer Interaction** 3 Course Prerequisite: Junior standing. Introduction to the field of human-computer interaction; understanding the system user; user-centered design and evaluation techniques including heuristic evaluation and usability testing.
- 447 Computer Game Design** 3 Course Prerequisite: CS 223 with a C or better; CS 320 with a C or better. Design and implementation of computer games. Credit not granted for both CS 447 and CS 547.

- 452 Compiler Design 3** Course Prerequisite: CS 317 with a C or better; CS 355 with a C or better. Design of lexical analyzers, syntactic analyzers, intermediate code generators, code optimizers and object code generators.
- 453 Web Data Management 3** Course Prerequisite: CS 351 with a C or better. Introduction of concepts, data models, query and retrieval languages; implementation issues for management of web data.
- 466 Embedded Systems 3 (2-3)** Course Prerequisite: CS 360 with a C or better, or ECE 370 with a C or better; senior standing. Design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CS 466 and CS 566.
- 516 Theory of Computation 3** Discrete structures, automata, formal languages, recursive functions, algorithms, computability, and complexity. Required preparation must include a strong background in discrete mathematics, automata, and formal languages.
- 518 Advanced Analysis of Algorithms 3** Advanced Study in design and analysis of algorithms, including randomized and approximation algorithms, linear programming, network flow and string matching.
- 521 Software Engineering Analysis 3** Research in software engineering; application of quantitative techniques in the software life cycle; current software engineering literature; exploration of techniques of mathematical modeling and solutions to software engineering problems. Required preparation must include a familiarity with the use and theory behind current software engineering practices.
- 527 Computer Security 3** Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CS 427 and CS 527.
- 541 Artificial Intelligence 3** Intelligent computer programs; simulation of cognitive processes. Required preparation must include prior knowledge and experience in artificial intelligence.
- 542 Computer Graphics 3** Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CS 442 and CS 542.
- 547 Computer Game Design 3** Design and implementation of computer games. Credit not granted for both CS 447 and CS 547.
- 548 Advanced Computer Graphics 3** Solid modeling, visual realism, light and color models, advanced surface generation techniques. Required preparation must include a prior knowledge and understanding of linear algebra and the graphics pipeline.
- 558 Wireless Sensor Networks 3** Design and implementation of sensor networks. Required preparation must include a prior knowledge and understanding of communication protocols such as TCP/IP and experience in network programming.
- 566 Embedded Systems 3 (2-3)** Design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CS 466 and CS 566.

- 570 Machine Learning 3** Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 580 Advanced Topics in Computer Science 3** May be repeated for credit.
- 595 Directed Study in Computer Science V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 3 hours. Current topics in computer science.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

Constraints Management – Cert in Constraints Management

Degree offered: Graduate Certificate in Constraints Management

Graduate students: 15

Program offered: DDP

Deadline: Fall: January 10
Spring: July 1
Summer: Default

Requirements

Students must apply for the certificate and pay the required fee, the first half of the final semester.

Program Description

The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs. Rather than completing all the course requirements for an ETM master's degree, students may take four courses (12-credit hours) in specialized areas. A certificate is awarded upon completion of these courses. Course credits earned for a certificate may also apply to a master's degree in the ETM Program or other graduate degree programs. A student may earn more than one certificate and may work on the certificate and master's program concurrently.

Degree Description

The Theory of Constraints (TOC) certificate focuses on the management of the limiting factors of any system. By providing specific methods of managing variability, TOC creates exceptional performance very quickly and then encourages a process on an on-going improvement through the focused use of LEAN and Six Sigma tools. The TOC methods apply to every level of the organization and at every level of maturity. As a result, using TOC over time results in a stable and ever improving organization. This certificate teaches the TOC proven solutions and the TOC thinking process for new solutions. It includes managing people, processes, projects, finances, and strategy for a company. Students with this certificate have become Technical Fellows at Boeing, senior managers at many companies, CEOs of technical companies, program leads, research directors, and independent

consultants. Students taking this certificate in the past include engineers, medical doctors, judges, cost analyst, rocket scientist, cabinet makers, professors, and consultants.

Training and Professional Development Opportunities

The Constraints Management Certificate prepares student for the TOC Certification Exams in Supply Chain Logistics, Project Management, TOC Thinking Process and Business Strategy exam given by the Theory of Constraints International Certification Organization. Students with the Constraints Management Certificate are effective 'change agents' who can lead rapid improvement efforts and stabilize organizations. This talent applies with internal and external consulting as well as management positions. They can implement the TOC solutions which are highly effective. There is a growing demand for Critical Chain Project Managers as well as TOC experts in Production and Distribution. Students with this certificate became Technical Fellows at Boeing, Senior Managers at many companies, CEO of technical companies, Program Leads, Research Directors and independent consultants. Students taking this certificate in the past included medical doctors, judges, cost analyst, rocket scientist, cabinet makers, Professors and consultants

Contact Information

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Engineering Management

E M

- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.
- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.

- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Construction Project Management – Cert in Construction Project Mgmt.

Degree offered: Graduate Certificate in Construction Project Management

Graduate students: 5

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)
 Spring: November 15 (July 1 international)
 Summer: April 1 (Default international)

Requirements

Student must apply for graduation with the certificate the final

semester according to graduate school deadlines. Only one certificate in either Project Management or Construction Project Management will be awarded.

Program Description

The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs. Rather than completing all the course requirements for an ETM master's degree, students may take four courses (12-credit hours) in specialized areas. A certificate is awarded upon completion of these courses. Course credits earned for a certificate may also apply to a master's degree in the ETM Program or other graduate degree programs. A student may earn more than one certificate and may work on the certificate and master's program concurrently. Eight certificates are available in the Master of Engineering and Technology Management degree program.

Degree Description

It is necessary for construction project managers to update their skills in modern project management techniques, to effectively contribute to the continuing growth of the industry. The increasing complexity of construction projects requires the manager to know and understand many different facets in order to become/remains proficient in the field. The CPM certificate provides the recipients with the skills to manage any type of project (not only construction) involving contractors and subcontractors. Many professionals have reported that this certificate has allowed them to advance in their careers as a project manager and as a technology manager.

Training and Professional Development Opportunities

Graduates should be able to: *Apply the principles of project management to successfully manage projects involving on-site construction and shop fabrication. *Manage projects as a representative of an owner or agent, a general contractor or subcontractor, in a commercial or government contracting environment. *Have an understanding of how to learn, analyze, and apply new/evolving techniques of project management in the future.

Contact Information

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Engineering Management

E M

- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.

- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Counseling

Degree offered: Master of Arts in Education

Faculty working with graduate students: 10

Graduate students: 1

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Requirements

The curriculum for Community Counseling program includes course work in theory, research, and techniques in individual and group counseling; vocational/career counseling and assessment; professional and ethical issues; life-span development; counseling diverse populations; statistics, measurement, and research design. Students in the Community Counseling program take additional coursework in personality assessment, diagnosis and psychopathology, and two semesters of internship in community mental health settings. Additional courses are available on an elective basis, including courses on hypnosis, counselor supervision, substance abuse counseling, Chicano/Latino psychology, cross-cultural counseling research, social psychology, and program evaluation.

Program Description

The counseling psychology program offers a Ph.D. degree and a Master of Arts degree available at the Pullman campus. The Ph.D. in counseling psychology program prepares students for careers in counseling, teaching, research, and other professional roles as counseling psychologists. For example, graduates obtain positions in university counseling centers, academic faculty in counseling psychology departments, private or group practice in psychology, or other mental health settings as therapists. Graduates of the program are license-eligible in most states. The Ph.D. program has been accredited by the American Psychological Association (APA) since 1990. The M.A. program with emphasis in community counseling, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students in either program can pursue the Master of Arts (M.A.) degree, with or without thesis. The M.A. degree, with thesis, can be helpful for students who plan to subsequently apply for doctoral programs or who have a strong interest in conducting research, although M.A. graduates without thesis also apply for and enter doctoral programs.

Degree Description

Master's degrees in counseling focus on community counseling, which, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students can pursue the Master of Arts (M.A.) degree,

with or without thesis. The M.A. degree, with thesis, can be helpful for students who plan to subsequently apply for doctoral programs or who have a strong interest in conducting research, although M.A. graduates without thesis also apply for and enter doctoral programs.

Post-Graduate Employment Opportunities

Counselors in community mental health centers, other helping professions.

Post-Graduate Career Placements

Master's program: Counselor

Contact Information

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Faculty

Olusola Adesope, Arreed Barabasz, Marianne Barabasz, Stephanie Bauman, Austin Church, Phyllis Erdman, Brian French, Laurie McCubbin, Brian McNeill and Michael Trevisan.

COPSY

- 457 Chicano/a Latino/a Psychology 3** Course Prerequisite: AMER ST 216, CES 101, 151, 254, 255, or HISTORY 150. Current psychosocial research and literature relevant to the mental health and psychological wellbeing of Chicana/o Latina/o populations.
- 501 Historical and Philosophical Foundations of Counseling Psychology 3** Course Prerequisite: Admission to Counseling Psychology PhD program. History of counseling psychology; philosophical and psychological systems; current identity of counseling psychology as an academic discipline and a profession.
- 502 Social Psychology Foundations in Educational and Counseling Psychology 3** Social psychology with a special emphasis on the relevance to education and counseling psychology.
- 503 Community Counseling 3** Course Prerequisite: Graduate student in Community Counseling program. Counseling in community settings.
- 511 Theories, Research, and Techniques in Counseling Psychology I 3** Philosophical assumptions, theory of personality, counseling process, techniques and relevant research in the major theories of counseling and personality.
- 512 Counseling Techniques and Microskills 3** Course Prerequisite: COUN PSY 511. Foundation course for all clinical experiences in counseling; communication and interpersonal skills under faculty supervision will be emphasized.
- 513 Career Counseling: Theories and Methods 3** Theories, concepts, methods and findings in career counseling; vocational assessment and prediction.

- 515 Ethics and Professional Problems in Counseling Psychology** 3 Professional problems; ethical, legal, and training issues, practices, and new issues.
- 516 Life Span Development and Counseling Issues** 3 Major theories and issues in human development and their application to counseling practice including case conceptualization, treatment and intervention planning and psychological assessment and research.
- 517 Diagnoses, Psychopathology and Counseling Psychology** 3 Course Prerequisite: COUN PSY 511. Psychopathology and the application of counseling theories to diagnoses, case conceptualization, assessments, treatment plans and research.
- 518 Theoretical Foundations of Group Counseling** 3 Course Prerequisite: COUN PSY 512 or concurrent enrollment. History, philosophy and theoretical foundations; the group counselor, members, and issues in group counseling.
- 523 Topics in Counseling Psychology V** 1-4 May be repeated for credit; cumulative maximum 8 hours. Recent research, developments, issues, and/or applications in selected areas of counseling psychology.
- 525 Counseling Diverse Populations** 3 Course Prerequisite: COUN PSY 512. Research and theories regarding the influence of culture, gender, and lifestyle on counseling processes; application of appropriate assessment/treatment strategies.
- 527 Individual Appraisal I** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Cognitive assessment of individuals, with an emphasis on the theoretical background and practical skills needed to administer, score, and interpret individual intelligence tests; assessment of learning disabilities, AD/HD, and individual achievement.
- 528 Individual Appraisal II** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Interpretation of representative personality assessment inventories and symptom checklists used in counseling practice; integration of results in psychological reports.
- 529 Counselor Supervision: Theory, Research, and Practice** 3 Course Prerequisite: Admission to Counseling Psychology PhD program. Survey of major theoretical approaches, techniques, and research in models of counselor supervision and training.
- 531 Current Issues in School Counseling I** 3 Course Prerequisite: Admission to MA program in School Counseling. Issues of immediate concern to school counselors: drug abuse, family violence, adolescent suicide, sexual orientation, crisis intervention, consultation and referral.
- 532 Current Issues in School Counseling II** 3 Course Prerequisite: COUN PSY 531. Additional coverage of contemporary issues of concern to school counselors; comprehensive developmental school programs, school community dynamics, parental involvement, consultation.
- 533 Master's Internship in Community Counseling** 4 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of counseling theory and techniques in an agency setting.
- 535 Master's Internship in School Counseling** 4 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of guidance and counseling theory and techniques in a school setting.
- 537 Professional Development in Counseling Psychology** 3 NBCC requirements; growth and development, social and cultural foundations, the helping relationship, group dynamics, career, appraisal and research.
- 541 Clinical and Experimental Hypnosis Seminar** 3 Course Prerequisite: Student in counseling, educational, experimental, or clinical psychology. Clinical and experimental hypnosis, emphasizing applied research and clinical methods.
- 542 Cross-cultural Research in Counseling and Assessment** 3 Cross-cultural research methods, concepts, and findings in counseling and assessment.
- 551 Doctoral Practicum in Counseling Psychology I** 4 (2-6) Course Prerequisite: Admission to Counseling Psychology PhD program; COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment; COUN PSY 517 or concurrent enrollment. Supervised experiences in the application of counseling psychology theory and techniques.
- 552 Doctoral Practicum in Counseling Psychology II** 4 (2-6) Course Prerequisite: COUN PSY 551. Supervised experiences in the application of counseling psychology theory and techniques.
- 553 Doctoral Practicum in Counseling Psychology III** 4 (3-3) May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 552. Supervised experiences in the application of counseling psychology theory and techniques.
- 561 Continuing Counseling ESA Certification** V 2-6 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Initial Counselor Certification; equivalent of 180 full days of school counselor experience; by department consent only. Peer review requirements for continuing level ESA Counselor Certification.
- 590 Seminar in Research in Counseling Psychology** 3 Course Prerequisite: By interview only. Recent developments in counseling psychology research and design applied to PhD dissertation proposals.
- 596 Pet Loss and Human Bereavement** 1 Addresses human bereavement and grief in the context of the human/animal relationship.
- 597 Counseling Psychology Internship** V 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience, individual and group counseling, evaluation, assessment, supervision, and teaching.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V** 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Counseling

Degree offered: Master of Arts in Education - Non Thesis

Faculty working with graduate students: 10

Graduate students: 54

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Requirements

The curriculum for Community Counseling program includes course work in theory, research, and techniques in individual and group counseling; vocational/career counseling and assessment; professional and ethical issues; life-span development; counseling diverse populations; statistics, measurement, and research design. Students in the Community Counseling program take additional coursework in personality assessment, diagnosis and psychopathology, and two semesters of internship in community mental health settings. Additional courses are available on an elective basis, including courses on hypnosis, counselor supervision, substance abuse counseling, Chicano/Latino psychology, cross-cultural counseling research, social psychology, and program evaluation. 4000 Character Limit.

Program Description

The counseling psychology program offers a Ph.D. degree and a Master of Arts degree available at the Pullman campus. The Ph.D. in counseling psychology program prepares students for careers in counseling, teaching, research, and other professional roles as counseling psychologists. For example, graduates obtain positions in university counseling centers, academic faculty in counseling psychology departments, private or group practice in psychology, or other mental health settings as therapists. Graduates of the program are license-eligible in most states. The Ph.D. program has been accredited by the American Psychological Association (APA) since 1990. The M.A. program with emphasis in community counseling, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students in either program can pursue the Master of Arts (M.A.) degree, with or without thesis. The M.A. degree, with thesis, can be helpful for students who plan to subsequently apply for doctoral programs or who have a strong interest in conducting research, although

M.A. graduates without thesis also apply for and enter doctoral programs.

Degree Description

Master's degrees in counseling focus on community counseling, which, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students can pursue the Master of Arts (M.A.) degree, with or without thesis. The M.A. degree, with thesis, can be helpful for students who plan to subsequently apply for doctoral programs or who have a strong interest in conducting research, although M.A. graduates without thesis also apply for and enter doctoral programs.

Post-Graduate Employment Opportunities

Counselors in community mental health centers, other helping professions.

Post-Graduate Career Placements

Master's program: Counselor

Contact Information

Office of Graduate Studies
Washington State University - Pullman
Cleveland Hall 252
PO Box 642114
Pullman, WA 99163-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Olusola Adesope, Arreed Barabasz, Marianne Barabasz, Stephanie Bauman, Austin Church, Phyllis Erdman, Brian French, Laurie McCubbin, Brian McNeill and Michael Trevisan.

COPSY

- 457 Chicano/a Latino/a Psychology 3** Course Prerequisite: AMER ST 216, CES 101, 151, 254, 255, or HISTORY 150. Current psychosocial research and literature relevant to the mental health and psychological wellbeing of Chicana/o Latina/o populations.
- 501 Historical and Philosophical Foundations of Counseling Psychology 3** Course Prerequisite: Admission to Counseling Psychology PhD program. History of counseling psychology; philosophical and psychological systems; current identity of counseling psychology as an academic discipline and a profession.
- 502 Social Psychology Foundations in Educational and Counseling Psychology 3** Social psychology with a special emphasis on the relevance to education and counseling psychology.
- 503 Community Counseling 3** Course Prerequisite: Graduate student in Community Counseling program. Counseling in community settings.

- 511 Theories, Research, and Techniques in Counseling Psychology I** 3 Philosophical assumptions, theory of personality, counseling process, techniques and relevant research in the major theories of counseling and personality.
- 512 Counseling Techniques and Microskills** 3 Course Prerequisite: COUN PSY 511. Foundation course for all clinical experiences in counseling; communication and interpersonal skills under faculty supervision will be emphasized.
- 513 Career Counseling: Theories and Methods** 3 Theories, concepts, methods and findings in career counseling; vocational assessment and prediction.
- 515 Ethics and Professional Problems in Counseling Psychology** 3 Professional problems; ethical, legal, and training issues, practices, and new issues.
- 516 Life Span Development and Counseling Issues** 3 Major theories and issues in human development and their application to counseling practice including case conceptualization, treatment and intervention planning and psychological assessment and research.
- 517 Diagnoses, Psychopathology and Counseling Psychology** 3 Course Prerequisite: COUN PSY 511. Psychopathology and the application of counseling theories to diagnoses, case conceptualization, assessments, treatment plans and research.
- 518 Theoretical Foundations of Group Counseling** 3 Course Prerequisite: COUN PSY 512 or concurrent enrollment. History, philosophy and theoretical foundations; the group counselor, members, and issues in group counseling.
- 523 Topics in Counseling Psychology V** 1-4 May be repeated for credit; cumulative maximum 8 hours. Recent research, developments, issues, and/or applications in selected areas of counseling psychology.
- 525 Counseling Diverse Populations** 3 Course Prerequisite: COUN PSY 512. Research and theories regarding the influence of culture, gender, and lifestyle on counseling processes; application of appropriate assessment/treatment strategies.
- 527 Individual Appraisal I** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Cognitive assessment of individuals, with an emphasis on the theoretical background and practical skills needed to administer, score, and interpret individual intelligence tests; assessment of learning disabilities, AD/HD, and individual achievement.
- 528 Individual Appraisal II** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Interpretation of representative personality assessment inventories and symptom checklists used in counseling practice; integration of results in psychological reports.
- 529 Counselor Supervision: Theory, Research, and Practice** 3 Course Prerequisite: Admission to Counseling Psychology PhD program. Survey of major theoretical approaches, techniques, and research in models of counselor supervision and training.
- 531 Current Issues in School Counseling I** 3 Course Prerequisite: Admission to MA program in School Counseling. Issues of immediate concern to school counselors: drug abuse, family violence, adolescent suicide, sexual orientation, crisis intervention, consultation and referral.
- 532 Current Issues in School Counseling II** 3 Course Prerequisite: COUN PSY 531. Additional coverage of contemporary issues of concern to school counselors; comprehensive developmental school programs, school community dynamics, parental involvement, consultation.
- 533 Master's Internship in Community Counseling** 4 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of counseling theory and techniques in an agency setting.
- 535 Master's Internship in School Counseling** 4 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of guidance and counseling theory and techniques in a school setting.
- 537 Professional Development in Counseling Psychology** 3 NBCC requirements; growth and development, social and cultural foundations, the helping relationship, group dynamics, career, appraisal and research.
- 541 Clinical and Experimental Hypnosis Seminar** 3 Course Prerequisite: Student in counseling, educational, experimental, or clinical psychology. Clinical and experimental hypnosis, emphasizing applied research and clinical methods.
- 542 Cross-cultural Research in Counseling and Assessment** 3 Cross-cultural research methods, concepts, and findings in counseling and assessment.
- 551 Doctoral Practicum in Counseling Psychology I** 4 (2-6) Course Prerequisite: Admission to Counseling Psychology PhD program; COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment; COUN PSY 517 or concurrent enrollment. Supervised experiences in the application of counseling psychology theory and techniques.
- 552 Doctoral Practicum in Counseling Psychology II** 4 (2-6) Course Prerequisite: COUN PSY 551. Supervised experiences in the application of counseling psychology theory and techniques.
- 553 Doctoral Practicum in Counseling Psychology III** 4 (3-3) May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 552. Supervised experiences in the application of counseling psychology theory and techniques.
- 561 Continuing Counseling ESA Certification V** 2-6 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Initial Counselor Certification; equivalent of 180 full days of school counselor experience; by department consent only. Peer review requirements for continuing level ESA Counselor Certification.
- 590 Seminar in Research in Counseling Psychology** 3 Course Prerequisite: By interview only. Recent developments in counseling psychology research and design applied to PhD dissertation proposals.
- 596 Pet Loss and Human Bereavement** 1 Addresses human bereavement and grief in the context of the human/animal relationship.

- 597 Counseling Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience, individual and group counseling, evaluation, assessment, supervision, and teaching.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V** 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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Counseling Psychology

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 9

Graduate students: 37

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Requirements

Students in the doctoral program who have completed a master's degree may be allowed to waive certain required courses. Once admitted, a complete waiver application must be submitted to the Office of Graduate Studies for each course a student wishes to waive by May 1st.

Program Description

The counseling psychology program offers a Ph.D. degree and a Master of Arts degree available at the Pullman campus. The Ph.D. in counseling psychology program prepares students for careers in counseling, teaching, research, and other professional roles as counseling psychologists. For example, graduates obtain positions in university counseling centers, academic faculty in counseling psychology departments, private or group practice in psychology, or other mental health settings as therapists. Graduates of the program are license-eligible in most states. The Ph.D. program has been accredited by the American Psychological Association (APA) since 1990. The M.A. program with emphasis in community counseling, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students in either program can pursue the Master of Arts (M.A.) degree, with or without thesis. The M.A. degree, with thesis, can be helpful for students who plan to subsequently apply for doctoral programs or who have a strong interest in conducting research, although M.A. graduates without thesis also apply for and enter doctoral

programs.

Degree Description

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Post-Graduate Employment Opportunities

Postdoctoral clinical or research positions, staff psychologist at university counseling centers, university faculty, licensed psychologist in private practice, and in community mental health organizations.

Post-Graduate Career Placements

Psychologist, San Jose State University; assistant professor, De La Salle University (Philippines); mental health specialist, LeRoy Haynes Center for Children (Laverne, CA); behavioral therapist, St. Luke's Rehabilitation Institute (Spokane, WA); postdoctoral position at University of California, Berkeley

Contact Information

Office of Graduate Studies
Washington State University
Cleveland Hall 252
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Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

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- 552 Doctoral Practicum in Counseling Psychology II** 4 (2-6) Course Prerequisite: COUN PSY 551. Supervised experiences in the application of counseling psychology theory and techniques.
- 553 Doctoral Practicum in Counseling Psychology III** 4 (3-3) May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 552. Supervised experiences in the application of counseling psychology theory and techniques.
- 561 Continuing Counseling ESA Certification V** 2-6 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Initial Counselor Certification; equivalent of 180 full days of school counselor experience; by department consent only. Peer review requirements for continuing level ESA Counselor Certification.
- 590 Seminar in Research in Counseling Psychology** 3 Course Prerequisite: By interview only. Recent developments in counseling psychology research and design applied to PhD dissertation proposals.
- 596 Pet Loss and Human Bereavement** 1 Addresses human bereavement and grief in the context of the human/animal relationship.

- 597 Counseling Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience, individual and group counseling, evaluation, assessment, supervision, and teaching.
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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- ED AD**
- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V** 2-3 The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V** 2-3 Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V** 2-3 Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V** 2-3 Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.

- 562 Professional Issues in Student Affairs Administration 3**
Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.

- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
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- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDRES**
- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

PSYCH

- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3** May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.

- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Counseling Psychology

Degree offered: Master of Education

Faculty working with graduate students: 10

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Requirements

The School Counseling and Community Counseling programs are available at the Pullman campus. Most students are enrolled full-time. The curriculum for both programs includes course work in theory, research, and techniques in individual and group counseling; vocational/career counseling and assessment; professional and ethical issues; life-span development; counseling diverse populations; statistics, measurement, and research design. In addition, students in the School Counseling program complete a two-course sequence on current issues in school counseling,

a course in cognitive assessment, a course in learning theory, and two semesters of internship in the public school setting. Students in the Community Counseling program take additional coursework in personality assessment, diagnosis and psychopathology, and two semesters of internship in community mental health settings. For both programs, additional courses are available on an elective basis, including courses on hypnosis, counselor supervision, substance abuse counseling, Chicano/Latino psychology, cross-cultural counseling research, social psychology, and program evaluation.

Program Description

The counseling psychology program offers a Ph.D. degree and a Master of Arts degree available at the Pullman campus. The Ph.D. in counseling psychology program prepares students for careers in counseling, teaching, research, and other professional roles as counseling psychologists. For example, graduates obtain positions in university counseling centers, academic faculty in counseling psychology departments, private or group practice in psychology, or other mental health settings as therapists. Graduates of the program are license-eligible in most states. The Ph.D. program has been accredited by the American Psychological Association (APA) since 1990. The M.A. program with emphasis in community counseling, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students in either program can pursue the Master of Arts (M.A.) degree, with or without thesis. The M.A. degree, with thesis, can be helpful for students who plan to subsequently apply for doctoral programs or who have a strong interest in conducting research, although M.A. graduates without thesis also apply for and enter doctoral programs.

Degree Description

Master's programs in counseling focus on one of two professional options: school counseling, which prepares students for initial certification as K-12 school counselors, and community counseling, which, in combination with the fulfillment of additional post-degree requirements, prepares students for licensure as a mental health counselor. Students who are pursuing certification as school counselors receive additional training to be effective in school settings. The Ed.M. program is generally pursued by those who intend to work in a K-12 educational or community/agency setting.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

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Faculty

Olusola Adesope, Arreed Barabasz, Marianne Barabasz, Stephanie Bauman, Austin Church, Phyllis Erdman, Brian French, Laurie McCubbin, Brian McNeill and Michael Trevisan.

COPSY

- 501 Historical and Philosophical Foundations of Counseling Psychology** 3 Course Prerequisite: Admission to Counseling Psychology PhD program. History of counseling psychology; philosophical and psychological systems; current identity of counseling psychology as an academic discipline and a profession.
- 502 Social Psychology Foundations in Educational and Counseling Psychology** 3 Social psychology with a special emphasis on the relevance to education and counseling psychology.
- 503 Community Counseling** 3 Course Prerequisite: Graduate student in Community Counseling program. Counseling in community settings.
- 511 Theories, Research, and Techniques in Counseling Psychology I** 3 Philosophical assumptions, theory of personality, counseling process, techniques and relevant research in the major theories of counseling and personality.
- 512 Counseling Techniques and Microskills** 3 Course Prerequisite: COUN PSY 511. Foundation course for all clinical experiences in counseling; communication and interpersonal skills under faculty supervision will be emphasized.
- 513 Career Counseling: Theories and Methods** 3 Theories, concepts, methods and findings in career counseling; vocational assessment and prediction.
- 515 Ethics and Professional Problems in Counseling Psychology** 3 Professional problems; ethical, legal, and training issues, practices, and new issues.
- 516 Life Span Development and Counseling Issues** 3 Major theories and issues in human development and their application to counseling practice including case conceptualization, treatment and intervention planning and psychological assessment and research.
- 517 Diagnoses, Psychopathology and Counseling Psychology** 3 Course Prerequisite: COUN PSY 511. Psychopathology and the application of counseling theories to diagnoses, case conceptualization, assessments, treatment plans and research.
- 518 Theoretical Foundations of Group Counseling** 3 Course Prerequisite: COUN PSY 512 or concurrent enrollment. History, philosophy and theoretical foundations; the group counselor, members, and issues in group counseling.

- 523 Topics in Counseling Psychology V** 1-4 May be repeated for credit; cumulative maximum 8 hours. Recent research, developments, issues, and/or applications in selected areas of counseling psychology.
- 525 Counseling Diverse Populations 3** Course Prerequisite: COUN PSY 512. Research and theories regarding the influence of culture, gender, and lifestyle on counseling processes; application of appropriate assessment/treatment strategies.
- 527 Individual Appraisal I 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Cognitive assessment of individuals, with an emphasis on the theoretical background and practical skills needed to administer, score, and interpret individual intelligence tests; assessment of learning disabilities, AD/HD, and individual achievement.
- 528 Individual Appraisal II 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Interpretation of representative personality assessment inventories and symptom checklists used in counseling practice; integration of results in psychological reports.
- 529 Counselor Supervision: Theory, Research, and Practice 3** Course Prerequisite: Admission to Counseling Psychology PhD program. Survey of major theoretical approaches, techniques, and research in models of counselor supervision and training.
- 531 Current Issues in School Counseling I 3** Course Prerequisite: Admission to MA program in School Counseling. Issues of immediate concern to school counselors: drug abuse, family violence, adolescent suicide, sexual orientation, crisis intervention, consultation and referral.
- 532 Current Issues in School Counseling II 3** Course Prerequisite: COUN PSY 531. Additional coverage of contemporary issues of concern to school counselors; comprehensive developmental school programs, school community dynamics, parental involvement, consultation.
- 533 Master's Internship in Community Counseling 4** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of counseling theory and techniques in an agency setting.
- 535 Master's Internship in School Counseling 4** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of guidance and counseling theory and techniques in a school setting.
- 537 Professional Development in Counseling Psychology 3** NBCC requirements; growth and development, social and cultural foundations, the helping relationship, group dynamics, career, appraisal and research.
- 541 Clinical and Experimental Hypnosis Seminar 3** Course Prerequisite: Student in counseling, educational, experimental, or clinical psychology. Clinical and experimental hypnosis, emphasizing applied research and clinical methods.
- 542 Cross-cultural Research in Counseling and Assessment 3** Cross-cultural research methods, concepts, and findings in counseling and assessment.
- 551 Doctoral Practicum in Counseling Psychology I 4 (2-6)** Course Prerequisite: Admission to Counseling Psychology PhD program; COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment; COUN PSY 517 or concurrent enrollment. Supervised experiences in the application of counseling psychology theory and techniques.
- 552 Doctoral Practicum in Counseling Psychology II 4 (2-6)** Course Prerequisite: COUN PSY 551. Supervised experiences in the application of counseling psychology theory and techniques.
- 553 Doctoral Practicum in Counseling Psychology III 4 (3-3)** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 552. Supervised experiences in the application of counseling psychology theory and techniques.
- 561 Continuing Counseling ESA Certification V** 2-6 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Initial Counselor Certification; equivalent of 180 full days of school counselor experience; by department consent only. Peer review requirements for continuing level ESA Counselor Certification.
- 590 Seminar in Research in Counseling Psychology 3** Course Prerequisite: By interview only. Recent developments in counseling psychology research and design applied to PhD dissertation proposals.
- 596 Pet Loss and Human Bereavement 1** Addresses human bereavement and grief in the context of the human/animal relationship.
- 597 Counseling Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience, individual and group counseling, evaluation, assessment, supervision, and teaching.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

502 Theoretical Foundations of Learning and Instruction 3 Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.

503 Advanced Educational Psychology 3 Contemporary theories, models, and empirical research in educational psychology.

504 Classroom-focused Research Methods 2 Methods, design, implementation, and application of results in classroom context.

505 Research Methods I 3 Research methods; literature review; design, implementation, and interpretation of results.

508 Educational Statistics 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.

509 Educational Measurements: Test Development and Assessment V 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.

510 Assessment of Learning 3 Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.

511 Classical and Modern Test Theory 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.

521 Topics in Educational Psychology V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.

563 Principles of Research 3 The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

564 Qualitative Research 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

565 Quantitative Research 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).

568 Quasi-Experimental Design 3 Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.

569 Seminar in Quantitative Techniques in Education V 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.

570 Introduction to Program Evaluation 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.

571 Advanced Program Evaluation 3 Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.

572 Introduction to Systematic Literature Reviews and Meta-Analyses 3 Introduction to the steps involved in conducting systematic reviews and meta-analyses.

573 Motivation Theories 3 Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.

574 Seminar in Educational Psychology 1 May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.

597 Educational Psychology Internship V 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Criminal Justice

Degree offered: Doctor of Philosophy (Criminal Justice)

Faculty working with graduate students: 12

Graduate students: 35

Graduate students receiving assistantships or scholarships: 71%

Tests required: GRE (Combined)

Deadline: Fall: January 10
Spring: July 1

Requirements

None other than listed

Program Description

The Criminal Justice graduate program is designed to increase student understanding of the nature and causes of crime, the operation of the criminal justice system and its institutions, and the development and reform of criminal justice policy. Courses and research are grounded in theoretical foundations upon which students can learn to address real world problems. Emphasis is placed on understanding, designing, and conducting research from multiple perspectives to help students become educated policymakers, researchers, and scholars. Substantive emphases include criminal justice institutions and policies, the connections between criminal justice policies and public health, and comparative and international criminal justice. Courses are taught and research is conducted from an interdisciplinary perspective by a diversely educated graduate faculty.

Degree Description

The mission of Criminal Justice Ph.D. program is to advance the development of criminological and criminal justice research and theory, and to train graduate students to conduct and understand theoretically based research involving crime and the criminal justice system. Upon completion of their graduate program, graduate students in criminal justice will be able to read and evaluate data and social science research, analyze and develop criminal justice policy, conduct independent research related to criminology and criminal justice, and communicate original research findings and analyses of secondary research cogently for consideration by multiple audiences.

Training and Professional Development Opportunities

Program evaluation, online instruction and curriculum development, advanced statistical training.

Post-Graduate Employment Opportunities

Academia, grant specialist, research manager, and planning and evaluation director for state and local criminal justice agencies.

Post-Graduate Career Placements

Research university professorships, police and corrections management.

Contact Information

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CRM J

- 403 Violence Toward Women 3** Course Prerequisite: Junior standing. Violence toward women and its relationship to broader social issues such as sexism and social control. (Cross-listed course offered as CRM J 403, WOMEN ST 403).
- 420 Criminal Procedure 3** Principal court decisions concerning standards of conduct and rights in the criminal process.
- 426 Victimology and Public Policy 3** Examination of victimization; policy responses to victims; victim's rights.
- 427 Crime Prevention Strategies 3** Personal, environmental, community-based and government crime prevention strategies and issues.
- 428 Drug and Alcohol Use and Abuse 3** Drug use, impact on behavior and drug control policies.
- 450 Senior Seminar: Ethical Issues in Criminal Justice 3** Examination of ethical issues in decision making in criminal justice.
- 468 Addictive Behavior Across the Demographic Spectrum 3** Course Prerequisite: Junior standing. Overview of social, cultural and historical perspectives on dealing with addictive behavior. (Cross-listed course offered as SOC 468, CRM J 468, PSYCH 468). Recommended preparation: SOC 101, PSYCH 105, or CRM J 101.
- 490 Criminal Justice Internship V 2-12** May be repeated for credit; cumulative maximum 12 hours. On/off-campus internship in criminal justice institutions (police, FBI, jails, law firms, etc.); written assignments and readings will be required.

- 499 Special Problems V** 1-4 May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.
- 505 Comparative Criminal Justice** 3 Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 Leadership in Criminal Justice** 3 Study of leadership models and theories as they apply to criminal justice institutions.
- 511 Criminal Justice Management** 3 Examines the theoretical framework for understanding criminal justice organizations through examining management theory, organizational dynamics, and administration research.
- 512 Juvenile Justice** 3 Examination of the major theories and contemporary issues related to juvenile delinquency, the juvenile justice system, gangs, and juvenile corrections.
- 513 Multicultural Issues in Criminal Justice** 3 Critical examination of race, gender, and other diversity and cultural issues within the U.S. criminal justice system.
- 514 Professional Development in Criminal Justice and Criminology** 1 Professional aspects of research, teaching, and service activities in criminal justice and criminology.
- 520 Criminal Justice Research Methods** 3 The design and execution of criminal justice research; critical examination of current research methods in criminal justice.
- 521 Advanced Topics in Criminal Justice Research Methods** 3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 520. Exploration of specialized topics in research methodology; topics may include qualitative methods, GIS, ethnography, and survey design.
- 522 Foundations of Quantitative Methods** 3 Application of foundational quantitative methods utilized in the field of Criminal Justice and Criminology.
- 523 Intermediate Quantitative Methods** 3 Course Prerequisite: CRM J 522. Intermediate-level quantitative methods including logistic regression, factor analysis, propensity scoring and model building.
- 524 Advanced Topics in Quantitative Methods** 3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 523. Advanced quantitative methods used in criminal justice, including time series, HLM, multi-level modeling, spatial analysis, and repeated measures analysis.
- 530 Criminal Justice: Process and Institutions** 3 Processes of criminal justice in the context of the social, political, and economic environments.
- 531 Drugs, Alcohol, and Crime** 3 Examination of the research and theory surrounding the relationship between alcohol, drugs, crime, and the criminal justice system.
- 540 Seminar in Evaluation Research** 3 Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 541 Seminar in Corrections** 3 Current issues related to the control, management, and sanctioning of criminal offenders.
- 542 Community Corrections** 3 Examines correctional processes in a community setting, including probation, parole, and innovative community-based strategies for dealing with the offender.
- 555 Seminar in Criminological Theory** 3 Individual, situational and ecological correlates of criminal behavior; data sources and empirical research.
- 560 Prosecution and Adjudication** 3 The function of courts and the behavior of prosecutors, defense attorneys and judges within the criminal justice system.
- 570 The Police and Society** 3 Community and selected social institutional factors as related to their influence on police systems.
- 572 Seminar in Comparative Policing** 3 Study of the history, organization, and policies of policing systems in selected countries and of transnational policing.
- 580 Gender and Justice** 3 Criminal justice system's treatment of women offenders, victims, and professionals.
- 590 PRACTICUM V** 1-6 May be repeated for credit; cumulative maximum 6 hours. S, F Grading.
- 591 Seminar in the Administration of Criminal Justice** 3 May be repeated for credit; cumulative maximum 6 hours. Current issues, problems, and critical concerns within the field of administration of criminal justice.
- 592 Proseminar in Administration, Justice, and Applied Policy Studies** 3 May be repeated for credit; cumulative maximum 6 hours. Same as POL S 542.
- 593 Special Topics in Criminological Theory** 3 May be repeated for credit; cumulative maximum 6 hours. Intense examination of a contemporary criminological theory, school, or paradigm.
- 594 Special Topics in Comparative Criminology and Criminal Justice** 3 May be repeated for credit; cumulative maximum 6 hours. Intensive study of specific topics in comparative criminal justice or criminology.
- 595 Advanced Topics in Criminal Justice Institutions and Processes** 3 May be repeated for credit; cumulative maximum 6 hours. In-depth study of issues associated with criminal justice institutions and processes.
- 596 Special Topics: Criminal Justice and Public Health** 3 May be repeated for credit; cumulative maximum 6 hours. Examination of public health ramifications of criminal justice policy and practice; public health approaches to violence and substance abuse prevention.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Criminal Justice

Degree offered: Master of Arts in Criminal Justice - Non Thesis

Faculty working with graduate students: 13

Graduate students: 12

Program offered: DDP, Pullman, Spokane

Tests required: GRE (Combined)

Deadline: Fall: January 10

Spring: July 1

Requirements

None

Program Description

The Criminal Justice graduate program is designed to increase student understanding of the nature and causes of crime, the operation of the criminal justice system and its institutions, and the development and reform of criminal justice policy. Courses and research are grounded in theoretical foundations upon which students can learn to address real world problems. Emphasis is placed on understanding, designing, and conducting research from multiple perspectives to help students become educated policymakers, researchers, and scholars. Substantive emphases include criminal justice institutions and policies, the connections between criminal justice policies and public health, and comparative and international criminal justice. Courses are taught and research is conducted from an interdisciplinary perspective by a diversely educated graduate faculty.

Degree Description

The Master of Arts in criminal justice is designed to develop and enhance the student's knowledge of criminal justice; expand and develop a student's analytical and assessment skills; and further develop their facility with oral and written communication and with research. The program is flexible and provides a superb basis for entry into graduate work at the doctoral level or applied work in criminal justice agencies. Approximately 70% of our M.A. graduates are employed in applied settings while the balance have pursued teaching and research careers.

Training and Professional Development Opportunities

Program evaluation, internships.

Post-Graduate Employment Opportunities

Federal law enforcement, secret service, IRS, Immigration and Customs, Homeland Security, corrections, police and corrections planning and analysis.

Post-Graduate Career Placements

IRS, ICE, Naval Criminal Investigations, criminal justice leadership, police chief, sheriff, lawyer.

Contact Information

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Faculty

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CRM J

505 Comparative Criminal Justice 3 Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).

510 Leadership in Criminal Justice 3 Study of leadership models and theories as they apply to criminal justice institutions.

- 511 **Criminal Justice Management 3** Examines the theoretical framework for understanding criminal justice organizations through examining management theory, organizational dynamics, and administration research.
- 512 **Juvenile Justice 3** Examination of the major theories and contemporary issues related to juvenile delinquency, the juvenile justice system, gangs, and juvenile corrections.
- 513 **Multicultural Issues in Criminal Justice 3** Critical examination of race, gender, and other diversity and cultural issues within the U.S. criminal justice system.
- 514 **Professional Development in Criminal Justice and Criminology 1** Professional aspects of research, teaching, and service activities in criminal justice and criminology.
- 520 **Criminal Justice Research Methods 3** The design and execution of criminal justice research; critical examination of current research methods in criminal justice.
- 521 **Advanced Topics in Criminal Justice Research Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 520. Exploration of specialized topics in research methodology; topics may include qualitative methods, GIS, ethnography, and survey design.
- 522 **Foundations of Quantitative Methods 3** Application of foundational quantitative methods utilized in the field of Criminal Justice and Criminology.
- 523 **Intermediate Quantitative Methods 3** Course Prerequisite: CRM J 522. Intermediate-level quantitative methods including logistic regression, factor analysis, propensity scoring and model building.
- 524 **Advanced Topics in Quantitative Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 523. Advanced quantitative methods used in criminal justice, including time series, HLM, multi-level modeling, spatial analysis, and repeated measures analysis.
- 530 **Criminal Justice: Process and Institutions 3** Processes of criminal justice in the context of the social, political, and economic environments.
- 531 **Drugs, Alcohol, and Crime 3** Examination of the research and theory surrounding the relationship between alcohol, drugs, crime, and the criminal justice system.
- 540 **Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 541 **Seminar in Corrections 3** Current issues related to the control, management, and sanctioning of criminal offenders.
- 542 **Community Corrections 3** Examines correctional processes in a community setting, including probation, parole, and innovative community-based strategies for dealing with the offender.
- 555 **Seminar in Criminological Theory 3** Individual, situational and ecological correlates of criminal behavior; data sources and empirical research.
- 560 **Prosecution and Adjudication 3** The function of courts and the behavior of prosecutors, defense attorneys and judges within the criminal justice system.
- 570 **The Police and Society 3** Community and selected social institutional factors as related to their influence on police systems.
- 572 **Seminar in Comparative Policing 3** Study of the history, organization, and policies of policing systems in selected countries and of transnational policing.
- 580 **Gender and Justice 3** Criminal justice system's treatment of women offenders, victims, and professionals.
- 590 **PRACTICUM V 1-6** May be repeated for credit; cumulative maximum 6 hours. S, F Grading.
- 591 **Seminar in the Administration of Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Current issues, problems, and critical concerns within the field of administration of criminal justice.
- 592 **Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Same as POL S 542.
- 593 **Special Topics in Criminological Theory 3** May be repeated for credit; cumulative maximum 6 hours. Intense examination of a contemporary criminological theory, school, or paradigm.
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- 700 **Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 **Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18

May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Crop Science

Degree offered: Doctor of Philosophy (Crop Science)

Faculty working with graduate students: 86

Graduate students: 35

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Fifteen hours of 500-level grade coursework are required; not included but required are 2 credits of Crops 510 Seminar and 1 credit of Crops 512 State Tour. Two credits of Crops 511 Research Proposal and Development are also required (S/F grading). No more than half of the graded credit may be transfer credit. Seventy-two credits are required for the degree.

Program Description

The Department of Crop and Soil Sciences at Washington State University department offers M.S. and Ph.D. programs in Crop Science, with the ability to conduct graduate research in a variety of specialized areas within each discipline. Current research in Crop Science is being conducted in the areas of plant breeding and genetics, molecular genetics, crop production, turf management, weed science, plant physiology, and cereal chemistry. We work with wheat, forages, barley, grain legumes, brassicas and turf. We have several research projects conducted in cooperation with the United States Department of Agriculture (USDA) through the USDA Agricultural Research Service (USDA-ARS) and USDA Natural Resources Conservation Service (USDA-NRCS) in addition to research projects being conducted in association with other universities. Research facilities include state of the art laboratories and greenhouse facilities, and research farms located in Pullman, as well as throughout the state at five Research and Extension Centers. Graduate students learn valuable skills and knowledge working side by side with faculty members and research technicians providing them the opportunity to play an integral role in the advancement of their major advisor's research. Students also have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Qualified students typically receive competitive teaching or research assistantships. These assistantships provide non-resident and resident tuition waivers, paid health insurance, and stipends to help cover living expenses.

Degree Description

Training and Professional Development Opportunities

Students have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Extension program delivery, and Graduate School teacher training and grant proposal writing workshop opportunities are also available.

Post-Graduate Employment Opportunities

Crop scientists with advanced degrees may find employment in government agencies, national labs, academia, private business, agricultural consulting, and international agriculture.

Contact Information

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Lisa Lujan

Academic Coordinator

Johnson Hall Graduate Center

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Faculty

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CROPS

503 Advanced Cropping Systems 3 Understanding the management of constraints to crop production and quality; biological, physical, and chemical approaches to crop health management. Field trips required. (Cross-listed course offered as CROP SCI 403, PL P 403). Recommended preparation: CROP SCI 305; PL P 429.

- 504 Plant Transmission Genetics 3** Transmission of genes across generations; detailed study of the basic laws of genetics to predict and describe inheritance.
- 505 Advanced Classical and Molecular Breeding 3** Characterization and principles of improving crop quality and adaptation traits with emphasis on molecular breeding strategies. Required preparation must include upper-division course in biology, genetics, or plant breeding.
- 510 Seminar 1** May be repeated for credit. Literature review; preparation and presentation of reports in crop science.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 512 Topics in Crop Science V 1-2** May be repeated for credit. Concepts of plant breeding, seed physiology, and technology; crop physiology and management.
- 545 Quantitative Trait Improvement 3** Concepts and applications in modern plant breeding programs.
- 554 Chromosome Structure and Function 3** Structural and functional organization of eukaryotic chromosomes. Required preparation must include upper-division course in biology, genetics, or plant breeding.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Crop Science

Degree offered: Master of Science in Crop Science

Faculty working with graduate students: 92

Graduate students: 17

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Twenty-one hours of graded credit are required, including seminar and state-wide tour. Twenty-six credits are required overall.

Program Description

The Department of Crop and Soil Sciences at Washington State University department offers M.S. and Ph.D. programs in Crop Science, with the ability to conduct graduate research in a variety of specialized areas within each discipline. Current research in Crop Science is being conducted in the areas of plant breeding and genetics, molecular genetics, crop production, turf management, weed science, plant physiology, and cereal chemistry. We work with wheat, forages, barley, grain legumes, brassicas and turf. We have several research projects conducted in cooperation with the United States Department of Agriculture (USDA) through the USDA Agricultural Research Service (USDA-ARS) and USDA Natural Resources Conservation Service (USDA-NRCS) in addition to research projects being conducted in association with other universities. Research facilities include state of the art laboratories and greenhouse facilities, and research farms located in Pullman, as well as throughout the state at five Research and Extension Centers. Graduate students learn valuable skills and knowledge working side by side with faculty members and research technicians providing them the opportunity to play an integral role in the advancement of their major advisor's research. Students also have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Qualified students typically receive competitive teaching or research assistantships. These assistantships provide non-resident and resident tuition waivers, paid health insurance, and stipends to help cover living expenses.

Degree Description

Training and Professional Development Opportunities

Students have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Extension program delivery, and Graduate School teacher training and grant proposal writing workshop opportunities are also available.

Post-Graduate Employment Opportunities

Crop scientists with advanced degrees may find employment in government agencies, national labs, academia, private business, agricultural consulting, and international agriculture.

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CROPS

- 503 Advanced Cropping Systems 3** Understanding the management of constraints to crop production and quality; biological, physical, and chemical approaches to crop health management. Field trips required. (Cross-listed course offered as CROP SCI 403, PL P 403). Recommended preparation: CROP SCI 305; PL P 429.
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- 510 Seminar 1** May be repeated for credit. Literature review; preparation and presentation of reports in crop science.

- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 512 Topics in Crop Science V 1-2** May be repeated for credit. Concepts of plant breeding, seed physiology, and technology; crop physiology and management.
- 545 Quantitative Trait Improvement 3** Concepts and applications in modern plant breeding programs.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Crop Science

Degree offered: Master of Science in Crop Science - Non Thesis

Faculty working with graduate students: 95

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

Twenty-six hours of graded coursework are required, including seminar and state-wide tour. Thirty hours are required overall.

Program Description

The Department of Crop and Soil Sciences at Washington State University department offers M.S. and Ph.D. programs in Crop Science, with the ability to conduct graduate research in a variety of specialized areas within each discipline. Current research in Crop Science is being conducted in the areas of plant breeding and genetics, molecular genetics, crop production, turf management, weed science, plant physiology, and cereal chemistry. We work with wheat, forages, barley, grain legumes, brassicas and turf. We have several research projects conducted in cooperation with the United States Department of Agriculture (USDA) through the USDA Agricultural Research Service (USDA-ARS) and USDA Natural Resources Conservation Service (USDA-NRCS) in addition to research projects being conducted in association with other universities. Research facilities include state of the art laboratories and greenhouse facilities, and research farms located in Pullman, as well as throughout the state at five Research and Extension Centers. Graduate students learn valuable skills and knowledge working side by side with faculty members and research technicians providing them the opportunity to play an integral role in the advancement of their major advisor's research. Students also have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Qualified students typically receive competitive teaching or research assistantships. These assistantships provide non-resident and resident tuition waivers, paid health insurance, and stipends to help cover living expenses.

Degree Description

Training and Professional Development Opportunities

Students have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Extension program delivery, and Graduate School teacher training and grant proposal writing workshop opportunities are also available.

Post-Graduate Employment Opportunities

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Contact Information

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CROPS

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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D) – Educational Administration

Degree offered: Doctor of Education in Educational Administration

Faculty working with graduate students: 14

Program offered: Pullman, Spokane, Tri-Cities, Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Not Accepting Applications

WSU is not accepting applications for this degree at this time.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman

campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The education administration program offers graduate studies at the master's and doctoral levels, plus administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer a specialization in K-12 educational leadership. Program faculty provide a balance and integration of practical experience, theory, and research and aim to prepare educational leaders who function as scholar-practitioners. All campuses offer the educational leadership master's degrees, certification programs, and access to the state-wide doctor of education degree; one-year residency is required for the doctor of philosophy degree. The University's educational leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. The administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. The goal of these standards and our programs is to prepare educational leaders who can provide effective leadership to promote learning for all children in K-12 schools. Washington State University's innovative field-based principal and superintendent certification programs serve certification candidates in a cohort-based program that promotes a close professional network.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

Graduate Coordinator
Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99163-2114
Telephone: 509-335-9195
Fax: 509-335-2097
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Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Paul Goldman, James Howard, Kristin Huggins, Joan Kingrey, Chad Lochmiller, Forrest Parkay, Dennis Ray, Nancy Sanders, Gay Selby, Gene Sharratt and Danny Talbot.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.

- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.

- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDRES**
- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.

- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.
- Teaching and Learning**
- T & L**
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.

- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning; set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.

- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.

- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D) – Educational Administration

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 15

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Not Accepting Applications

WSU is not accepting applications for this degree at this time.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and

Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The education administration program offers graduate studies at the master's and doctoral levels, plus administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer a specialization in K-12 educational leadership. Program faculty provide a balance and integration of practical experience, theory, and research and aim to prepare educational leaders who function as scholar-practitioners. All campuses offer the educational leadership master's degrees, certification programs, and access to the state-wide doctor of education degree; one-year residency is required for the doctor of philosophy degree. The University's educational leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. The administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. The goal of these standards and our programs is to prepare educational leaders who can provide effective leadership to promote learning for all children in K-12 schools. Washington State University's innovative field-based principal and superintendent certification programs serve certification candidates in a cohort-based program that promotes a close professional network.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

Graduate Coordinator
Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99163-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Paul Goldman, James Howard, Kristin Huggins, Joan Kingrey, Chad Lochmiller, Forrest Parkay, Paul Pitre, Dennis Ray, Nancy Sanders, Gay Selby, Gene Sharratt and Danny Talbot.

ED AD

- 501 **Philosophy of Education** 3 Development of American educational philosophy.
- 503 **Values and Ethics for Educational Leaders** 3 Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 **Social Context of Education** 2 The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 **Social Foundations of Education** 3 Educational adaptations to the economic and social trends and forces.
- 510 **Improvement of Instruction** 3 Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 **Leadership Studies for Social Justice** 3 Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 **Organizational Behavior** 3 Human behavior within various social and cultural organizational settings.
- 514 **Basic Principles of Curriculum Design** V 2-3 The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 **Curriculum Implementation** 3 Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 **Instructional and Curricular Leadership** V 2-3 Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 **Media Literacy and Educational Technology** 3 Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 **Seminar in Curriculum and Instruction** V 2-3 Contemporary issues, analyses and developments of educational programs.

- 521 **Topics in Education** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 **Topics in Education** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 **Special Topics** 1 May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 **Special Topics** 1 May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 **Special Topics** 1 May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 **Introduction to Qualitative Research in Education** 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 **Advanced Qualitative Research in Education** 3 Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 **Special Topics in Qualitative Research in Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 **Applied Research for Educational Leaders** 3 Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 **Student Personnel Services in Higher Education** V 2-3 Philosophy, structure, functions, and organization of student affairs administration.
- 561 **Introduction to College Student Development** 3 Student development theory, related research and the application of theory to practice in student affairs work.
- 562 **Professional Issues in Student Affairs Administration** 3 Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 **Research in College Student Development** 3 Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 **Practicum in Higher Education** 3 (0-9) Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.

- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.

- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
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Doctor of Education (Ed.D.) – Educational Administration

Degree offered: Master of Arts in Education

Faculty working with graduate students: 15

Program offered: Pullman, Tri-Cities

Deadline: Fall: January 10

Spring: September 1

Not Accepting Applications

WSU is not accepting applications for this degree at this time.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman

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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
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- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
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- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D.) – Educational Administration

Degree offered: Master of Arts in Education – Non Thesis

Faculty working with graduate students: 15

Program offered: Pullman, Tri-Cities

Deadline: Fall: January 10

Spring: September 1

Not Accepting Applications

WSU is not accepting applications for this degree at this time.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman

campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The education administration program offers graduate studies at the master's and doctoral levels, plus administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer a specialization in K-12 educational leadership. Program faculty provide a balance and integration of practical experience, theory, and research and aim to prepare educational leaders who function as scholar-practitioners. All campuses offer the educational leadership master's degrees, certification programs, and access to the state-wide doctor of education degree; one-year residency is required for the doctor of philosophy degree. The University's educational leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. The administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. The goal of these standards and our programs is to prepare educational leaders who can provide effective leadership to promote learning for all children in K-12 schools. Washington State University's innovative field-based principal and superintendent certification programs serve certification candidates in a cohort-based program that promotes a close professional network. 4000 Character Limit.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

Graduate Coordinator
Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99163-2114
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Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Paul Goldman, James Howard, Kristin Huggins, Joan Kingrey, Chad Lochmiller, Forrest Parkay, Paul Pitre, Dennis Ray, Nancy Sanders, Gay Selby, Gene Sharratt and Danny Talbot.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.

- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.

- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D.) – Educational Administration

Degree offered: Master of Education

Faculty working with graduate students: 15

Program offered: Pullman, Tri-Cities, Vancouver

Deadline: Fall: January 10

Spring: September 1

Not Accepting Applications

WSU is not accepting applications for this degree at this time.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman

campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The education administration program offers graduate studies at the master's and doctoral levels, plus administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer a specialization in K-12 educational leadership. Program faculty provide a balance and integration of practical experience, theory, and research and aim to prepare educational leaders who function as scholar-practitioners. All campuses offer the educational leadership master's degrees, certification programs, and access to the state-wide doctor of education degree; one-year residency is required for the doctor of philosophy degree. The University's educational leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. The administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. The goal of these standards and our programs is to prepare educational leaders who can provide effective leadership to promote learning for all children in K-12 schools. Washington State University's innovative field-based principal and superintendent certification programs serve certification candidates in a cohort-based program that promotes a close professional network. 4000 Character Limit. 4000 Character Limit.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

Graduate Coordinator
Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
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Faculty

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ED AD

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- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
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- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
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- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.

- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D) – Educational Leadership

Degree offered: Doctor of Education

Faculty working with graduate students: 11

Graduate students: 64

Program offered: Pullman, Spokane, Tri-Cities, Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Requirements

Courses are sequenced to allow students at all campuses to complete program requirements within a four-year time frame (contingent upon successful completion of dissertation research). In addition to program offerings at the regional campuses, students attend two-week summer institutes at the Pullman campus for two consecutive summers, after completion of at least 12 graded credit hours including a research methods course (typically EdRes 563). The purpose of the summer institutes is to build a learning community and support network among the statewide cohort, and to form inquiry groups that will focus dissertation research on common problems of leadership for school improvement. During the third or fourth year of the program, students fulfill the program's residency requirements by enrolling full-time (10-18 credits) in dissertation research (EdAd 800).

Program Description

WSU's Educational Leadership program offers graduate studies at

the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The Statewide Doctor of Education (Ed.D.) program is designed as a modified cohort-based program, offered through all WSU campuses. Students in all regions of the state follow the same application process for admission; once admitted, students may access course offerings and advisement through any of WSU's campuses. Courses are sequenced to allow students at all campuses to complete program requirements within a four-year time frame (contingent upon successful completion of dissertation research). In addition to program offerings at the regional campuses, students attend two-week summer institutes at the Pullman campus for two consecutive summers. The purpose of the summer institutes is to build a learning community and support network among the statewide cohort, and to form inquiry groups that will focus dissertation research on common problems of leadership for school improvement.

Post-Graduate Employment Opportunities

K-12 district leadership positions, leadership in public administration or non-profit agencies

Post-Graduate Career Placements

K-12 superintendent, K-12 school district administrator

Contact Information

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Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Kristin Huggins, Joan Kingrey, Teena McDonald, Xyanthe Neider, Forrest Parkway, Gay Selby, Danny Talbot and Kelly Ward.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.

- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.

- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.

- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.
- Teaching and Learning**
- T & L**
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.

- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.

- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.

- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-Internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D) – Educational Leadership

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 11

Graduate students: 4

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Requirements

The program of study for the Ph.D. with a Specialization in Educational Leadership requires a total of 72 semester hours, including at least 36 semester hours of graded course work and at least 24 semester hours of EdAd 800 for completion and defense of the doctoral dissertation. In addition to core courses in Educational Leadership, a cognate area of at least 9 semester hours of graded coursework is required; the cognate may consist of a special emphasis within the College of Education (e.g., educational psychology or cultural studies) or outside the College of Education (e.g., anthropology, economics, health policy administration, political science, public administration). The Ph.D. dissertation requires the completion of an original, empirical research study that makes a contribution to scholarship in the field of leadership studies. A one-year residency of full-time enrollment (a minimum of 10 credits for 2 consecutive semesters) is required for the Ph.D. with a specialization in Educational Leadership. Most courses for the degree are offered at all WSU campuses.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational lead-

ership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The program for the Doctor of Philosophy (Ph.D.) in Education with a specialization in Educational Leadership is intended to prepare scholars and researchers and focuses on developing and applying theoretical and research knowledge and skills to the field of leadership studies. The Ph.D. program is designed primarily for students who intend to pursue careers in policy, research, or college and university teaching. It may also be appropriate for students who are interested in careers in k-20 education or related fields, though it is more theory and research oriented than the Doctor of Education (Ed.D.) degree.

Post-Graduate Employment Opportunities

University research faculty.

Post-Graduate Career Placements

University research faculty, community college dean

Contact Information

Office of Graduate Studies
Washington State University - Pullman
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Kristin Huggins, Joan Kingrey, Teena McDonald, Xyanthe Neider, Forrest Parkay, Gay Selby, Danny Talbot and Kelly Ward.

ED AD

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- 503 **Values and Ethics for Educational Leaders** 3 Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 **Social Context of Education** 2 The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 **Social Foundations of Education** 3 Educational adaptations to the economic and social trends and forces.

- 510 **Improvement of Instruction** 3 Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 **Leadership Studies for Social Justice** 3 Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
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- 514 **Basic Principles of Curriculum Design** V 2-3 The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 **Curriculum Implementation** 3 Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 **Instructional and Curricular Leadership** V 2-3 Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 **Media Literacy and Educational Technology** 3 Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 **Seminar in Curriculum and Instruction** V 2-3 Contemporary issues, analyses and developments of educational programs.
- 521 **Topics in Education** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 **Topics in Education** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 **Special Topics** 1 May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
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- 537 **Advanced Qualitative Research in Education** 3 Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 **Special Topics in Qualitative Research in Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.

- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.

- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

Doctor of Education (Ed.D) – Educational Leadership

Degree offered: Master of Arts in Education

Faculty working with graduate students: 11

Graduate students: 4

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Requirements

The Program for the M.A. requires a minimum of 30 semester hours, including at least 21 hours of graded coursework and 4 hours of EdAd 700 for completion and defense of the master's thesis. At least 18 hours of the graded coursework must be in the Educational Leadership program.

Program Description

WSU's Educational Leadership program offers graduate studies at

the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The Educational Leadership Master of Arts in Education (M.A.), a thesis degree designed for professional educators who plan to subsequently pursue a research-based doctoral program (Ph.D.). It is offered only on the Pullman campus and is closely aligned with the Principal and Program Administrator Certification program.

Post-Graduate Employment Opportunities

K-12 administrator, preparation for advanced graduate study, administration in public or non-profit agency, leadership positions in higher education

Post-Graduate Career Placements

K-12 school district program administrator, principal, teacher, and higher education administration

Contact Information

Office of Graduate Studies
Washington State University - Pullman
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Kristin Huggins, Joan Kingrey, Teena McDonald, Xyanthe Neider, Forrest Parkay, Gay Selby, Danny Talbot and Kelly Ward.

ED AD

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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
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- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Doctor of Education (Ed.D) – Educational Leadership

Degree offered: Master of Education

Faculty working with graduate students: 11

Graduate students: 68

Program offered: Pullman, Spokane, Tri-Cities, Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Requirements

The Master of Education (Ed.M.) is a non-thesis degree, the Program of Study requires a minimum of 35 semester hours, including at least 33 hours of graded coursework and 2 hours of EdAd 702 for completion of a master's comprehensive examination.

Program Description

WSU's Educational Leadership program offers graduate studies at the Master's and doctoral levels and administrator certification programs for the superintendent, residency principal, and residency program administrator certificates. The Master's (M.A. and Ed.M.) and doctoral (Ed.D. and Ph.D.) degree programs offer specializations in educational leadership. Program faculty are dedicated to meeting students' needs as current and future educational leaders and to preparing future professors for work in academia. The program provides a balance and integration of practical experience, theory, and research and aims to prepare educational leaders who function as scholar-practitioners. Educational leadership programs are offered at all of WSU's campuses (Pullman, Spokane, Tri-Cities, and Vancouver). All campuses offer the Educational Leadership Master's degrees, certification programs, and access to the statewide doctor of education degree (Ed.D.). One-year residency at the Pullman campus is required for the doctor of philosophy degree (Ph.D.). WSU's Educational Leadership program is one of 70 doctoral-granting programs nationwide selected for membership in the University Council for Educational Administration, a national consortium dedicated to the improvement of educational leadership preparation and practice. WSU's graduate students have the opportunity to participate in UCEA's annual convention and other professional activities. WSU's administrator certification

programs are organized around the national ISLLC (Interstate School Leaders Licensure Consortium) standards, which have been adopted as the certification standards for Washington State licensure. WSU's innovative cohort-based and field-based certification programs for principals and superintendents promote a close professional network. Faculty members for certification programs have extensive experience as school principals and/or central office administrators.

Degree Description

The Educational Leadership Master of Education (Ed.M.) is a non-thesis degree program designed for professional educators preparing for leadership positions in K-12 schools. It is offered at all four WSU campuses (Pullman, Spokane, Tri-Cities and Vancouver) and is closely aligned with the Principal and Program Administrator Certification program. Models for delivery of the master's program (e.g., sequencing of courses) differ slightly across the four campuses, although basic requirements for the degree are the same across the campuses.

Post-Graduate Employment Opportunities

K-12 administrator, preparation for advanced graduate study, administration in public or non-profit agency

Post-Graduate Career Placements

K-12 school district program administrator, principal, and teacher

Contact Information

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Faculty

Michele Acker-Hocevar, Gail Furman, Gordon Gates, Kristin Huggins, Joan Kingrey, Teena McDonald, Xyanthe Neider, Forrest Parkay, Gay Selby, Danny Talbot and Kelly Ward.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.

- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.

- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.

- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Early Childhood Leadership and Administration – Cert in Early Childhood Ldr Adm

Degree offered: Graduate Certificate in Early Childhood Leadership and Administration

Not Accepting Applications

WSU is not accepting applications for this degree at this time.

Requirements

Please see the program/department for more information.

Degree Description

Contact Information

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Economics

Degree offered: Doctor of Philosophy (Economics)

Faculty working with graduate students: 24

Graduate students: 68

Graduate students receiving assistantships or scholarships: 44%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10

Requirements

Must successfully complete three preliminary core exams (end of first year) Written Doctoral Examination Must complete two fields must complete one additional course elective

Program Description

The PhD in Economics is designed to prepare students for careers as professional economists in academia, government, and the private sector.

Degree Description

The PhD in Economics is designed to prepare students for careers as professional economists in academia, government, and the private sector. The program is structured so that a student with a Bachelor of Arts degree in Economics and an appointment as a graduate assistant should be able to complete the required coursework within three academic years, excluding summer sessions. Students with a Master of Arts in Applied Economics degree may be able to complete the required coursework in less time, depending on the content and quality of the previous work. The length of time required to complete the dissertation varies greatly but students usually complete the entire program, including the dissertation, within four years.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

Professional Economists in academia, government, and the private sector

Post-Graduate Career Placements

Health Research Scientist, Texas A&M Assistant Professor, Eastern Washington University Economist and Research Fellow, Center for Disease Control in Atlanta

Contact Information

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ECONS

- 500 Macroeconomic Theory I** 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I** 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II** 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II** 3 Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics** 3 Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making** 3 Managerial economics with specific applications to agricultural issues.
- 510 Statistics for Economists** 3 Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I** 3 Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II** 3 Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics** 3 Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I** 3 Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II** 3 Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V** 1-2 May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.

- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**

- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Educational Psychology

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 6

Graduate students: 13

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Requirements

Doctoral students with a specialization in educational psychology take a foundation set of courses. To provide in-depth education in the program in students select supporting coursework. This is done in consultation with the student's doctoral committee. Each student has the opportunity of individualizing the program of study to meet his/her professional goals that may include course work from other departments (e.g., Department of Human Development, Sociology, and Statistics).

Program Description

Individuals with training and experience in educational psychology have strong methodological skills and a deep understanding of learning theory to work on challenging educational problems. As a consequence, educational psychologists enjoy a wide variety of options for employment and career advancement in a variety of education and research settings. For example, educational

psychologists are highly sought after for jobs in industry, state agencies, laboratories, school districts, and universities. Simply stated, this intriguing field presents an ever-changing, challenging, and rewarding work environment. The work in such areas may be rewarded, for example, by the ability to make contributions to the improvement of educational settings (e.g., schools, universities), to have a direct influence on individuals through the development of programs, methods, and tools to meet their needs, or to provide information to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career.

Degree Description

The educational psychology program, with core requirements in research, evaluation, and measurement and learning theory, provides students with a solid academic foundation in educational measurement and evaluation. In 2009, the College of Education Learning and Performance Research Center (formally the Assessment and Evaluation Center) was established at WSU to provide leadership, training, consultation, and state-of-the-art solutions to challenging educational research questions at the university, state, national, and international levels. Assistantships for educational psychology students in the center provide unique opportunities to apply theoretical concepts and methodologies of program evaluation and educational and psychological measurement to specific practical projects in various educational settings through partnerships with school districts, state agencies, and other social service organizations. Successful professionals in this field have strong methodological skills, an understanding of researchable topics, the ability to develop a research program, the ability to communicate and work with a wide variety of professionals, and the skills to understand nuance and ambiguity in the work environment. Through faculty and student partnerships across campus, the program provides an exciting, interdisciplinary atmosphere for course and field study. Consistent with the scientist-practitioner model of professional training in psychology, students in the doctoral program in educational psychology are required to integrate the theoretical and research offerings of the university with substantial practicum and internship experiences by completing an internship directly related to the specific area of professional training.

Post-Graduate Employment Opportunities

Research, evaluation, and measurement positions at school districts, state education agencies, and universities; positions in the testing industry; researcher at national firms studying educational issues; assessment specialist at national foundation.

Post-Graduate Career Placements

Evaluator for Appalachian Education Laboratory, West Virginia; assessment specialist for the regional educational agency in Cedar Rapids, Iowa; assistant professor in measurement, statistics, and evaluation, Indiana State University; research scientist, Duke Energies, South Carolina; assistant professor of Educational Technology, Morehead State University, Minnesota; Project Director of Psychometrics, Applied Measurement Professionals.

Contact Information

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Faculty

Olusola Adesope, Jennifer Beller, Austin Church, Brian French, Gail Furman and Michael Trevisan.

COPSY

- 501 Historical and Philosophical Foundations of Counseling Psychology 3** Course Prerequisite: Admission to Counseling Psychology PhD program. History of counseling psychology; philosophical and psychological systems; current identity of counseling psychology as an academic discipline and a profession.
- 502 Social Psychology Foundations in Educational and Counseling Psychology 3** Social psychology with a special emphasis on the relevance to education and counseling psychology.
- 503 Community Counseling 3** Course Prerequisite: Graduate student in Community Counseling program. Counseling in community settings.
- 511 Theories, Research, and Techniques in Counseling Psychology I 3** Philosophical assumptions, theory of personality, counseling process, techniques and relevant research in the major theories of counseling and personality.
- 512 Counseling Techniques and Microskills 3** Course Prerequisite: COUN PSY 511. Foundation course for all clinical experiences in counseling; communication and interpersonal skills under faculty supervision will be emphasized.
- 513 Career Counseling: Theories and Methods 3** Theories, concepts, methods and findings in career counseling; vocational assessment and prediction.
- 515 Ethics and Professional Problems in Counseling Psychology 3** Professional problems; ethical, legal, and training issues, practices, and new issues.
- 516 Life Span Development and Counseling Issues 3** Major theories and issues in human development and their application to counseling practice including case conceptualization, treatment and intervention planning and psychological assessment and research.
- 517 Diagnoses, Psychopathology and Counseling Psychology 3** Course Prerequisite: COUN PSY 511. Psychopathology and the application of counseling theories to diagnoses, case conceptualization, assessments, treatment plans and research.
- 518 Theoretical Foundations of Group Counseling 3** Course Prerequisite: COUN PSY 512 or concurrent enrollment. History, philosophy and theoretical foundations; the group counselor, members, and issues in group counseling.

- 523 Topics in Counseling Psychology V** 1-4 May be repeated for credit; cumulative maximum 8 hours. Recent research, developments, issues, and/or applications in selected areas of counseling psychology.
- 525 Counseling Diverse Populations 3** Course Prerequisite: COUN PSY 512. Research and theories regarding the influence of culture, gender, and lifestyle on counseling processes; application of appropriate assessment/treatment strategies.
- 527 Individual Appraisal I 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Cognitive assessment of individuals, with an emphasis on the theoretical background and practical skills needed to administer, score, and interpret individual intelligence tests; assessment of learning disabilities, AD/HD, and individual achievement.
- 528 Individual Appraisal II 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Interpretation of representative personality assessment inventories and symptom checklists used in counseling practice; integration of results in psychological reports.
- 529 Counselor Supervision: Theory, Research, and Practice 3** Course Prerequisite: Admission to Counseling Psychology PhD program. Survey of major theoretical approaches, techniques, and research in models of counselor supervision and training.
- 531 Current Issues in School Counseling I 3** Course Prerequisite: Admission to MA program in School Counseling. Issues of immediate concern to school counselors: drug abuse, family violence, adolescent suicide, sexual orientation, crisis intervention, consultation and referral.
- 532 Current Issues in School Counseling II 3** Course Prerequisite: COUN PSY 531. Additional coverage of contemporary issues of concern to school counselors; comprehensive developmental school programs, school community dynamics, parental involvement, consultation.
- 533 Master's Internship in Community Counseling 4** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of counseling theory and techniques in an agency setting.
- 535 Master's Internship in School Counseling 4** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment. Supervised experience in the application of guidance and counseling theory and techniques in a school setting.
- 537 Professional Development in Counseling Psychology 3** NBCC requirements; growth and development, social and cultural foundations, the helping relationship, group dynamics, career, appraisal and research.
- 541 Clinical and Experimental Hypnosis Seminar 3** Course Prerequisite: Student in counseling, educational, experimental, or clinical psychology. Clinical and experimental hypnosis, emphasizing applied research and clinical methods.
- 542 Cross-cultural Research in Counseling and Assessment 3** Cross-cultural research methods, concepts, and findings in counseling and assessment.
- 551 Doctoral Practicum in Counseling Psychology I 4 (2-6)** Course Prerequisite: Admission to Counseling Psychology PhD program; COUN PSY 512; COUN PSY 513 or concurrent enrollment; COUN PSY 515 or concurrent enrollment; COUN PSY 517 or concurrent enrollment. Supervised experiences in the application of counseling psychology theory and techniques.
- 552 Doctoral Practicum in Counseling Psychology II 4 (2-6)** Course Prerequisite: COUN PSY 551. Supervised experiences in the application of counseling psychology theory and techniques.
- 553 Doctoral Practicum in Counseling Psychology III 4 (3-3)** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: COUN PSY 552. Supervised experiences in the application of counseling psychology theory and techniques.
- 561 Continuing Counseling ESA Certification V** 2-6 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Initial Counselor Certification; equivalent of 180 full days of school counselor experience; by department consent only. Peer review requirements for continuing level ESA Counselor Certification.
- 590 Seminar in Research in Counseling Psychology 3** Course Prerequisite: By interview only. Recent developments in counseling psychology research and design applied to PhD dissertation proposals.
- 596 Pet Loss and Human Bereavement 1** Addresses human bereavement and grief in the context of the human/animal relationship.
- 597 Counseling Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience, individual and group counseling, evaluation, assessment, supervision, and teaching.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- ED AD**
- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.

- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDRES**
- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

SOC

- 510 Development of Social Theory 3** Examination of the foundations of social theory.
- 517 Seminar in Contemporary Sociological Theory 3** Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 520 Research Methods in Sociology 3** Methodology of social research at the professional level.
- 521 Regression Models 3** Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.
- 522 Advanced Sociological Methodology 3** May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.
- 523 Qualitative Methods Practicum 3** Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.
- 525 Practicum in Survey Research 3** Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.
- 526 Experimental Methods 3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.
- 530 Demography 3** Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.
- 531 Human Ecology 3** Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.
- 532 Environmental Sociology 3** Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.
- 535 Technology and Society 3** Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.
- 536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.
- 542 Social Stratification: Class, Race and Gender Inequalities 3** Theoretical and empirical research in both classic stratification literature and recent scholarship on class, race/ethnicity and gender.
- 545 Sociology of Community 3** Community stability and change: interaction processes; decision making; societal linkages; effects on well-being.
- 553 Social Organization and the Family 3** The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.
- 554 Social Psychology of the Family 3** The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.
- 556 Sociology of Aging and the Life Course 3** Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.
- 574 Labor Market Inequality 3** Overview of research on the causes and consequences of inequality in U.S. work organizations.
- 580 Sociology of Race Relations 3** Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.
- 582 Social Movements 3** Theories and methods in social movement studies.
- 590 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 591 The Sociology Profession 1** May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.
- 592 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 593 Special Topics in Sociology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Educational Psychology

Degree offered: Master of Arts in Education

Faculty working with graduate students: 4

Graduate students: 5

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Program Description

Individuals with training and experience in educational psychology have strong methodological skills and a deep understanding of learning theory to work on challenging educational problems. As a consequence, educational psychologists enjoy a wide variety of options for employment and career advancement in a variety of education and research settings. For example, educational psychologists are highly sought after for jobs in industry, state agencies, laboratories, school districts, and universities. Simply stated, this intriguing field presents an ever-changing, challenging, and rewarding work environment. The work in such areas may be rewarded, for example, by the ability to make contributions to the improvement of educational settings (e.g., schools, universities), to have a direct influence on individuals through the development of programs, methods, and tools to meet their needs, or to provide information to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career.

Degree Description

The Ed.M. and M.A. degrees with specialization in educational psychology are a concentration in research, evaluation, psychometrics, and cognition. While students at the Master's level in educational psychology complete a common core of courses, a portion of each Master's degree program is composed of courses selected by the student and his/her advisory committee to tailor the program of study around the student's personal interests and professional aspirations. M.A. or Ed.M. recipients in educational psychology are well prepared to continue doctoral level training if so desired. However, an M.A. or Ed.M. would give access to entry level positions in this intriguing field that presents an ever-changing, challenging, and rewarding work environment. The M.A. and the Ed.M. are both options available to a student. The M.A. does require the completion of a written thesis, whereas the Ed.M. requires an examination. The former is encouraged if a student is considering the pursuit of a doctoral degree. The work in such areas may include for example, the opportunity to make contributions to the improvement of educational settings (e.g., schools, universities), to have some influence on individuals through consultation on programs, methods, or to provide information through analysis to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career in employment in private firms, school districts, business, industry, or state agencies as program evaluators, student assessment coordinators, research technicians, or data analysts, as examples.

Post-Graduate Employment Opportunities

Research, evaluation, and measurement positions at school

districts, state education agencies, and universities; positions in the testing industry; researcher at national firms studying educational issues; assessment specialist at national foundation.

Post-Graduate Career Placements

Evaluator for Appalachian Education Laboratory, West Virginia; assessment specialist for the regional educational agency in Cedar Rapids, Iowa; assistant professor in measurement, statistics, and evaluation, Indiana State University; research scientist, Duke Energies, South Carolina; assistant professor of Educational Technology, Morehead State University, Minnesota; Project Director of Psychometrics, Applied Measurement Professionals.

Contact Information

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Faculty

Olusola Adesope, Brian French, Jessica Lester and Michael Trevisan.

EDPSY

- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.

- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conduction systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Educational Psychology

Degree offered: Master of Arts in Education – Non Thesis

Faculty working with graduate students: 4

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10
Spring: July 1

Requirements

None

Program Description

Individuals with training and experience in educational psychology have strong methodological skills and a deep understanding of learning theory to work on challenging educational problems. As a consequence, educational psychologists enjoy a wide variety of options for employment and career advancement in a variety of education and research settings. For example, educational psychologists are highly sought after for jobs in industry, state agencies, laboratories, school districts, and universities. Simply stated, this intriguing field presents an ever-changing, challenging, and rewarding work environment. The work in such areas may be rewarded, for example, by the ability to make contributions to the improvement of educational settings (e.g., schools, universities), to have a direct influence on individuals through the development of programs, methods, and tools to meet their needs, or to provide information to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career.

Degree Description

The Ed.M. and M.A. degrees with specialization in educational psychology are a concentration in research, evaluation, psychometrics, and cognition. While students at the Master's level in educational psychology complete a common core of courses, a

portion of each Master's degree program is composed of courses selected by the student and his/her advisory committee to tailor the program of study around the student's personal interests and professional aspirations. M.A. or Ed.M. recipients in educational psychology are well prepared to continue doctoral level training if so desired. However, an M.A or Ed.M. would give access to entry level positions in this intriguing field that presents an ever-changing, challenging, and rewarding work environment. The M.A. and the Ed.M. are both options available to a student. The M.A. does require the completion of a written thesis, whereas the Ed.M. requires an examination. The former is encouraged if a student is considering the pursuit of a doctoral degree. The work in such areas may include for example, the opportunity to make contributions to the improvement of educational settings (e.g., schools, universities), to have some influence on individuals through consultation on programs, methods, or to provide information through analysis to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career in employment in private firms, school districts, business, industry, or state agencies as program evaluators, student assessment coordinators, research technicians, or data analysts, as examples. 4000 Character Limit.

Post-Graduate Employment Opportunities

Research, evaluation, and measurement positions at school districts, state education agencies, and universities; positions in the testing industry; researcher at national firms studying educational issues; assessment specialist at national foundation

Post-Graduate Career Placements

Evaluator for Appalachian Education Laboratory, West Virginia; assessment specialist for the regional educational agency in Cedar Rapids, Iowa; assistant professor in measurement, statistics, and evaluation, Indiana State University; research scientist, Duke Energies, South Carolina; assistant professor of Educational Technology, Morehead State University, Minnesota; Project Director of Psychometrics, Applied Measurement Professionals

Contact Information

Office of Graduate Studies
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Faculty

Olusola Adesope, Brian French, Jessica Lester and Michael Trevisan.

EDPSY

502 Theoretical Foundations of Learning and Instruction 3 Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.

- 503 Advanced Educational Psychology** 3 Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods** 2 Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I** 3 Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics** 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment** V 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning** 3 Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research** 3 The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research** 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research** 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design** 3 Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education** V 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation** 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation** 3 Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.

- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Educational Psychology

Degree offered: Master of Education

Faculty working with graduate students: 4

Graduate students: 1

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Program Description

Individuals with training and experience in educational psychology

have strong methodological skills and a deep understanding of learning theory to work on challenging educational problems. As a consequence, educational psychologists enjoy a wide variety of options for employment and career advancement in a variety of education and research settings. For example, educational psychologists are highly sought after for jobs in industry, state agencies, laboratories, school districts, and universities. Simply stated, this intriguing field presents an ever-changing, challenging, and rewarding work environment. The work in such areas may be rewarded, for example, by the ability to make contributions to the improvement of educational settings (e.g., schools, universities), to have a direct influence on individuals through the development of programs, methods, and tools to meet their needs, or to provide information to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career.

Degree Description

The Ed.M. and M.A. degrees with specialization in educational psychology are a concentration in research, evaluation, psychometrics, and cognition. While students at the Master's level in educational psychology complete a common core of courses, a portion of each Master's degree program is composed of courses selected by the student and his/her advisory committee to tailor the program of study around the student's personal interests and professional aspirations. M.A. or Ed.M. recipients in educational psychology are well prepared to continue doctoral level training if so desired. However, an M.A. or Ed.M. would give access to entry level positions in this intriguing field that presents an ever-changing, challenging, and rewarding work environment. The M.A. and the Ed.M. are both options available to a student. The M.A. does require the completion of a written thesis, whereas the Ed.M. requires an examination. The former is encouraged if a student is considering the pursuit of a doctoral degree. The work in such areas may include for example, the opportunity to make contributions to the improvement of educational settings (e.g., schools, universities), to have some influence on individuals through consultation on programs, methods, or to provide information through analysis to individuals who shape policy. Experienced individuals in this profession can expect to earn a good salary and maintain an interesting and fulfilling career in employment in private firms, school districts, business, industry, or state agencies as program evaluators, student assessment coordinators, research technicians, or data analysts, as examples.

Post-Graduate Employment Opportunities

Research, evaluation, and measurement positions at school districts, state education agencies, and universities; positions in the testing industry; researcher at national firms studying educational issues; assessment specialist at national foundation

Post-Graduate Career Placements

Evaluator for Appalachian Education Laboratory, West Virginia; assessment specialist for the regional educational agency in Cedar Rapids, Iowa; assistant professor in measurement, statistics, and evaluation, Indiana State University; research scientist, Duke Energies, South Carolina; assistant professor of Educational Technology, Morehead State University, Minnesota; Project Director of Psychometrics, Applied Measurement Professionals.

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May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Electrical Engineering

Degree offered: Doctor of Philosophy (Electrical and Computer Engineering)

Faculty working with graduate students: 36

Graduate students: 41

Graduate students receiving assistantships or scholarships: 73%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10th

Spring: July 1st

Requirements

Qualifying Examination in 3rd Semester

Program Description

WSU's reputation for high-quality education, research, and public service enables it to continue achieving its missions. Graduate students play an essential part in carrying out the School's mission to conduct research that will make a difference to industry, government, and society. Graduate-level programs in electrical and computer engineering include power engineering; microelectronics; electromagnetics and optical communications, control, and signal processing; embedded systems and software engineering.

Degree Description

WSU's reputation for high-quality education, research, and public service enables it to continue achieving its missions. Graduate students play an essential part in carrying out the School's mission to conduct research that will make a difference to industry, government, and society. Graduate-level programs in electrical and computer engineering include power engineering; microelectronics; electromagnetics and optical communications, control, and signal processing; embedded systems and software engineering.

Contact Information

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Academic coordinator

EECS

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Faculty

Roger Alexander, David Bakken, Benjamin Belzer, Anjan Bose, Shira Broschat, Diane Cook, Zhe Dang, Jose Delgado-Frias, Thomas Fischer, Carl Hauser, Deuk Heo, Lawrence Holder, Scott Hudson, Christopher Hundhausen, Sankar Jayaram, Anantharaman Kalyanaraman, Min Kim, George Larue, Robert Lewis, Chen-Ching Liu, John Miller, Robert Olsen, Mohamed Osman, Partha Pande, Patrick Pedrow, John Ringo, Sandip Roy, Ali Saberi, John Schneider, Behrooz Shirazi, Krishnamoorthy Sivakumar, Wenzhan Song, Anurag Srivastava, Li Tan, Vaithianath Venkatasubramanian and Kung-Chi Wang.

Electrical Engineering

E E

- 501 Linear System Theory 3** Dynamic systems from the state variable approach; observability, controllability, stability, and sensitivity of differential and nondifferential systems.
- 502 Linear Multivariable Control 3** Course Prerequisite: E E 501. Optimal linear feedback control, optimal stochastic observers, LQG/LTR design methodology, modern Wiener-Hopf design, robust controllers.
- 503 Structure, Dynamics and Control of Large-scale Networks 3** Course Prerequisite: E E 501; E E 507. Introduction and development of computational and analytical methods required to characterize large-scale networks.
- 504 Modern Optics 3** Diffraction theory, Fourier transforming and imaging properties of lenses, spatial filtering, holography, temporal and spatial coherence, imaging through random media.
- 505 Nonlinear System Theory 3** Course Prerequisite: E E 501. Overview of nonlinear phenomena, Lyapunov stability, input-output stability, periodic orbits, singular perturbation, differential geometric methods, bifurcations and complex behaviors.
- 507 Random Processes in Engineering 3** Functions of random variables; random sequences; stochastic processes; mean-square stochastic calculus; ergodicity; spectral density; linear transformations, filtering, dynamic systems.
- 508 Estimation Theory for Signal Processing, Communications, and Control 3** Course Prerequisite: E E 501; E E 507. Principles of statistical estimation; LLSE; Kalman filtering; smoothing; prediction; maximum-likelihood and Bayesian estimation.
- 509 Adaptive Control 3** Course Prerequisite: E E 501. Model reference adaptive systems (MRAS), adaptive observers, adaptive control, on-line identification, robustness issues, and self-tuning regulators.
- 511 Protection of Power Systems II 3** Protection of electrical equipment as related to electric power systems with emphasis on digital algorithms.
- 518 Advanced Electromagnetic Theory I 3** Electromagnetic waves, electromagnetic theorems and concepts, solutions to the wave equation in rectangular, cylindrical and spherical coordinates.
- 520 Plasma Engineering 3** Electromagnetics, kinetic theory, and fluid mechanics of plasmas in space, arcs, plasma processing, coronas, and fusion reactors.

- 521 Analysis of Power Systems 3** Concepts and practices of modern power engineering, including steady-state and dynamic analysis, economics and control design.
- 523 Power Systems Stability and Control 3** Dynamic analysis of interconnected electric power system; modeling of synchronous generators, loads and transmission network; small-signal stability and transient stability analysis; dynamic stability controls.
- 524 Advanced Computer Architecture 3** Instruction set architectures, pipelining and super pipelining, instruction level parallelism, superscalar and VLIW processors, cache memory, thread-level parallelism and VLSI.
- 525 Power System Applications of Power Electronics 3** Course Prerequisite: E E 521. Power electronic converters in modern power systems, FACTS devices, HVDC, compensation; microgrids and integration renewable energy resources; modeling and control.
- 527 Antenna Theory and Design 3** Antenna fundamentals, analytical techniques, characteristics and design procedures for selected types of wire, broadband, and aperture antennas.
- 528 Advanced Topics in Electromagnetics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topics of current interest in wave propagation (electromagnetics, acoustics, or optics).
- 530 Digital Signal Processing II 3** Course Prerequisite: E E 507. Frequency selective digital filtering, least-squares filtering, adaptive filtering, multirate signal processing.
- 535 Numerical Solutions to EM Problems 3** Theory and use of finite-difference time-domain; numeric dispersion; absorbing boundary conditions; scattering; radiation; time-domain vs. frequency-domain.
- 536 Power Systems Economics and Electricity Markets 3** Economic dispatch and optimal power flow; electricity market; short-term load forecasting; electricity price forecasting; price-based unit commitment; arbitrage in electricity markets; market power analysis.
- 545 Data Compression 3** Course Prerequisite: E E 507. Source coding with a fidelity criterion; quantization theory; predictive, transform and subband coding; noiseless source codes.
- 548 Information Theory and Channel Coding 3** Course Prerequisite: E E 507. Information theory; entropy, mutual information, source and channel coding theorems, channel capacity, Gaussian channels; channel coding: block and convolutional codes.
- 551 Data Communication Systems 3** Course Prerequisite: E E 507. Digital communications; multi-amplitude/phase signal constellations; probability of error performance; cutoff rate; Viterbi algorithm; trellis coded modulation.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 571 Advanced Wireless Integrated Circuits and Systems 3** Analysis and design methodologies of state-of-the-art wireless integrated circuits and systems.
- 576 Analog Integrated Circuits 3** Analysis and design of analog integrated circuits in CMOS and BiCMOS technologies; current mirrors, gain stages, operational amplifiers, frequency response, and compensation.
- 581 Advanced Topics in Power Systems V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E E 521. Power system operations including AGC, economic dispatch and security; power system dynamics; intelligent systems applications.
- 582 Advanced Topics V 1-3** May be repeated for credit.
- 586 VLSI Systems Design 3** VLSI models, layout algorithms, design methodologies, simulation and layout tools, algorithm design for VLSI implementation.
- 587 System on Chip (SoC) Design and Test 3** System on Chip (SoC) and sub-micron integrated circuit design and testing.
- 595 Directed Study in Electrical Engineering V 1 (0-3) to 3 (0-9)** May be repeated for credit. Current topics in electrical engineering.
- 596 Advanced Analog Integrated Circuits 3** MOS and BiCMOS technologies; MOS and BiCMOS operational amplifiers; A/D, D/A converters; switched-capacitor filters; continuous-time filters.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Electrical Engineering

Degree offered: Master of Science in Electrical Engineering

Faculty working with graduate students: 36

Graduate students: 41

Graduate students receiving assistantships or scholarships: 73%

Program offered: Pullman, Spokane, Tri-Cities

Tests required: TOEFL, GRE (Combined)

Deadline: Fall: January 10th

Spring: July 1st

Requirements

The program must consist of 30 or more hours of credit including 21 or more hours of coursework for which a grade of A-F is given and nine or more credits of thesis research (EE 700).

Program Description

WSU's reputation for high-quality education, research, and public service enables it to continue achieving its missions. Graduate students play an essential part in carrying out the School's mission to conduct research that will make a difference to industry, government, and society. Graduate-level programs in electrical and computer engineering include power engineering; microelectronics; electromagnetics and optical communications, control, and signal processing; embedded systems and software engineering.

Degree Description

The program must consist of 30 or more hours of credit including 21 or more hours of coursework for which a grade of A-F is given and nine or more credits of thesis research (EE 700). Under the thesis option (all programs), the student is expected to complete a significant research project and submit a thesis, which adheres to EECS standards and the formatting requirements of the advisory committee and the Graduate School. The thesis work should be submitted for refereed publication prior to scheduling the final exam. It is the student's responsibility to meet the deadlines specified by the Graduate School. All students on financial aid from WSU must choose the thesis option.

Post-Graduate Employment Opportunities

The success of our graduate students in industry and higher education reflects the excellence of the School of EECS and its programs. In industry, our graduate degree holders are presidents, CEOs, CIOs, vice presidents, directors, and division and department managers. Some have founded at least one company and initiated and promoted new technologies, operations and sales strategies. Others have excelled as senior designers, project managers, senior scientists, and lead engineers. In higher education, they are professors, deans, and research directors. Graduate degrees have enriched their lives and careers, while affecting positively the economy of the state and nation. All are excellent role models for their peers and our students.

Post-Graduate Career Placements

Microsoft, Boeing, Intel, PNNL

Contact Information

Sidra Gleason

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Electrical Engineering & Computer Science

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Engineering

Degree offered: Master of Science in Engineering

Faculty working with graduate students: 5

Graduate students: 7

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

This is an interdisciplinary program administered through the College of Engineering and Architecture's Office of the Associate Dean of Research and Graduate Programs, with students typically advised and funded through one of several departments in the College. The interdisciplinary nature of this degree provides considerable flexibility in designing programs of study tailored to the specialized needs of each student. Areas of specialization include (but are not limited to): biological systems engineering, atmospheric research, materials science and engineering, and bioengineering. These students often work in one of our interdisciplinary centers such as: Bioengineering Research Center (BRC), Center for Environmental, Sediment, and Aquatic Research (CESAR), Center for Environmental Education and Outreach (CEREO), Center for Materials Research (CMR), Engineering Education Research Center (EERC), Laboratory for Atmospheric Research (LAR), and the Wood Materials Research Lab (WMEL). Thesis and non-thesis options are available in the M.S. degree program.

Degree Description

These interdisciplinary programs are administered through the College of Engineering and Architecture's Office of the Associate Dean of Research and Graduate Programs, with students typically advised and funded through one of several departments in the College. The interdisciplinary nature of these degrees provides considerable flexibility in designing programs of study tailored to the specialized needs of each student. Areas of specialization include (but are not limited to): biological systems engineering, atmospheric research, materials science and engineering, and bioengineering. These students often work in one of our interdisciplinary centers such as: Bioengineering Research Center (BRC), Center for Environmental, Sediment, and Aquatic Research (CESAR), Center for Environmental Education and Outreach (CEREO), Center for Materials Research (CMR), Engineering Education Research Center (EERC), Laboratory for Atmospheric Research (LAR), and the Wood Materials Research Lab (WMEL). Thesis and non-theses options are available in the M.S. degree program.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

Christopher Gass

Program Coordinator

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Faculty

Shulin Chen, Manuel Garcia-Perez, Claudio Stockle, Anita Vasavada and Joan Wu.

Engineering

Degree offered: Master of Science in Engineering – Non Thesis

Faculty working with graduate students: 4

Graduate students: 4

Graduate students receiving assistantships or scholarships: 25%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

No additional requirements.

Program Description

This is an interdisciplinary program administered through the College of Engineering and Architecture's Office of the Associate Dean of Research and Graduate Programs, with students typically advised and funded through one of several departments in the College. The interdisciplinary nature of this degree provides considerable flexibility in designing programs of study tailored to the specialized needs of each student. Areas of specialization include (but are not limited to): biological systems engineering, atmospheric research, materials science and engineering, and bioengineering. These students often work in one of our interdisciplinary centers such as: Bioengineering Research Center (BRC), Center for Environmental, Sediment, and Aquatic Research (CESAR), Center for Environmental Education and Outreach (CEREO), Center for Materials Research (CMR), Engineering Education Research Center (EERC), Laboratory for Atmospheric Research (LAR), and the Wood Materials Research Lab (WMEL). Thesis and non-theses options are available in the M.S. degree program.

Degree Description

This is an interdisciplinary program administered through the

College of Engineering and Architecture's Office of the Associate Dean of Research and Graduate Programs, with students typically advised and funded through one of several departments in the College. The interdisciplinary nature of this degree provides considerable flexibility in designing programs of study tailored to the specialized needs of each student. Areas of specialization include (but are not limited to): biological systems engineering, atmospheric research, materials science and engineering, and bioengineering. These students often work in one of our interdisciplinary centers such as: Bioengineering Research Center (BRC), Center for Environmental, Sediment, and Aquatic Research (CESAR), Center for Environmental Education and Outreach (CEREO), Center for Materials Research (CMR), Engineering Education Research Center (EERC), Laboratory for Atmospheric Research (LAR), and the Wood Materials Research Lab (WMEL). Thesis and non-theses options are available in the M.S. degree program

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

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Faculty

Shulin Chen, Shyam Sablani, Anita Vasavada and Joan Wu.

Engineering and Technology Management

Degree offered: Master of Engineering and Technology Management

Faculty working with graduate students: 9

Graduate students: 100

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)
Spring: November 1 (July 1 international)
Summer: March 15 (Default international)

Requirements

Students must complete six classes from the core areas of study and four electives to equal 10 classes (30 graded credits); and students must choose either a 3 credit comprehensive exam or a 4+ credit project. Students must enroll in two hours of E M 702 the final semester regardless of which option they choose.

Program Description

Washington State University's Engineering and Technology Management (ETM) Program is designed for working professionals who want to develop skills to manage technology and people. The program prepares engineering and business professionals to make strategic and operational decisions and become leaders in the management of technology. Courses are designed to provide practicing engineers with the knowledge, tools, and skills to become proficient managers of projects, operations, organizations, and people. The ETM program is specifically tailored for professionals who want to advance their careers while still working full time. Live, online lectures are available from anywhere and at any time. Students will focus on: Customer-oriented approaches global technology and innovation strategies, performance management in technical organizations, management of scarce resources, interdisciplinary team approach

Degree Description

A Master's Degree in Engineering and Technology Management (METM) requires 30 semester hours (10 courses) of course work and three to four+ credits of a final non-thesis project report or comprehensive exam (E M 702). The program is interdisciplinary, with course offerings in engineering management and technology related business courses. E M courses are delivered via the Internet to students worldwide. Elluminate Web conferencing software allows faculty and students to interact and collaborate in a virtual classroom environment in real-time. Each class session is a self-contained Webinar presented and facilitated by your instructor. All course webinars are presented and managed using WSU's Angel Learning Management System, a Web-enabled course hosting platform. Students must be familiar with the software used in the METM Program before taking classes. Links are posted on the program web site.

Training and Professional Development Opportunities

Students may choose either one of the many graduate certificates or the full master of engineering and technology management degree. Many students earn one or more certificates while working towards the Master's degree. Others begin in the certificate program and migrate to a full degree program.

Post-Graduate Employment Opportunities

The Master of Engineering and Technology Management Program (METM) prepares engineering and business professionals to make strategic and operational decisions and become leaders in the management of technology. The program provides technology team managers with the knowledge, tools, and skills to become proficient managers of projects, operations, organizations, and people. The program is specifically tailored for professionals who want to advance their careers while still working fulltime.

Contact Information

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Faculty

Rick Cherf, Robert Crick, William Gray, James Holt, Luna Magpili, David Paulus, John Ringo, Hal Rumsey and George Sudikatus.

Engineering Management

E M

- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.
- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Engineering Nanotechnology – Cert in Eng Nanotechnology

Degree offered: Graduate Certificate in Engineering Nanotechnology

Faculty working with graduate students: 30

Graduate students: 5

Program offered: Pullman, Tri-Cities

Deadline: Fall: January 10

Spring: July 1

Requirements

The student must complete a minimum of 9 credits from the following list of 3-credit courses: ME 509 MEMS Engineering, ME 520 Multiscale Modeling, MSE 506 Biomaterials, MSE 508 Polymer Nanocomposites and Functionalities, MSE 517 Thin Films, MSE 592 Transmission Electron Microscopy. Note: courses in which a grade of B- or below is obtained may not count towards completion of the requirements.

Program Description

Nanotechnology is the vanguard of a revolution in technology and industry. Fundamental nanoscale processes, nanomaterials, nanoscale devices and systems, and instrumentation for nanotechnology have been identified as key component areas by the National Nanotechnology Initiative. This certificate program is designed for working professionals who wish to develop expertise in this emerging technology to advance their careers or graduate students who wish to have an emphasis in this area. The program will provide a suite of classes that will offer a focused and comprehensive emphasis in engineering nanotechnology.

Degree Description

This certificate program is designed for working professionals who wish to develop expertise in this emerging technology to advance their careers or graduate students who wish to have an emphasis in this area. Students must complete a minimum of nine credits from a specific list of three-credit 500-level courses found at <http://www.mme.wsu.edu/grad/certificate.html>.

Post-Graduate Employment Opportunities

This certificate program is designed for working professionals who wish to develop expertise in this emerging technology to advance their careers or graduate students who wish to have an emphasis

in this area.

Contact Information

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Faculty

Gaurav Ameta, Stephen Antolovich, David Bahr, Amit Bandyopadhyay, Susmita Bose, Jow-Lian Ding, Indranath Dutta, Prashanta Dutta, Karl Englund, David Field, Sankar Jayaram, Uma Jayaram, William Kinsel, Jacob Leachman, David Lin, Kelvin Lynn, Konstantin Matveev, Sinisa Mesarovic, Changki Mo, M Norton, Jitesh Panchal, Charles Pezeshki, Cecilia Richards, Robert Richards, Lloyd Smith, Anita Vasavada, Michael Wolcott, Hussein Zbib, Jinwen Zhang and Weihong Zhong.

Mechanical Engineering

M E

- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.

- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Materials Science and Engineering**
- MSE**
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.

- 509 MEMS Engineering 3** (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elasto-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Engineering Science

Degree offered: Doctor of Philosophy (Engineering Science)

Faculty working with graduate students: 32

Graduate students: 32

Graduate students receiving assistantships or scholarships: 90%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

These interdisciplinary programs are administered through the College of Engineering and Architecture's Office of the Associate Dean of Research and Graduate Programs, with students typically advised and funded through one of several departments in the College. The interdisciplinary nature of these degrees provides considerable flexibility in designing programs of study tailored to the specialized needs of each student. Areas of specialization include (but are not limited to): biological systems engineering, atmospheric research, materials science and engineering, and bioengineering. These students often work in one of our interdisciplinary centers such as: Bioengineering Research Center (BRC), Center for Environmental, Sediment, and Aquatic Research (CESAR), Center for Environmental Education and Outreach (CEREO), Center for Materials Research (CMR), Engineering Education Research Center (EERC), Laboratory for Atmospheric Research (LAR), and the Wood Materials Research Lab (WMEL).

Degree Description

These interdisciplinary programs are administered through the College of Engineering and Architecture's Office of the Associate Dean of Research and Graduate Programs, with students typically advised and funded through one of several departments in the College. The interdisciplinary nature of these degrees provides considerable flexibility in designing programs of study tailored to the specialized needs of each student. Areas of specialization include (but are not limited to): biological systems engineering, atmospheric research, materials science and engineering, and bioengineering. These students often work in one of our interdisciplinary centers such as: Bioengineering Research Center (BRC), Center for Environmental, Sediment, and Aquatic Research (CESAR), Center for Environmental Education and Outreach (CEREO), Center for Materials Research (CMR), Engineering Education Research Center (EERC), Laboratory for Atmospheric Research (LAR), and the Wood Materials Research Lab (WMEL).

Training and Professional Development Opportunities

National lab and private industry internships.

Post-Graduate Employment Opportunities

Opportunities include careers in the sciences, engineering, and technology, both in government labs, academia, and industry.

Contact Information

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Faculty

Nehal Abu-Lail, Birgitte Ahring, David Bahr, Gustavo Barbosa-Canovas, Haluk Beyenal, Susmita Bose, Shane Brown, Shulin Chen, Denny Davis, Wenji Dong, Prashanta Dutta, David Field, Manuel Garcia-Perez, Md Hossain, B Jobson, Brian Lamb, David Lin, Kelvin Lynn, George Mount, Pius Ndegwa, M Norton, James Petersen, Shyam Sablani, Claudio Stockle, Juming Tang, Jeffrey Ullman, Timothy Vanreken, Bernard Vanwie, Anita Vasavada, Richard Watts, Michael Wolcott and Joan Wu.

English

Degree offered: Doctor of Philosophy (English)

Faculty working with graduate students: 36

Graduate students: 23

Graduate students receiving assistantships or scholarships: 91%

Tests required: GRE (Verbal), GRE (Quantitative), TOEFL

Deadline:

Fall: January 10

Requirements

Qualifying exams (written); dissertation prospectus

Program Description

The Department of English at Washington State University offers graduate programs leading to the degrees of Master of Arts (M.A.) and Doctor of Philosophy (Ph.D.). Providing opportunities for diverse coursework and extensive pedagogical training, these programs emphasize interpretive and critical thinking, breadth of disciplinary preparation, grounding in current theory and methodology, and respect for the value of multiple perspectives. Students may elect to concentrate either on literary study (British, American, and postcolonial Anglophone literatures) or on rhetoric and composition. The English Department also participates in Washington State's interdisciplinary American Studies program, which offers opportunities for M.A. and Ph.D. students to take specialized seminars in American Studies. All students admitted to the various M.A. and Ph.D. programs will have been carefully selected from pools of applicants. They are expected to pursue their degree programs with success and to earn the M.A. degree in two years and the Ph.D. in four. The final oral examination - the culmination of all degree programs - is understood to be a conversation among colleagues, a forum in which the candidate discusses his or her own scholarly goals and asks questions as well as answering them. The intent is that it serve as a welcome into the profession of English studies.

Degree Description

Students entering the Ph.D. program in English are expected to

have completed a master's degree in English or in a related field of study at an accredited college or university, and to show promise of doing excellent work at the doctoral level. Students who complete a master's degree at WSU must reapply for admission to the Ph.D. program. Ph.D. candidates must demonstrate general competence in two foreign languages or advanced competence in one (see Language Proficiency Requirements, below). All doctoral students are expected to take part actively in planning their own literary and language programs and in meeting deadlines set by the department and by the WSU Graduate School. The objective of the Ph.D. program - including concentrations either in literature or in rhetoric and composition - is to prepare scholars for employment in a wide variety of post-secondary institutions of learning by providing both generalized and specialized training in literary/cultural theory and criticism, as well as opportunities to develop critical and research skills in literary and intellectual history, rhetorical theory, genre studies, composition studies, pedagogical theory, linguistics, and other related fields. The Ph.D. candidate's course of study is not designed to confront the student with every significant piece of writing in the respective field (i.e., English and American literature or rhetoric and composition). Rather, the coursework aims to produce mature critics and scholars who are widely read in English and American literature, knowledgeable about the methods of systematic scholarship, and competent to function professionally, not only in the modern university, but also in related research institutions such as historical societies, museums, and publishing firms.

Training and Professional Development Opportunities

See <http://libarts.wsu.edu/english/PhD.html>

Post-Graduate Career Placements

See <http://libarts.wsu.edu/english/After%20graduation.html>

Contact Information

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Faculty

Christopher Arigo, Kristin Arola, Nancy Bell, Todd Butler, Beth Buyserie, Donna Campbell, Peter Chilson, William Condon, Andrea Davis, Michael Delahoyde, Robert Eddy, Patricia Ericsson, Lynn Gordon, Rudyne Grigar, William Hamlin, Michael Hanly, Jon Hegglund, Desiree Hellegers, Crag Hill, Wendy Johnson, George Kennedy, Linda Kittell, Debbie Lee, Lynn Levy, Thabiti Lewis, Louis McAuley, David Menchaca, Barbara Monroe, Pavithra Narayanan, Aaron Oforlea, Wendy Olson, Thomas Reed, Augusta Rohrbach, Susan Ross, Carol Siegel and Elizabeth Siler.

ENGL

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- 512 Introduction to Graduate Study 3**
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- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

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English

Degree offered: Master of Arts in English

Faculty working with graduate students: 36

Graduate students: 21

Graduate students receiving assistantships or scholarships: 95%

Tests required: GRE (Verbal), GRE (Quantitative), TOEFL

Deadline:

Fall: January 10

Program Description

The Department of English at Washington State University offers graduate programs leading to the degrees of Master of Arts (M.A.) and Doctor of Philosophy (Ph.D.). Providing opportunities for diverse coursework and extensive pedagogical training, these programs emphasize interpretive and critical thinking, breadth of disciplinary preparation, grounding in current theory and methodology, and respect for the value of multiple perspectives. Students may elect to concentrate either on literary study (British, American, and postcolonial Anglophone literatures) or on rhetoric and composition. The English Department also participates in Washington State's interdisciplinary American Studies program, which offers opportunities for M.A. and Ph.D. students to take specialized seminars in American Studies. All students admitted to the various M.A. and Ph.D. programs will have been carefully selected from pools of applicants. They are expected to pursue their degree programs with success and to earn the M.A. degree in two years and the Ph.D. in four. The final oral examination - the culmination of all degree programs - is understood to be a conversation among colleagues, a forum in which the candidate discusses his or her own scholarly goals and asks questions as well as answering them. The intent is that it serve as a welcome into the profession of English studies.

Degree Description

Master of Arts in English: Literature Emphasis This broad program provides a solid foundation for more specialized doctoral study in English or American literature, American studies, comparative literature, or postcolonial anglophone literatures, as well as for professional training in such areas as law, information technology, divinity, journalism, and business. Students pursuing an M.A. in literature may choose either to write a thesis or to prepare a final

portfolio. Master of Arts in English: Rhetoric and Composition Emphasis This program allows students to specialize in the theory and pedagogy of composition. The degree is designed to prepare candidates for teaching positions at the college level or for doctoral programs with a specialization in composition and rhetoric. Language proficiency requirements are based on the candidate's expected needs and may be met by linguistics or other language studies. Candidates in this degree option must fulfill the following requirements.

Training and Professional Development Opportunities

See <http://libarts.wsu.edu/english/malit.html> See <http://libarts.wsu.edu/english/marketcomp.html>

Post-Graduate Career Placements

See <http://libarts.wsu.edu/english/After%20graduation.html>

Contact Information

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Program Coordinator
English
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Faculty

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English

Degree offered: Master of Arts in English – Non Thesis

Faculty working with graduate students: 36

Graduate students: 21

Graduate students receiving assistantships or scholarships: 95%

Tests required: GRE (Verbal), GRE (Quantitative), TOEFL

Deadline:

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Post-Graduate Career Placements

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Contact Information

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Entomology

Degree offered: Doctor of Philosophy (Entomology)

Faculty working with graduate students: 28

Graduate students: 30

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI, IELTS

Deadline: Fall: March 25

Spring: October 25

Requirements

Collegiate teaching experience is required. This can include the preparation, introductory remarks and conduct of at least three lecture or lab sessions for an entomology course. Doctoral students are required to participate in at least five 1-credit seminars. Courses: Students may choose between GEOL 102, Soils 413, Phys 101 or Phys 102 for the Physical Science requirement. Students may choose between ENTOM 340, 361, 545, 546, 548, 572 or IPM 201, 452 or 462 for the Applied Entomology requirement. Students may choose between ENTOM 539 or 540 for the Taxonomy requirement. Students may choose between MBIOS 303 or 514 for the Biochemistry requirement.

Program Description

The Entomology Program at Washington State University provides students the opportunity to work on real world issues that support

a safe, sustainable and abundant food supply; address human and animal health issues; and protect many other natural resources. Entomology graduate students are able to tailor their individual research program based on their specific interests. The Entomology Graduate Program encourages the interaction of students with leaders in the field of entomology locally, nationally and world-wide. We have an excellent history of producing graduates who go on to lucrative careers in their area of expertise and to professionally follow their passions.

Degree Description

The Department of Entomology offers graduate programs leading to Doctoral and Master of Science degrees. The curriculum provides the opportunity to study the basic and applied aspects of the science. Facilities and training are available for graduate study in major areas of entomology, including (but not limited to) apiculture; behavior; integrated biological control and sustainable pest management; ecology; forest entomology; insect/plant interactions; medical/veterinary entomology; population genetics; physiology; systematic; biological diversity and environmental toxicology. Departmental faculty, adjunct faculty, and affiliate faculty may all serve as student advisors. Faculty are housed both on campus and at Research and Extension Centers throughout the state; the ability to significantly interact with both on- and off-campus advisors and mentors offers students opportunities and perspectives not available in most programs. We maintain strong cooperative interactions with the USDA ARS lab in Yakima, Washington. Students whose major advisor resides at a Research and Extension Center (Wenatchee, Prosser, Puyallup, Mt. Vernon or USDA Wapato) typically come to Pullman for at least two semesters then relocate to the center where they will conduct their research and take the remainder of their coursework via AMS/WECN. Each student's program of study is individualized based on their research interests, prior academic experience, and collaboration with their major advisor.

Training and Professional Development Opportunities

Students have access to excellent labs and greenhouse facilities on the Pullman campus and at Research and Extension centers located throughout Washington State. Students are encouraged to attend Entomological Society of America meetings, as well as other professional meetings, where they present their research, and learn from other scientists in their chosen field.

Post-Graduate Employment Opportunities

New opportunities open daily for entomology graduates that include: federal government agencies (EPA, USDA, APHIS); state departments of agriculture and ecology; state agricultural research stations; university extension service; agrichemical company field representatives in research and sales; agricultural consulting firms; private agribusiness firms; timber and seed production companies; international development agencies; pest control operators; parkland and golf course pest management specialists; mosquito abatement districts; weed control districts; food processing industry; ornamental plant protection; public health service; industrial pest control consultant; the armed forces and homeland security.

Post-Graduate Career Placements

The Entomology Department has excellent record of career placement for its graduates nationally and internationally. Our

graduates have found careers in teaching, research and extension at colleges and universities; with federal and state agencies (e.g. USDA, FDA, and Washington State Department of Agriculture); in private industry; entrepreneurial endeavors; pesticide education programs; and forensics laboratories.

Contact Information

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Academic Program Coordinator
Entomology
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E-mail: entom@wsu.edu

Faculty

Carol Anelli, Elizabeth Beers, Carol Black, Jay Brunner, Allan Felsot, Stephen Garczynski, Laurel Hansen, Vincent Hebert, David Horton, David James, Andrew Jensen, Vincent Jones, Peter Landolt, Laura Lavine, Bethany Marshall, Joseph Munyaneza, Jeb Owen, Merrill Peterson, Gary Piper, Walter Sheppard, William Snyder, John Stark, Daniel Suomi, Lynell Tanigoshi, Thomas Unruh, Doug Walsh, Terry Whitworth and Richard Zack.

BIOL

- 352 Cell Physiology 3** Course Prerequisite: BIOLOGY 107; CHEM 345. Function and control at the cell-tissue level.
- 372 General Ecology 4 (3-3)** Course Prerequisite: BIOLOGY 106; CHEM 102 or 105. Relationship of organisms with physical and biotic components of their environment at the population, community, and ecosystem level.

CHEM

- 332 Physical Chemistry 3** Course Prerequisite: MATH 273 with a C or better; MATH 220 with a C or better; PHYSICS 202 with a C or better. Elementary quantum theory; molecular structure and spectra; bonding theory; reaction rates; photochemistry and radiation chemistry; energy states and statistical thermodynamics.

ENTOM

- 340 Agricultural Entomology 3 (2-3)** Course Prerequisite: BIOLOGY 106 or 107. Control, identification, and biology of insects and related arthropods. Course equivalent to OSU's Ent 311 and UI's Ent 322.
- 343 General Entomology 3** Biology, natural history, and importance of insects and related arthropods.
- 361 Honey Bee Biology 3** Biology of the honey bee, including behavior, genetics, evolution, pollination, sociality, and beekeeping practices.

GEOL

- 102 Physical Geology 4 (3-3)** Course Prerequisite: Certified major in sciences, engineering, or in the Honors College. Modern concepts of earth science; mineral rock, resource, and map study. Field trip required. Credit not granted for more than one of GEOLOGY 101, 102, 180.

Integrated Pest Management

IPM

- 201 Introduction to Pest Management in a Quality Environment 2** Pest management to maximize plant protection and safeguard the quality of the environment.
- 452 Pesticides and the Environment 2** Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.
- 462 Systems of Integrated Pest Management 3 (2-3)** Utilization of the systems approach in agricultural pest management; design, implementation, and analysis of IPM programs for selected crops.

Integrated Pest Management

MBIOS

- 301 General Genetics 4** Course Prerequisite: BIOLOGY 106 or 120; BIOLOGY 107; CHEM 101 or 105; CHEM 102 or 106. Principles of modern and classical genetics. (Cross-listed course offered as MBIOS 301, BIOLOGY 301).
- 303 Introductory Biochemistry 4** Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

Integrated Pest Management

PHYS

- 101 General Physics 4 (3-3)** Course Prerequisite: MATH 107 or 108 with a grade of C or better, ALEKS math placement score 60% or higher, or passing MATH 140, 171, 202, or 206. Algebra/trigonometry-based physics; topics in mechanics, wave phenomena, temperature, and heat; oriented toward non-physical science majors. Credit not granted for more than one of PHYSICS 101, 201, or 205.
- 102 General Physics 4 (3-3)** Course Prerequisite: PHYSICS 101 with a grade of C or better; MATH 107 or 108 with a grade of C or better, ALEKS math placement score 60% or higher, or passing MATH 140, 171, 202, or 206. Algebra/trigonometry-based physics; topics in electricity, magnetism, optical phenomena, relativity, and quantum theory; oriented toward non-physical science majors. Credit not granted for more than one of PHYSICS 102, 202, or 206.

SOILS

- 413 Soil Physics 3 (2-3)** Characterization of soil properties including water content and potential and hydraulic conductivity; modeling water, solute transport, erosion and contamination of groundwater.
- 500 Seminar 1** May be repeated for credit.
- 501 Proposal Defense Seminar 2** Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.
- 504 Experimental Methods in Plant Physiology 3 (2-3)** Advanced techniques and instrumental methods applicable to research in plant physiology.
- 509 Plant Anatomy 4 (2-6)** Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.
- 512 Molecular Mechanisms of Plant Development 3** Physiology of growth; metabolism during development and reproduction.
- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.
- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.
- 533 Modern Methods in Phylogenetics 4 (2-6)** Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3 (2-3)** Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2 (0-6)** Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)** Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.

- 575 Systems Biology of Reproduction** 3 Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology** 3 Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences** 3 Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions** 3 Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing** 2 Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching** 2 Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences** 1 May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I** 1 May be repeated for credit. Literature and problems.
- 597 Teaching Practicum** V 1-4 May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar** 1 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Advanced Inorganic Chemistry I** 3 Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry** V 1-3 May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory** 3 Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics** 2 Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis** 2 Methods for the measurement of biological compounds.
- 514 Mass Spectrometry** 2 Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography** 2 Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry** 2 Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry** 3 Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers** 2 Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory** 1 (0-3) Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry** 2 Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry** V 1-3 May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I** 3 Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.

- 532 Advanced Physical Chemistry II 3** Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics 3** Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry 3** Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V 1-3** May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V 1-3** May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 540 Taxonomy of Immature Insects V 2-4** Identification of eggs, larvae, nymphs, and pupal stages of insects. Insect collection required.
- 548 Medical and Veterinary Entomology 3** Biology and ecology of parasitic arthropods and their direct impacts on human and animal health; transmission of pathogens. Credit not granted for both ENTOM 448 and ENTOM 548.
- 550 Insect Physiology 3** General principles of insect physiology; the mechanisms of vital processes in insects; organ, cellular, subcellular, chemical and physical levels. Required preparation must include BIOLOGY 332, 352, CHEM 345, ENTOM 340, or 343.
- 555 Agricultural Chemical Technology for Crop Protection & Production 3** Mechanistic examination of agricultural chemical technology; synthetic and biological pesticides and fertilizers; mechanism of biological activity; deployment; management.

- 556 Insecticides: Toxicology and Mode of Action** 1 Insecticides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 557 Herbicides: Toxicology and Mode of Action** 1 Herbicides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 558 Pesticide Topics** 1 Current issues concerning pesticides in terms of toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 590 Special Topics in Entomology** V 1-4 May be repeated for credit; cumulative maximum 10 hours. Credit not granted for both ENTOM 490 and ENTOM 590.
- 593 Seminar** 1 May be repeated for credit. Reporting and discussing problems and research in entomology.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 505 Geophysics** 4 (3-3) Theory and application of geophysical methods for hydrology, environmental, engineering, exploration, and structural geology; review of techniques. (Cross-listed course offered as GEOLOGY 405).
- 520 Advanced Topics in Sedimentology** 3 (2-3) May be repeated for credit; cumulative maximum 6 hours. Modern aspects of sedimentary rocks. Field trip required.
- 521 Clastic Depositional Systems** 3 (2-3) Clastic sedimentary environments; architectural elements and facies analysis. Field trip required.
- 523 Advanced Topics in Stratigraphy** 3 May be repeated for credit.
- 525 Carbonate Depositional Systems** 3 (2-3) Modern carbonate environments and processes; ancient carbonate rock sequences; carbonate platform-to-basin transition; diagenesis of carbonate rocks. Field trip required.
- 538 Orogenic Systems** I 3 Field-base course examines tectonic processes active in the northern Cordillera. Field trip required and final research paper.
- 540 Tectonics** 3 Nature and origin of the Earth's major tectonic features.
- 541 Structural Analysis** 3 (2-3) Structural analysis of complexly deformed rocks in orogenic belts. Field trip required.
- 545 Astrobiology** 3 Origin, evolution, distribution and future of life in the universe; fundamental concepts of life and habitable environments on Earth and other planetary bodies within and outside of the solar system. Credit not granted for both GEOLOGY 445 and GEOLOGY 545.
- 550 Advanced Mineralogy** 3 Elements of crystal chemistry and crystal physics.
- 552 Analytical Methods in Earth Sciences** 3 (2-3) Theory and practical experience in EMPA, XRD, XRF, and ICPMS analysis.
- 560 Advanced Igneous Petrology** 3 (2-3) Origin, evolution, and tectonic significance of igneous rocks. Field trip required.
- 562 Watershed Biogeochemistry** 3 Sources, transformations, fates and impacts of biogeochemically important compounds as they move downstream through watersheds to the coastal zone.
- 567 Volcanology** 3 (2-3) Volcanic process, eruption mechanisms, volcanic deposits, hazard assessment. Field trip required. Credit not granted for both GEOLOGY 467 and GEOLOGY 567.
- 578 Groundwater Geobiology** 3 (2-3) Interaction of groundwater geology and the environment including microbial populations with emphasis on microbial transport in the sub-surface and bioremediation approaches.
- 579 Groundwater Geochemistry** V 2-4 May be repeated for credit; cumulative maximum 4 hours. Organic and inorganic aqueous geochemistry; controls on groundwater contaminant fate.
- 583 Radiogenic Isotopes and Geochronology** 3 Radiogenic isotopes and their uses as chronometers (radiometric dating) and as tracers of earth evolution and differentiation.
- 584 Stable Isotope Geochemistry** 3 Principles and applications of isotope geochemistry in the geological sciences.
- 588 Methods in Radiogenic Isotope Geochemistry** 3 (1-6) Course Prerequisite: GEOLOGY 583. Laboratory-based course in modern analytical methods in radiogenic isotope geochemistry.
- 595 Advanced Topics in Geology** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 596 Advanced Topics in Geology** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 597 Advanced Topics in Geology** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 598 Seminar** 1 May be repeated for credit; cumulative maximum 3 hours. Research papers presented by students, faculty, and visiting scientists on geological research. Credit not granted for both GEOLOGY 498 and GEOLOGY 598.

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- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 552 Pesticides and the Environment 2** Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.
- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.

- 568 Advanced Topics in Molecular Biosciences V** 1-3 May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology** 3 Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics** 3 (2-3) Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V** 1-2 May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy** 2 Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar** 1 Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics** 3 The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal** 2 May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Graduate Seminar** 1 Introduction to graduate and interdisciplinary research.
- 514 Optoelectronics Lab I** 1 (0-3) May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II V** 1 (0-3) to 3 (0-9) May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I** 3 Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II** 3 Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.
- 533 Thermal and Statistical Physics I** 3 Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II** 3 Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
- 541 Electromagnetic Theory** 3 Special relativity and the classical electromagnetic field; emission, propagation, and absorption of electromagnetic waves.
- 542 Electrodynamics** 3 Interaction of matter and electromagnetic radiation; classical and quantum electrodynamics.
- 545 Nonlinear Optics** 3 Nonlinear wave propagation theory applied to several nonlinear-optical phenomena; experimental techniques that probe a material's nonlinearity.
- 546 Quantum Electronics** 3 The physics of lasers and of coherent optical radiation generation and propagation.
- 550 Quantum Theory I** 3 Introduction to quantum theory; physical and mathematical foundations; application to atomic systems.
- 551 Quantum Theory II** 3 Symmetry and invariance; angular momentum theory; approximation methods.
- 552 Quantum Theory III** 3 Scattering theory; relativistic wave mechanics; quantum field theory.
- 561 Atomic and Molecular Physics** 3 Physics of atoms and molecules using quantum theory.
- 563 Physics of the Solid State** 3 Lattice vibrations and defects; ionic and electronic conductivities; band theory; magnetic properties; luminescence.
- 566 Biological Physics** 3 Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics** 3 Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.

- 575 Advanced Solid State Physics 3** Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics 3** May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar 1** May be repeated for credit.
- 592 Wave Propagation Seminar 2** May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories 1** May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3 (2-3)** Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).

- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.

- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Entomology

Degree offered: Master of Science in Entomology

Faculty working with graduate students: 28

Graduate students: 30

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL, TOEFLI, GRE (Quantitative), GRE (Verbal), IELTS

Deadline: Fall: March 25

Spring: October 25

Requirements

Collegiate teaching experience is required. This can include the preparation, introductory remarks and conduct of at least three lecture or lab sessions for an entomology course. Master's students are required to participate in two 1-credit seminars. Course Information: Students may choose between GEOL 102, Soils 413, Phys 101 or Phys 102 for the Physical Science requirement. Students may choose between ENTOM 340, 361, 545, 546, 548, 572 or IPM 201, 452 or 462 for the Applied Entomology requirement. Students may choose between ENTOM 539 or 540 for the Taxonomy requirement. Students may choose between MBIOS 303 or 514 for the Biochemistry requirement.

Program Description

The Entomology Program at Washington State University provides students the opportunity to work on real world issues that support a safe, sustainable and abundant food supply; address human and animal health issues; and protect many other natural resources. Entomology graduate students are able to tailor their individual research program based on their specific interests. The Entomology Graduate Program encourages the interaction of students with leaders in the field of entomology locally, nationally and world-wide. We have an excellent history of producing graduates who go on to lucrative careers in their area of expertise and to professionally follow their passions.

Degree Description

The Department of Entomology offers graduate programs leading to Doctoral and Master of Science degrees. The curriculum provides the opportunity to study the basic and applied aspects of the science. Facilities and training are available for graduate study in major areas of entomology, including (but not limited to) apiculture; behavior; integrated biological control and sustainable pest management; ecology; forest entomology; insect/plant interactions; medical/veterinary entomology; population genetics; physiology; systematic; biological diversity and environmental toxicology. Departmental faculty, adjunct faculty, and affiliate faculty may all serve as student advisors. Faculty are housed both on campus and at research stations throughout the state; the ability to significantly interact with both on- and off-campus advisors and mentors offers students opportunities and perspectives not available in most programs. We maintain strong cooperative interactions with the USDA ARS lab in Yakima, Washington. Students whose major advisor resides at a Research & Extension Center (Wenatchee, Prosser, Puyallup, Mt. Vernon or USDA Wapato) typically come to Pullman for at least two semesters then relocate to the center where they will conduct their research and take the remainder of their coursework via AMS/WECN. Each student's program of study is individualized based on their research interests, prior academic experience, and collaboration with their major advisor.

Training and Professional Development Opportunities

Students have access to excellent labs and greenhouse facilities on the Pullman campus and at Research and Extension centers located throughout Washington State. Students are encouraged to attend Entomological Society of America meetings, as well as other professional meetings, where they present their research, and learn from other scientists in their chosen field.

Post-Graduate Employment Opportunities

New opportunities open daily for entomology graduates, including: federal government agencies (EPA, USDA, APHIS); state departments of agriculture and ecology; state agricultural research stations; university extension service; agrichemical company field representatives in research and sales; agricultural consulting firms; private agribusiness firms; timber and seed production companies; international development agencies; pest control operators; parkland and golf course pest management specialists; mosquito abatement districts; weed control districts; food processing industry; ornamental plant protection; public health service; industrial pest control consultant; the armed forces and homeland security.

Post-Graduate Career Placements

The Entomology Department has an excellent record of career placement for its graduates nationally and internationally. Our graduates have found careers in teaching, research and extension at colleges and universities; with federal and state agencies (e.g. USDA, FDA, and Washington State Department of Agriculture); in private industry; entrepreneurial endeavors; pesticide education programs; and forensics laboratories.

Contact Information

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Faculty

Carol Anelli, Elizabeth Beers, Carol Black, Jay Brunner, Allan Felsot, Stephen Garczynski, Laurel Hansen, Vincent Hebert, David Horton, David James, Andrew Jensen, Vincent Jones, Peter Landolt, Laura Lavine, Bethany Marshall, Joseph Munyaneza, Jeb Owen, Merrill Peterson, Gary Piper, Walter Sheppard, William Snyder, John Stark, Daniel Suomi, Lynell Tanigoshi, Thomas Unruh, Doug Walsh, Terry Whitworth and Richard Zack.

BIOL

352 Cell Physiology 3 Course Prerequisite: BIOLOGY 107; CHEM 345. Function and control at the cell-tissue level.

372 General Ecology 4 (3-3) Course Prerequisite: BIOLOGY 106; CHEM 102 or 105. Relationship of organisms with physical and biotic components of their environment at the population, community, and ecosystem level.

CHEM

332 Physical Chemistry 3 Course Prerequisite: MATH 273 with a C or better; MATH 220 with a C or better; PHYSICS 202 with a C or better. Elementary quantum theory; molecular structure and spectra; bonding theory; reaction rates; photochemistry and radiation chemistry; energy states and statistical thermodynamics.

ENTOM

340 Agricultural Entomology 3 (2-3) Course Prerequisite: BIOLOGY 106 or 107. Control, identification, and biology of insects and related arthropods. Course equivalent to OSU's Ent 311 and UI's Ent 322.

343 General Entomology 3 Biology, natural history, and importance of insects and related arthropods.

361 Honey Bee Biology 3 Biology of the honey bee, including behavior, genetics, evolution, pollination, sociality, and beekeeping practices.

Integrated Pest Management

IPM

452 Pesticides and the Environment 2 Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.

462 Systems of Integrated Pest Management 3 (2-3) Utilization of the systems approach in agricultural pest management; design, implementation, and analysis of IPM programs for selected crops.

Integrated Pest Management

MBIOS

301 General Genetics 4 Course Prerequisite: BIOLOGY 106 or 120; BIOLOGY 107; CHEM 101 or 105; CHEM 102 or 106. Principles of modern and classical genetics. (Cross-listed course offered as MBIOS 301, BIOLOGY 301).

303 Introductory Biochemistry 4 Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

Integrated Pest Management

SOILS

413 Soil Physics 3 (2-3) Characterization of soil properties including water content and potential and hydraulic conductivity; modeling water, solute transport, erosion and contamination of groundwater.

500 Seminar 1 May be repeated for credit.

501 Proposal Defense Seminar 2 Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.

504 Experimental Methods in Plant Physiology 3 (2-3) Advanced techniques and instrumental methods applicable to research in plant physiology.

509 Plant Anatomy 4 (2-6) Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.

512 Molecular Mechanisms of Plant Development 3 Physiology of growth; metabolism during development and reproduction.

- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.
- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.
- 533 Modern Methods in Phylogenetics 4 (2-6)** Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3 (2-3)** Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2 (0-6)** Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)** Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.
- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).

- 581 Comparative Biology of Social Traditions** 3 Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing** 2 Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching** 2 Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences** 1 May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I** 1 May be repeated for credit. Literature and problems.
- 597 Teaching Practicum** V 1-4 May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar** 1 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Advanced Inorganic Chemistry I** 3 Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry** V 1-3 May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory** 3 Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics** 2 Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis** 2 Methods for the measurement of biological compounds.
- 514 Mass Spectrometry** 2 Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography** 2 Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry** 2 Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry** 3 Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers** 2 Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory** 1 (0-3) Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry** 2 Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry** V 1-3 May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I** 3 Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II** 3 Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics** 3 Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry** 3 Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.

- 537 Advanced Topics in Physical Chemistry V** 1-3 May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V** 1-3 May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 540 Taxonomy of Immature Insects V** 2-4 Identification of eggs, larvae, nymphs, and pupal stages of insects. Insect collection required.
- 548 Medical and Veterinary Entomology 3** Biology and ecology of parasitic arthropods and their direct impacts on human and animal health; transmission of pathogens. Credit not granted for both ENTOM 448 and ENTOM 548.
- 550 Insect Physiology 3** General principles of insect physiology; the mechanisms of vital processes in insects; organ, cellular, subcellular, chemical and physical levels. Required preparation must include BIOLOGY 332, 352, CHEM 345, ENTOM 340, or 343.
- 555 Agricultural Chemical Technology for Crop Protection & Production 3** Mechanistic examination of agricultural chemical technology; synthetic and biological pesticides and fertilizers; mechanism of biological activity; deployment; management.
- 556 Insecticides: Toxicology and Mode of Action 1** Insecticides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 557 Herbicides: Toxicology and Mode of Action 1** Herbicides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 558 Pesticide Topics 1** Current issues concerning pesticides in terms of toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.

- 590 Special Topics in Entomology V 1-4** May be repeated for credit; cumulative maximum 10 hours. Credit not granted for both ENTOM 490 and ENTOM 590.
- 593 Seminar 1** May be repeated for credit. Reporting and discussing problems and research in entomology.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- 552 Pesticides and the Environment 2** Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.
- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).

- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3 (2-3)** Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.

- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.

- 536 Statistical Computing 3** (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V** 1-2 May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Entomology

Degree offered: Master of Science in Entomology – Non Thesis

Faculty working with graduate students: 28

Graduate students: 30

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), IELTS, TOEFL, TOEFLI

Deadline: Fall: March 25

Spring: October 25

Requirements

Collegiate teaching experience is required. This can include the preparation, introductory remarks and conduct of at least three lecture or lab sessions for an entomology course. Master's students are required to participate in two 1-credit seminars. Courses: Students may choose between GEOL 102, Soils 413, Phys 101 or Phys 102 for the Physical Science requirement. Students may choose between ENTOM 340, 361, 545, 546, 548, 572 or IPM 201, 452 or 462 for the Applied Entomology requirement. Students may choose between ENTOM 539 or 540 for the Taxonomy requirement. Students may choose between MBIOS 303 or 514 for the Biochemistry requirement.

Program Description

The Entomology Program at Washington State University provides students the opportunity to work on real world issues that support a safe, sustainable and abundant food supply; address human and animal health issues; and protect many other natural resources. Entomology graduate students are able to tailor their individual research program based on their specific interests. The Entomology Graduate Program encourages the interaction of students with leaders in the field of entomology locally, nationally and world-wide. We have an excellent history of producing graduates who go on to lucrative careers in their area of expertise and to professionally follow their passions.

Degree Description

The Department of Entomology offers graduate programs leading to Doctoral and Master of Science degrees. The curriculum provides the opportunity to study the basic and applied aspects of the science. Facilities and training are available for graduate study in major areas of entomology, including (but not limited to) apiculture; behavior; integrated biological control and sustainable pest management; ecology; forest entomology; insect/plant interactions; medical/veterinary entomology; population genetics; physiology; systematic; biological diversity and environmental toxicology. Departmental faculty, adjunct faculty, and affiliate faculty may all serve as student advisors. Faculty are housed

both on campus and at research stations throughout the state; the ability to significantly interact with both on- and off-campus advisors and mentors offers students opportunities and perspectives not available in most programs. We maintain strong cooperative interactions with the USDA ARS lab in Yakima, Washington. Students whose major advisor resides at a Research & Extension Center (Wenatchee, Prosser, Puyallup, Mt. Vernon or USDA Wapato) typically come to Pullman for at least two semesters then relocate to the center where they will conduct their research and take the remainder of their coursework via AMS/WEEN. Each student's program of study is individualized based on their research interests, prior academic experience, and collaboration with their major advisor.

Training and Professional Development Opportunities

Students have access to excellent labs and greenhouse facilities on the Pullman campus and at Research and Extension centers located throughout Washington State. Students are encouraged to attend Entomological Society of America meetings, as well as other professional meetings, where they present their research, and learn from other scientists in their chosen field.

Post-Graduate Employment Opportunities

New opportunities open every day for entomology graduates that include: federal government agencies (EPA, USDA, APHIS); state departments of agriculture and ecology; state agricultural research stations; university extension service; agrichemical company field representatives in research and sales; agricultural consulting firms; private agribusiness firms; timber and seed production companies; international development agencies; pest control operators; parkland and golf course pest management specialists; mosquito abatement districts; weed control districts; food processing industry; ornamental plant protection; public health service; industrial pest control consultant; the armed forces and homeland security.

Post-Graduate Career Placements

The Entomology Department has excellent record of career placement for its graduates nationally and internationally. Our graduates have found careers in teaching, research and extension at colleges and universities; with federal and state agencies (e.g. USDA, FDA, and Washington State Department of Agriculture); in private industry; entrepreneurial endeavors; pesticide education programs; forensics laboratories.

Contact Information

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Faculty

Carol Anelli, Elizabeth Beers, Carol Black, Jay Brunner, Allan Felsot, Stephen Garczynski, Laurel Hansen, Vincent Hebert, David Horton, David James, Andrew Jensen, Vincent Jones, Peter Landolt, Laura Lavine, Bethany Marshall, Joseph Munyaneza, Jeb Owen, Merrill Peterson, Gary Piper, Walter Sheppard, William Snyder, John Stark, Daniel Suomi, Lynell Tanigoshi, Thomas Unruh, Doug Walsh, Terry Whitworth and Richard Zack.

BIOL

- 352 Cell Physiology 3** Course Prerequisite: BIOLOGY 107; CHEM 345. Function and control at the cell-tissue level.
- 372 General Ecology 4 (3-3)** Course Prerequisite: BIOLOGY 106; CHEM 102 or 105. Relationship of organisms with physical and biotic components of their environment at the population, community, and ecosystem level.

CHEM

- 332 Physical Chemistry 3** Course Prerequisite: MATH 273 with a C or better; MATH 220 with a C or better; PHYSICS 202 with a C or better. Elementary quantum theory; molecular structure and spectra; bonding theory; reaction rates; photochemistry and radiation chemistry; energy states and statistical thermodynamics.

ENTOM

- 340 Agricultural Entomology 3 (2-3)** Course Prerequisite: BIOLOGY 106 or 107. Control, identification, and biology of insects and related arthropods. Course equivalent to OSU's Ent 311 and UI's Ent 322.
- 343 General Entomology 3** Biology, natural history, and importance of insects and related arthropods.
- 361 Honey Bee Biology 3** Biology of the honey bee, including behavior, genetics, evolution, pollination, sociality, and beekeeping practices.

Integrated Pest Management

IPM

- 452 Pesticides and the Environment 2** Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.
- 462 Systems of Integrated Pest Management 3 (2-3)** Utilization of the systems approach in agricultural pest management; design, implementation, and analysis of IPM programs for selected crops.

Integrated Pest Management

MBIOS

- 301 General Genetics 4** Course Prerequisite: BIOLOGY 106 or 120; BIOLOGY 107; CHEM 101 or 105; CHEM 102 or 106. Principles of modern and classical genetics. (Cross-listed course offered as MBIOS 301, BIOLOGY 301).

303 Introductory Biochemistry 4 Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

Integrated Pest Management

SOILS

413 Soil Physics 3 (2-3) Characterization of soil properties including water content and potential and hydraulic conductivity; modeling water, solute transport, erosion and contamination of groundwater.

500 Seminar 1 May be repeated for credit.

501 Proposal Defense Seminar 2 Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.

504 Experimental Methods in Plant Physiology 3 (2-3) Advanced techniques and instrumental methods applicable to research in plant physiology.

509 Plant Anatomy 4 (2-6) Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.

512 Molecular Mechanisms of Plant Development 3 Physiology of growth; metabolism during development and reproduction.

513 Plant Metabolism 3 Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.

514 Fish Genetics 2 Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.

517 Stress Physiology of Plants 3 Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.

519 Introduction to Population Genetics 3 Survey of basic population and quantitative genetics.

520 Conservation Genetics 2 Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.

521 Quantitative Genetics 3 Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.

531 Principles of Systematic Biology 3 Systematic theory; history and current views; approaches to phylogenetic analysis and classification.

533 Modern Methods in Phylogenetics 4 (2-6) Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.

537 Plant Cell Biology 3 Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.

540 Stable Isotope Theory and Methods 3 (2-3) Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.

544 Nitrogen Cycling in the Earth's Systems 3 Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).

548 Evolutionary Ecology of Populations 3 Evolutionary dynamics of natural populations and the co-evolution of species.

556 Biochemical Adaptation 3 Relationships between enzyme/macromolecule adaptation and animal performance.

559 Hormones, Brain and Behavior 3 Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.

560 Plant Ecophysiology 3 Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.

561 Environmental Physiology 3 Individual and evolutionary adaptations to changing environments with emphasis on recent literature.

562 Community Ecology 3 Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.

563 Field Ecology 2 (0-6) Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.

564 Molecular Ecology and Phylogeography 3 Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.

565 Ecology and Evolution of Disease 3 Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.

566 Mathematical Genetics 3 Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.

567 Ecological Restoration 3 Introduction to major issues in restoration ecology; major ecological dimensions of restoration.

568 Conservation Ecology 3 Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.

569 Ecosystem Ecology and Global Change 3 Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.

- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)**
Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.
- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.
- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Advanced Inorganic Chemistry I 3** Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry V 1-3** May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory 3** Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics 2** Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis 2** Methods for the measurement of biological compounds.
- 514 Mass Spectrometry 2** Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography 2** Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry 2** Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry 3** Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers 2** Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.

- 522 Radiochemistry Laboratory 1** (0-3) Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry 2** Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry V** 1-3 May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I** 3 Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II** 3 Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics** 3 Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry** 3 Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V** 1-3 May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry** 3 Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry** 3 Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry** 3 Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V** 1-3 May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry** 3 Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds** 3 Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry** 1 Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena** 3 Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms** 3 Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I** 3 Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics** 1 Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry** 1 May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry** 1 May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry** 1 May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 540 Taxonomy of Immature Insects V** 2-4 Identification of eggs, larvae, nymphs, and pupal stages of insects. Insect collection required.

- 548 Medical and Veterinary Entomology 3** Biology and ecology of parasitic arthropods and their direct impacts on human and animal health; transmission of pathogens. Credit not granted for both ENTOM 448 and ENTOM 548.
- 550 Insect Physiology 3** General principles of insect physiology; the mechanisms of vital processes in insects; organ, cellular, subcellular, chemical and physical levels. Required preparation must include BIOLOGY 332, 352, CHEM 345, ENTOM 340, or 343.
- 555 Agricultural Chemical Technology for Crop Protection & Production 3** Mechanistic examination of agricultural chemical technology; synthetic and biological pesticides and fertilizers; mechanism of biological activity; deployment; management.
- 556 Insecticides: Toxicology and Mode of Action 1** Insecticides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 557 Herbicides: Toxicology and Mode of Action 1** Herbicides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 558 Pesticide Topics 1** Current issues concerning pesticides in terms of toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 590 Special Topics in Entomology V 1-4** May be repeated for credit; cumulative maximum 10 hours. Credit not granted for both ENTOM 490 and ENTOM 590.
- 593 Seminar 1** May be repeated for credit. Reporting and discussing problems and research in entomology.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 552 Pesticides and the Environment 2** Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.
- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.

- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).

- 513 Environmental Soil Physics 3** (2-3) Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1** (0-3) Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3** (2-3) Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4** (2-6) Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3** (1-4) Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3** (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Environmental and Natural Resource Sciences

Degree offered: Doctor of Philosophy (Environmental and Natural Resource Sciences)

Faculty working with graduate students: 10

Graduate students: 19

Graduate students receiving assistantships or scholarships: 100%

Program offered: Pullman, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 15

Spring: October 15

Requirements

As described in the Graduate School rules: 15 semester hours of graded coursework at the 500 level beyond the Bachelor's degree. No more than 9 credits of non-graduate credit course work may be used for the total credits for the Program of Study. Only those master's degree and transfer courses at a level equivalent to 500 level courses and which are applicable to the doctoral program can be used. Minimum GPA is 3.0. Any course with a grade of C- must be repeated.

Program Description

The School of Earth & Environmental Sciences (SEES) is a new unit established August, 2006 comprised of the former Program in Environmental Science & Regional Planning and Department of Geology. The School offers a: * Master of Science in Envi-

ronmental Science, * Master of Science in Geology, * Doctor of Philosophy in Environmental and Natural Resource Sciences) and * Doctor of Philosophy in Geology. The Master's degree in Environmental Science is offered at WSU Tri-Cities and WSU Vancouver, as well as at WSU-Pullman

Contact Information

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Faculty

Allyson Beall, Michael Berger, Stephen Bollens, M Chappell, Frederick Ford, John Harrison, Stephen Henderson, Cailin Orr, Gretchen Rollwagen-Bollens and Brian Tissot.

Environmental Engineering

Degree offered: Master of Science in Environmental Engineering

Faculty working with graduate students: 32

Program offered: Pullman, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Program Description

The graduate programs in Environmental Engineering are offered leading to the Master of Science in Environmental Engineering degree. The department also participates in university programs leading to the M.S. in Environmental Science and the Ph.D. in Engineering Science. At the Master's level, specific programs are available within each area.

Degree Description

Students may be accepted into the graduate program with undergraduate degrees in other than Civil or environmental Engineering (e.g., related areas such as mechanical engineering, materials science, environmental science, etc.). These students, however, may need to complete additional courses to cover deficiencies. Courses taken to satisfy deficiencies cannot be included in the program of study. Each student, in consultation with his/her graduate committee, will develop a plan of study. This plan outlines what courses will be required for completion of the degree. To develop a plan of study, students may choose from a variety of graduate and selected undergraduate courses offered in the area of emphasis. In addition, courses may be selected from a number of related courses in other programs in the Department of Civil and Environmental Engineering, as well as in other departments of the University.

Contact Information

Dr. Balasingam Muhunthan
Graduate Committee Chair

Vicki Ruddick
Graduate Coordinator

Faculty

Jennifer Adam, Michael Barber, Donald Bender, Marc Beutel, Shane Brown, Phillip Butterfield, Serena Chung, Candis Claiborn, William Cofer, James Dolan, Karl Englund, Liv Haselbach, Md Hossain, B Jobson, Brian Lamb, Fok-Yan Leung, Heping Liu, David McLean, George Mount, Balasingam Muhunthan, David Pollock, Shelley Pressley, Pizhong Qiao, Shihui Shen, Timothy Vanreken, Joseph Vaughan, Richard Watts, Haifang Wen, Michael Wolcott, Vikram Yadama, David Yonge and Jinwen Zhang.

Environmental Engineering

Degree offered: Master of Science in Environmental Engineering - Non Thesis

Faculty working with graduate students: 32

Program offered: Pullman, Tri-Cities

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Program Description

The graduate programs in Environmental Engineering are offered leading to the Master of Science in Environmental Engineering degree. The department also participates in university programs leading to the M.S. in Environmental Science and the Ph.D. in Engineering Science. At the Master's level, specific programs are available within each area.

Degree Description

Students may be accepted into the graduate program with undergraduate degrees in other than Civil or environmental Engineering (e.g., related areas such as mechanical engineering, materials science, environmental science, etc.). These students, however, may need to complete additional courses to cover deficiencies. Courses taken to satisfy deficiencies cannot be included in the program of study. Each student, in consultation with his/her graduate committee, will develop a plan of study. This plan outlines what courses will be required for completion of the degree. To develop a plan of study, students may choose from a variety of graduate and selected undergraduate courses offered in the area of emphasis. In addition, courses may be selected from a number of related courses in other programs in the Department of Civil and Environmental Engineering, as well as in other departments of the University.

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Environmental Science

Degree offered: Master of Science in Environmental Science

Faculty working with graduate students: 11

Graduate students: 39

Graduate students receiving assistantships or scholarships: 74%

Program offered: Pullman, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 15
Spring: October 15

Program Description

The School of Earth & Environmental Sciences (SEES) is a new unit established August, 2006 comprised of the former Program in Environmental Science & Regional Planning and Department of Geology. The School offers a: * Master of Science in Environmental Science, * Master of Science in Geology, *

Doctor of Philosophy in Environmental and Natural Resource Sciences) and * Doctor of Philosophy in Geology. The Master's degree in Environmental Science is offered at WSU Tri-Cities and WSU Vancouver, as well as at WSU-Pullman.

Degree Description

The MS degree is an interdisciplinary program with the flexibility for elective classes in the student's own area of specialization. In consultation with their advisor, students may select classes from a wide variety of areas (i.e., ecosystem science and management, ecological planning, land and water conservation, air quality management, water quality management, energy and carbon policy, etc.). Most students conclude their MS studies with a thesis, where the goal is a publishable contribution. The requirements are given below and are subject to completion after entering the Master's program.

Contact Information

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Faculty

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Environmental Science & Regional Planning

ES/RP

- 501 Graduate Skills Seminar 1** Seminar designed to introduce first year graduate students to the science graduate program; roles and responsibilities of graduate students, teaching assistants and researchers.
- 504 Ecosystem Management 3** Analysis of ecosystem processes; dual emphasis on ecological principles and development of methods and concepts to evaluate policies for management.
- 531 Fundamentals of Environmental Toxicology 3** Fundamentals of toxicology; environmental fate and biological deposition and effects of natural products, drugs, food chemicals, and pollutants.
- 532 Applied Environmental Toxicology 3** Course Prerequisite: ENVR SCI 531 or PHARMSCI 505. Overview of the field of environmental toxicology; interactions of xenobiotics with natural systems.
- 540 Agroecology 3** Social and ecological aspects of agriculture and human food systems.
- 544 Environmental Assessment 4** Environmental impact statements and their national and state policy frameworks, methods of assessment, and team preparation of an impact statement. Credit not granted for both ENVR SCI 444 and ENVR SCI 544.
- 545 Hazardous Waste Management 3** Environmental, technical, and political aspects of hazardous waste management; evaluative methods, risk assessment, and current management requirements. Credit not granted for both ENVR SCI 445 and ENVR SCI 545.
- 550 System Dynamics Models of Environmental Systems 3** Analysis of environmental system dynamics; development and uses of simulation models using the Stella software on Macintosh.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.

- 585 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 586 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 590 Special Topics 2** May be repeated for credit; cumulative maximum 6 hours.
- 592 Special Topics V 1-4** May be repeated for credit; cumulative maximum 4 hours.
- 593 Seminar in Environmental Science and Regional Planning 1** May be repeated for credit; cumulative maximum 8 hours. May be repeated for credit, cumulative maximum 8 hours.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Environmental Science

Degree offered: Master of Science in Environmental Science - Non Thesis

Faculty working with graduate students: 11

Graduate students: 7

Program offered: Pullman, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 15

Spring: October 15

Program Description

The School of Earth & Environmental Sciences (SEES) is a new unit established August, 2006 comprised of the former Program in Environmental Science & Regional Planning and Department of Geology. The School offers a: * Master of Science in Environmental Science, * Master of Science in Geology, *

Doctor of Philosophy in Environmental and Natural Resource Sciences) and * Doctor of Philosophy in Geology. The Master's degree in Environmental Science is offered at WSU Tri-Cities and WSU Vancouver, as well as at WSU-Pullman.

Degree Description

After consultation with their advisor, some students may decide to produce a project rather than a thesis. This option may be preferable for students who wish to take additional course work and want a more flexible format for the project report. This option requires a final oral exam to test the candidate's knowledge of Environmental Science with emphasis on the work presented in the project report. The project requires 4 credits of ESRP 702 (rather than 6 credits of ESRP 700) and 2 additional hours of course work. The requirements are given below and are subject to completion after entering the Master's program.

Contact Information

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Faculty

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Environmental Science & Regional Planning

ES/RP

501 Graduate Skills Seminar 1 Seminar designed to introduce first year graduate students to the science graduate program; roles and responsibilities of graduate students, teaching assistants and researchers.

504 Ecosystem Management 3 Analysis of ecosystem processes; dual emphasis on ecological principles and development of methods and concepts to evaluate policies for management.

- 531 Fundamentals of Environmental Toxicology 3** Fundamentals of toxicology; environmental fate and biological deposition and effects of natural products, drugs, food chemicals, and pollutants.
- 532 Applied Environmental Toxicology 3** Course Prerequisite: ENVR SCI 531 or PHARMSCI 505. Overview of the field of environmental toxicology; interactions of xenobiotics with natural systems.
- 540 Agroecology 3** Social and ecological aspects of agriculture and human food systems.
- 544 Environmental Assessment 4** Environmental impact statements and their national and state policy frameworks, methods of assessment, and team preparation of an impact statement. Credit not granted for both ENVR SCI 444 and ENVR SCI 544.
- 545 Hazardous Waste Management 3** Environmental, technical, and political aspects of hazardous waste management; evaluative methods, risk assessment, and current management requirements. Credit not granted for both ENVR SCI 445 and ENVR SCI 545.
- 550 System Dynamics Models of Environmental Systems 3** Analysis of environmental system dynamics; development and uses of simulation models using the Stella software on Macintosh.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 585 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 586 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 590 Special Topics 2** May be repeated for credit; cumulative maximum 6 hours.
- 592 Special Topics V 1-4** May be repeated for credit; cumulative maximum 4 hours.
- 593 Seminar in Environmental Science and Regional Planning 1** May be repeated for credit; cumulative maximum 8 hours. May be repeated for credit, cumulative maximum 8 hours.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Exercise Science – Certificate in Exercise Science

Degree offered: Graduate Certificate in Exercise Science

Program offered: Spokane

Tests required: GRE (Combined), TOEFL

Deadline: Fall: February 1

Program Description

WSU Spokane offers the only research-based Exercise Science graduate program in Washington State that focuses on clinical and experimental exercise physiology with an emphasis on cellular and molecular mechanisms. The core curriculum provides a foundation in the study of the cellular mechanisms that regulate physiological responses to exercise and the molecular mechanisms that govern these cellular responses. Research methods and statistics courses provide preparatory study in research design and analysis for future project/thesis work.

Degree Description

The Master of Science Coordinated Program in Dietetics Nutrition and Exercise Physiology is designed for those individuals whose career goal is to become eligible to take the registration examination for dietitians through the American Dietetic Association. Graduates of the program are expected to function effectively as entry-level dietetics practitioners in a clinical, administrative, or community setting. The supervised practice experience requirement is currently 1200 hours. The 1200 hours of supervised practice consists of 160 hours in a food man-

agement rotation, 440 hours in a clinical rotation, 200 hours in a community rotation, and 400 hours in an exercise physiology internship

Training and Professional Development Opportunities

Most registered dietitians work at hospitals and medical centers, private practice or other health-care facilities. Many work in community and public health settings, academia and research. Others work in food and nutrition industry and business, journalism, sports nutrition, corporate wellness programs and in other nontraditional settings. RDs work in: Hospitals, HMOs or other health care facilities, educating patients about nutrition and administering medical nutrition therapy as part of the health care team. They may also manage the foodservice operations in these settings, as well as in schools, day-care centers, and correctional facilities, overseeing everything from food purchasing and preparation to managing staff. Sports nutrition and corporate wellness programs, educating clients about the connection between food and fitness, health, and exercise performance. Food and nutrition-related businesses and industries, working in communications, consumer affairs, public relations, marketing, or product development. Private practice, working under contract with health care or food companies, or in their own business. RDs may provide services to foodservice or restaurant managers, food vendors and distributors, athletes, nursing home residents, or company employees. Community and public health settings teaching monitoring, and advising the public, and helping to improve their quality of life through healthy eating habits. Universities and medical centers, teaching physicians, nurses, dietetics students and others the sophisticated science of foods and nutrition. Research areas, in food and pharmaceutical companies, universities, and hospitals, directing or conducting experiments to answer critical nutrition questions and find alternative foods or nutrition recommendations for the public.

Contact Information

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Nutrition and Exercise Physiology

NEP

- 300 Professional Preparation 2** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Standards of practice in dietetics and exercise physiology; healthcare ethics; social and cultural issues; professional writing; career development.
- 320 Strength Training and Conditioning; Theory and Application 3** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Application of scientific principles of strength and conditioning as they relate to exercise training.

- 340 Foods with Application to Physical Activity 3 (2-3)** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Experimental approach to physical, chemical and sensory properties of foods; overview of culinary techniques, technology and application to physical activity.
- 362 Biomechanical Analysis 3** Applied sport, clinical and occupational biomechanics.
- 400 Macronutrient Metabolism 3** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Digestion, absorption, and metabolism of carbohydrates, protein and fats, and their utilization for energy.
- 401 Community Supervised Practice 9** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Advanced principles of community dietetic nutrition education along with hands-on community supervised practice experience.
- 402 Vitamin and Mineral Metabolism 3** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Absorption and metabolism of vitamins and minerals and their role in macronutrient metabolism and nutritional requirements for maintenance of health.
- 427 Nutritional Assessment and Lifestyle Counseling 3 (2-3)** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Basic skills and concepts of nutrition assessment and lifestyle counseling of ambulatory adults using dietary intakes, menu planning and communication skills.
- 435 Exercise, Diet and Disease 4** Course Prerequisite: NEP 400; NEP 402 or concurrent enrollment; NEP 463. Pathophysiology of disease and implications for dietary and exercise interventions.
- 437 Diet Therapy 4** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Theoretical and practical base for diet modification and nutritional therapy in health and a variety of disease states.
- 440 Clinical Supervised Practice 11** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Professional supervised experience offsite in clinical dietetics. Meets American Dietetic Association requirements for registration eligibility.
- 450 Management and Facilities 3** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Essential skills and guidelines for those in the health facility industry in establishing and maintaining a safe and proper facility.

- 451 Management Practices in Food Science 5** (1-12) Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Advanced principles of food systems; institutional food service management along with offsite, hands-on food service supervised practice experience.
- 458 Nutrition and Exercise Throughout the Life Cycle 3** Physical activity relating to nutritional needs and dietary patterns from infancy through old age and including maternal nutrition.
- 463 Advanced Exercise Physiology 4** (3-3) Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Advanced undergraduate exercise physiology with emphasis on mechanisms regulating physiological responses to exercise across the life span.
- 465 Nutrition and Exercise Assessment 3** (2-3) Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Field and laboratory techniques and tools required to properly assess nutritional and physiological parameters.
- 470 Sports Nutrition 3** Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Identification of energy, macro/micronutrients and fluid requirements during exercise; evaluation of dietary practices and ergogenic aids for pre- and post-competition, weight maintenance.
- 473 Nutrition in the Community 2** Public health nutrition including assessment of communities, problem list development, program planning and an overview of existing programs and services.
- 476 Exercise Testing and Prescription 3** (2-3) Course Prerequisite: Certified major in nutrition and exercise physiology, or admitted to the Master of Science in Coordinated Program in Dietetics, Nutrition, and Exercise Physiology. Principles of exercise testing and prescription based on current practices in physical education, physiology, and rehabilitation.
- 478 Electrocardiography, Medications and Procedures 3** (2-3) Development of ECG interpretation skills, including 12-leads, with emphasis on procedures and impact of medication in resting and exercising persons.
- 479 Nutrition and Exercise Practicum 3** (1-6) May be repeated for credit; cumulative maximum 6 hours. Supervised experience in applying exercise and nutrition assessment techniques and developing exercise and nutrition prescription for normal and diseased subjects.
- 480 Cardiopulmonary Rehabilitation 4** (3-3) Course Prerequisite: Certified major in Nutrition and Exercise Physiology. Principles and applications of exercise assessment/prescription and nutrition recommendations and program management to cardiopulmonary and rehabilitation situations and populations.
- 490 Exercise and Nutrition Internship V 10** (0-30) to 15 (0-45) Supervised offsite exercise field experience to assess normal and diseased populations and develop/apply exercise prescriptions and nutrition recommendations.
- 501 Community Supervised Practice 5** (1-12) Review of literature in dietetic education and health promotion including supervised practice in community facilities.
- 505 Graduate Seminar V 2-3** May be repeated for credit; cumulative maximum 6 hours. Current issues and evaluation of literature related to nutrition, dietetics, exercise physiology practice and research.
- 510 Foundations of Cellular Regulation 3** Fundamentals of pharmacology and toxicology; signal transduction; cellular effects of diet and exercise; action and regulation of dietary supplements.
- 520 Research Methods in Nutrition and Exercise Physiology 3** Current research designs and methods in nutrition and exercise physiology including behavioral and basic sciences emphasizing chronic disease prevention.
- 526 Advanced Community Nutrition and Health 3** Research basis of practice in community nutrition or health programs; assessment and outcome measures emphasizing chronic disease prevention.
- 537 Advanced Medical Nutrition Therapy 4** Exercise and nutrition assessment/prescription and program management in rehabilitation for populations in various disease states.
- 540 Clinical Supervised Practice 10** Clinical supervised practical experience for graduate students in coordinated program in dietetics.
- 551 Management Practices in Food Service 4** (1-9) Advanced principles and supervised experience in food systems, institutional food service management, school food service and community feeding programs.
- 573 Nutrition in the Community 2** Public health from a nutrition perspective including current issues in nutrition healthcare, overview of existing programs and assessment of program planning.
- 577 Introduction to Research 3** Philosophy, standards, and practices of scientific inquiry and scholarship appropriate to basic, clinical, and social and administrative sciences in healthcare, and the performance expectations of researchers and scholars. (Cross-listed course offered as PHARMSCI 577, NEP 577).
- 578 Biomedical Statistics 3** Research process; techniques for conducting health services research and evaluation, critique published health services research and collect, utilize, and evaluate primary and secondary data. (Cross-listed course offered as PHARMSCI 578, NEP 578).
- 580 Advanced Topics in Exercise Physiology 3** Advanced topics in cellular and molecular physiology.
- 585 Clinical Exercise Physiology 4** Exercise and nutrition assessment/prescription and program management in rehabilitation for populations in various disease states.
- 597 College of Pharmacy Graduate Seminar 1** May be repeated for credit; cumulative maximum 12 hours. (Cross-listed course offered as PHARMSCI 597, NEP 597.)

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Exercise Science

Degree offered: Master of Science in Exercise Science – Non Thesis

Faculty working with graduate students: 9

Program offered: Spokane

Tests required: TOEFLI

Deadline: Fall: February 1

Program Description

WSU Spokane offers the only research-based Exercise Science graduate program in Washington State that focuses on clinical and experimental exercise physiology with an emphasis on cellular and molecular mechanisms. The core curriculum provides a foundation in the study of the cellular mechanisms that regulate physiological responses to exercise and the molecular mechanisms that govern these cellular responses. Research methods and statistics courses provide preparatory study in research design and analysis for future project/thesis work.

Degree Description

The MS NEP is a research-based graduate program that focuses on nutrition and exercise physiology. The non-thesis option focuses on clinical nutrition and exercise physiology. The graduate curriculum provides a foundation in the study of the cellular mechanisms that regulate physiological responses and the molecular mechanisms that govern these cellular responses.

Contact Information

Deborah Howe

Faculty

Miriam Ballejos, Janet Beary, Sally Blank, Laura Frank, Madeline Houghton, Emily Johnson, Susan Marsh, Kathryn Meier and Jill Shultz.

NURS

- 503 Scientific Inquiry in Nursing 2** Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.
- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V** 1 (0-3) to 4 (0-12) Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V** 1 (0-3) to 4 (0-12) Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V** 2-3 Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V** 1-2 Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V** 3 (0-9) to 5 (0-15) Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.

- 521 Teaching, Learning and Evaluation in Nursing V** 3-6 Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V** 3-5 Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.
- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
- 535 Philosophy of Nursing Science 2** Course prerequisite: Graduate standing in Nursing; NURS 534 or concurrent enrollment. Structure and organization of fields of knowledge in science including historical and philosophical tenets of inquiry.
- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V** 1-10 May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4** (3-3) Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4** (3-3) Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V** 4 (1-9) to 5 (1-12) Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
- 548 Psychiatric Nurse Practitioner Internship V** 1-9 May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V** 2-4 Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology: principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V** 2-6 Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.

- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3 (2-3)** Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
- 569 Primary Care of Families: Family 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1 (0-3)** Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3 (2-3)** Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V 2-3** Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3 (2-3)** Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.

- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Family Nurse Practitioner – Cert in Family Nurse Practition

Degree offered: Graduate Certificate in Family Nurse Practitioner

Faculty working with graduate students: 57

Graduate students: 10

Graduate students receiving assistantships or scholarships: 40%

Program offered: Spokane, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: February 1

Spring: October 1

Requirements

A personalized program of study is developed at the time of acceptance into the program. Certificate requirements are individualized based on prior MN education. At this point, only prior WSU credits meet the requirements of this certificate program.

Program Description

The MN degree program prepares advanced-practice nurses with leadership skills to plan, implement, coordinate and evaluate health care, as well as formulate policy for a diverse and multi-cultural society. It also prepares advanced-practice nurses to work with health care providers and those in other occupations to plan and provide high quality care. A post-Master's program is also available for nurse practitioner students.

Degree Description

The Master's program is described in the WSU on-line annual catalog. Students with a master's degree in nursing with specialization in another field are eligible for review to complete courses specific to the Family Nurse Practitioner program and receive a certificate of completion.

Training and Professional Development Opportunities

Some opportunities exist for: teaching assistantships, research assistantships, clinical internships and international medical work.

Post-Graduate Employment Opportunities

Family nurse practitioner positions

Post-Graduate Career Placements

FNP positions in such places as clinics, offices, hospitals, rural and urban areas.

Contact Information

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NURS

- 503 Scientific Inquiry in Nursing 2** Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.
- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V 3 (0-9) to 5 (0-15)** Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.
- 521 Teaching, Learning and Evaluation in Nursing V 3-6** Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.

- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
- 535 Philosophy of Nursing Science 2** Course prerequisite: Graduate standing in Nursing; NURS 534 or concurrent enrollment. Structure and organization of fields of knowledge in science including historical and philosophical tenets of inquiry.
- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4 (3-3)** Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V 4 (1-9) to 5 (1-12)** Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
- 548 Psychiatric Nurse Practitioner Internship V 1-9** May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices or clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V 2-4** Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology: principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V 2-6** Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3 (2-3)** Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.

- 569 Primary Care of Families: Family 4** (1-9) Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1** (0-3) Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3** (2-3) Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V** 2-3 Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3** (2-3) Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V** 1 (0-3) to 5 (0-15) Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I** 3 Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I** 3 Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II** 2 Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II** 2 Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V** 1-10 May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V** 1-18 May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Fine Arts

Degree offered: Master of Fine Arts

Faculty working with graduate students: 12

Graduate students: 14

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL

Deadline: Fall: January 15

Spring: July 1

Program Description

The Fine Arts Department offers a master's program for those wishing to pursue a career in studio art. This is an interdisciplinary program where artists may focus in, but are not limited to, ceramics, drawing, digital media, painting, photography, printmaking and sculpture. Emphasis is placed on personal and conceptual artistic development. The MFA degree serves as the entry credential to college-level teaching and/or work as a practicing artist in the fine and applied arts.

Degree Description

The department offers an interdisciplinary program where students may focus in, but are not limited to, ceramics, drawing, digital media, painting, photography, printmaking, and sculpture. Emphasis is placed on personal and conceptual artistic development in light of contemporary art practices. Graduates meet with faculty for one-on-one studio discussions. First year students have an exhibition in the departmental gallery and the second year

program culminates in a thesis exhibition held in the Museum of Art. A final oral examination is also required. The degrees requires 24-30 credit hours in a major emphasis, 6-9 credit hours in a relative minor, 6 credit hours in seminar and special problems, 4 credit hours in Art History and 12 credit hours of Thesis (MFA exhibition and written thesis.)

Training and Professional Development Opportunities

Training and Professional Development Opportunities;-Opportunities are available for students to work in a professional museum context and learn to install exhibitions, give tours etc.-Our galleries in Fine Arts also enhance.-Endowed Visiting Artist program enables students to work one on one with professional artists in the field. These artists give critical feedback to our students in the form of studio visits.

Post-Graduate Employment Opportunities

Post Graduate Employment Opportunities;-Teaching at the college/university level.-Professional Artist-Curatorial/Gallery work.

Post-Graduate Career Placements

Post -Grad Career Placement; WSU Museum of Art, Teaching Middleton, Texas Adjunct Teaching at WSU and Tri Cities, Teaching at Missouri State University Teaching at Green River Community College Teaching at Black Hills State College and Nevada State College Adjunct Professor of Art, Prince George's Community College in MD

Contact Information

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Fine Arts

F A

- 500 Graduate Art History 2** May be repeated for credit; cumulative maximum 6 hours.
- 510 Graduate Drawing 3** May be repeated for credit; cumulative maximum 9 hours.
- 511 Graduate Drawing 3** May be repeated for credit; cumulative maximum 9 hours.
- 512 Graduate Drawing 3** May be repeated for credit; cumulative maximum 9 hours.
- 520 Graduate Painting 3** May be repeated for credit; cumulative maximum 9 hours.

- 521 Graduate Painting 3** May be repeated for credit; cumulative maximum 9 hours. May be repeated for credit; cumulative maximum 9 hours.
- 522 Graduate Painting 3** May be repeated for credit; cumulative maximum 9 hours.
- 530 Graduate Digital Media 3** May be repeated for credit; cumulative maximum 9 hours.
- 531 Graduate Digital Media 3** May be repeated for credit; cumulative maximum 9 hours.
- 532 Graduate Digital Media 3** May be repeated for credit; cumulative maximum 9 hours.
- 540 Graduate Ceramics 3** May be repeated for credit; cumulative maximum 9 hours.
- 541 Graduate Ceramics 3** May be repeated for credit; cumulative maximum 9 hours.
- 542 Graduate Ceramics 3** May be repeated for credit; cumulative maximum 9 hours.
- 550 Graduate Sculpture 3** May be repeated for credit; cumulative maximum 9 hours.
- 551 Graduate Sculpture 3** May be repeated for credit; cumulative maximum 9 hours.
- 552 Graduate Sculpture 3** May be repeated for credit; cumulative maximum 9 hours.
- 570 Graduate Printmaking 3** May be repeated for credit; cumulative maximum 9 hours.
- 571 Graduate Printmaking 3** May be repeated for credit; cumulative maximum 9 hours.
- 572 Graduate Printmaking 3** May be repeated for credit; cumulative maximum 9 hours.
- 580 Graduate Photography 3** May be repeated for credit; cumulative maximum 9 hours.
- 581 Graduate Photography 3** May be repeated for credit; cumulative maximum 9 hours.
- 582 Graduate Photography 3** May be repeated for credit; cumulative maximum 9 hours.
- 598 Graduate Seminar 2** May be repeated for credit; cumulative maximum 6 hours. Topics in contemporary issues, theory, and criticism.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

Food Science

Degree offered: Doctor of Philosophy (Food Science)

Faculty working with graduate students: 22

Graduate students: 18

Graduate students receiving assistantships or scholarships: 88%

Tests required: GRE (Combined), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Complete courses in food chemistry, food microbiology, food processing, advanced food science, seminars, statistics, research, and college teaching course. Present research proposal, complete teaching requirements in food science courses, and pass written and oral preliminary examination.

Program Description

The School of Food Science offers graduate programs leading to Doctoral and Master's of Food Science degrees. Washington State University (WSU) and University of Idaho (UI) merged faculty and programs to become the School of Food Science (SFS). This is the first program in the nation to share teaching, research, extension programs, faculty, and resources between two states and two universities. Food Science is a multidisciplinary science that applies biology, chemistry, physics, engineering, nutrition, and other sciences to improve the safety and quality of food products; develop new food products; and design new, safer, and more energy efficient food preservation methods.

Degree Description

The School of Food Science offers graduate programs leading to Doctoral and Master's of Food Science degrees. Washington State University (WSU) and University of Idaho (UI) merged faculty and programs to become the School of Food Science (SFS). This is the first program in the nation to share teaching, research, extension programs, faculty, and resources between two states and two universities. Food Science is a multidisciplinary science that applies biology, chemistry, physics, engineering, nutrition, and other sciences to improve the safety and quality of food products; develop new food products; and design new, safer, and more energy efficient food preservation methods. Curriculum emphasizes courses in food processing, food chemistry, food microbiology, sensory evaluation, and other specialized areas. Examples include the processing and manufacturing of cereal, dairy, fruit, and vegetable products; including cheeses, wines, and potatoes. Departmental faculty and adjunct/affiliate faculty may all serve as student advisors. Faculty are housed at WSU and UI campuses, the WSU Tri-Cities campus, and the research station in Prosser, WA. Each student's program of study is individualized based on their research interests, prior academic experience, and collaboration with their major advisor.

Training and Professional Development Opportunities

Students gain research experience and leadership skills at the SFS facilities housed on the WSU and UI campuses that includes: research level chemistry, microbiology, and engineering laboratories; the WSU Creamery where on-going research on ice cream and cheese occurs, including the world renowned 'Cougar

Gold' cheese; a contemporary sensory evaluation facility where aroma, flavor and taste panels are conducted, and a processing pilot plant where small-scale equipment allows for applied research. Off-campus facilities include the Food Technology Center in Caldwell, ID., and the Irrigated Agriculture Research and Extension Center (IAREC) in Prosser, WA., in the heart of the Northwest's expanding wine and food processing industries.

Post-Graduate Employment Opportunities

Food science graduates begin careers in food research and development, food quality assurance, food safety microbiology, production management, regulatory affairs, or research in the food/allied industries or federal/state regulatory agencies.

Post-Graduate Career Placements

Food scientist, research and development scientist, food safety researcher, product and process development scientist, faculty, postdoctoral research associate, director of research, development, and technical support for large companies such as Conagra, SunOpta Fruit Group, Sorrento Lactalis, Cadbury Adams, Kraft, Continental Mills, Caravan's, PepsiCo, Safeway, Danisco, Whirlpool.

Contact Information

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Food Science

FS

- 303 Food Processing 3** Course Prerequisite: FS 110 or 220; MATH 140 or 171; STAT 212 or concurrent enrollment. Specialized techniques, concepts and practices of food processing.
- 304 Cereal Products 2** Course Prerequisite: CHEM 345. Technical principles related to the production and commercial processing of legume and cereal foods. Field trip required.
- 416 Food Microbiology 3** Course Prerequisite: MBIOS 304; MBIOS 305. Purpose for enumeration, detection and identification of microorganisms in food products; physical, chemical and environmental factors influencing growth and survival of foodborne microorganisms; pathogenic and spoilage microorganisms in food and their control.

- 417 Food Microbiology Laboratory 2 (0-6)** Course Prerequisite: Concurrent enrollment in FS 416. Methods for enumeration, detection, and identification of spoilage and pathogenic microorganisms in foods.
- 432 Food Engineering 3** Course Prerequisite: FS 303; PHYSICS 101. Food engineering for improving the efficiency of food processing operations and quality processed food; heat transfer, stream, air-vapor mixtures, refrigeration and fluid flow.
- 433 Food Engineering Lab 1 (0-3)** Course Prerequisite: FS 432 or concurrent enrollment. To enhance the learning experience of the students taking FS 432 through laboratories, problem sessions and group discussions.
- 460 Food Chemistry 3** Course Prerequisite: CHEM 345; MBIOS 303. Fundamentals of food chemistry; composition of foods and the changes that occur during processing.
- 461 Food Chemistry Laboratory 1 (0-3)** Course Prerequisite: FS 460 or concurrent enrollment. Experiments related to the properties, reactions and interactions of chemical components of foods.
- 489 Food Product Development 3 (1-6)** Course Prerequisite: FS 303; FS 416; FS 460; senior standing. Course serves as a capstone experience for food science seniors, and will require the application of food chemistry, food processing/engineering, and microbiology course knowledge in formulating a new food product.

Food Science

STAT

- 412 Statistical Methods in Research I 3** Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 501 Topics in Food Science V 1-3** May be repeated for credit; cumulative maximum 6 hours. Selected topics in food science.
- 510 Functional Foods and Health 3** Benefits of foods beyond basic nutrition; bioactive compounds in functional foods and nutraceuticals relating to disease prevention and health promotion. Recommended preparation: BIOLOGY 101; BIOLOGY 102, or BIOLOGY 106; BIOLOGY 107; MBIOS 303.
- 511 Food Lipids 3** Occurrence, structure, chemical and physical properties; functions of lipids in foods. Recommended preparation: FS 460; MBIOS 303.
- 512 Food Proteins and Enzymes 2** Chemistry/biochemistry of proteins/enzymes applied to food research and industry; protein functionality/enzyme technology application to food industry. Recommended preparation: FS 460; MBIOS 303.
- 513 Food Carbohydrates 3** Structure function relationships of polysaccharides within food systems as a function of their respective molecular structures and physical characteristics.

- 516 Food Laws 2** Become familiar with government statutes and regulations that contribute to a safe, nutritious, and wholesome food supply. Understand more about the law and the US legal system relevant to the regulation of the manufacture and sale of food and supplements, including jurisdictional issues, administrative law, and tort, contract, corporate, environmental, labor, and criminal law issues.
- 517 Scientific Writing 2** May be repeated for credit. Fundamentals of good technical writing and presentation; preparing and writing thesis/dissertation, scientific publications, and research grants; bibliography organization and citing, statistical data analysis, and preparation of graphics, tables, and posters; reviewing and evaluating current research.
- 518 Oral Seminar 1** May be repeated for credit. Development of skills and communication tools and techniques for oral presentations of current food science research.
- 522 Sensory Evaluation of Food and Wine 3** Recommended preparation: STAT 212; FS 110 or VIT ENOL 113. Theory, principles and application of sensory evaluation techniques in appearance, aroma, flavor and texture of foods and wine. (Cross-listed course offered as FS 422, VIT ENOL 422).
- 529 Dairy Products 3** Dairy chemistry, microbiology, sanitation, product development and processing from cow to consumer. Credit not granted for both FS 429 and FS 529.
- 530 Dairy Products Lab 1 (0-3)** Course Prerequisite: Concurrent enrollment in FS 529. Hands-on skills formulating, processing, evaluating and analyzing dairy products using communication and critical thinking skills.
- 531 Advanced Food Safety and Quality 3** Analysis of the safety, regulation, protection, and quality of processed food products and their manufacturing environment.
- 538 Physical Properties of Food 2** Thermophysical behavior of foods and biopolymers, including water transport/activity, rheological, thermal, dielectric, and barrier properties; Newtonian and non-Newtonian flow; Viscous, viscoelastic, and Hookean behavior; relationship between rheology of food biopolymers and structure, composition, temperature, and plasticizer content.
- 564 Food Toxicology 3** General principles of toxicological evaluation of chemicals which enter the food chain; toxicology of food additives, colors, preservatives, drugs, pesticides and natural toxins in foods and risk characterization. Credit not granted for both FS 464 and FS 564.
- 565 Wine Microbiology and Processing 3** Technical principles related to the processing and fermentation of wines with an emphasis on microbiology. (Cross-listed course offered as FS 465, VIT ENOL 465). Recommended preparation for graduate students: MBIOS 303; MBIOS 305; MBIOS 306.
- 570 Advanced Food Technology 3** Physical principles of food preservation and recent advances in food technology. Recommended preparation: FS 416; FS 432; FS 460.
- 583 Advances in Cereal Sciences and Technology 2** Chemistry and functionality of cereal grains as related to their processing and product quality. Recommended preparation: MBIOS 303, CHEM 345, or FS 460.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.

- 530 Applied Linear Models 3** (2-2) The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3** (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
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- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V** 1-2 May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 580 Leadership Development V** 1-3 Course Prerequisite: By permission only. Meetings and workshops designed to develop professional and leadership skills for doctoral students.
- 590 Preparation for College Teaching 2** Cross-discipline instructional development for graduate teaching assistants; course development teaching techniques, university policies and procedures.
- 591 Interdisciplinary Studies 1** May be repeated for credit. Contemporary issues in interdisciplinary education and research. Open to all interested students.
- 597 Preparing the Future Professoriate 2** Course Prerequisite: By permission only. Understanding and contextual knowledge of the professoriate and issues facing higher education.
- 598 Interdisciplinary Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Seminar on theory and practice of advanced interdisciplinary doctoral study.
- 698 Continuous Enrollment Status 0** This course (no credit earned) satisfies continuous enrollment status for graduate students who are not otherwise enrolled.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 899 Continuing Doctoral Status 0** May be repeated for credit; cumulative maximum 0 hours. Continuing Doctoral Status

Food Science

Degree offered: Master of Science in Food Science

Faculty working with graduate students: 22

Graduate students: 33

Graduate students receiving assistantships or scholarships: 84%

Tests required: GRE (Combined), TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

Complete courses in food chemistry, food microbiology, food processing, advanced food science, seminars, statistics, and research. Present thesis seminar.

Program Description

The School of Food Science offers graduate programs leading to Doctoral and Master's of Food Science degrees. Washington State University (WSU) and University of Idaho (UI) merged faculty and programs to become the School of Food Science (SFS). This is the first program in the nation to share teaching, research, extension programs, faculty, and resources between two states and two universities. Food Science is a multidisciplinary science that applies biology, chemistry, physics, engineering, nutrition, and other sciences to improve the safety and quality of food products; develop new food products; and design new, safer, and more energy efficient food preservation methods.

Degree Description

The School of Food Science offers graduate programs leading to Doctoral and Master's of Food Science degrees. Washington State University (WSU) and University of Idaho (UI) merged faculty and programs to become the School of Food Science (SFS). This is the first program in the nation to share teaching, research, extension programs, faculty, and resources between two states and two universities. Food Science is a multidisciplinary science that applies biology, chemistry, physics, engineering, nutrition, and other sciences to improve the safety and quality of food products; develop new food products; and design new, safer, and more energy efficient food preservation methods. Curriculum emphasizes courses in food processing, food chemistry, food microbiology, sensory evaluation, and other specialized areas. Examples include the processing and manufacturing of cereal, dairy, fruit, and vegetable products; including cheeses, wines, and potatoes. Departmental faculty and adjunct/affiliate faculty may all serve as student advisors. Faculty are housed at WSU and UI campuses, the WSU Tri-Cities campus, and the research station in Prosser, WA. Each student's program of study is individualized based on their research interests, prior academic experience, and collaboration with their major advisor.

Training and Professional Development Opportunities

Students gain research experience and leadership skills at the SFS facilities housed on the WSU and UI campuses that includes: research level chemistry, microbiology, and engineering laboratories; the WSU Creamery where on-going research on ice cream and cheese occurs, including the world renowned 'Cougar Gold' cheese; a contemporary sensory evaluation facility where aroma, flavor and taste panels are conducted, and a processing pilot plant where small-scale equipment allows for applied research. Off-campus facilities include the Food Technology Center in Caldwell, ID., and the Irrigated Agriculture Research and Extension Center (IAREC) in Prosser, WA., in the heart of the Northwest's expanding wine and food processing industries.

Post-Graduate Employment Opportunities

Food science graduates begin careers in food research and development, food quality assurance, food safety microbiology,

production management, regulatory affairs, or research in the food/allied industries or federal/state regulatory agencies.

Post-Graduate Career Placements

Gallo Wines, ConAgra Foods, Givaudan Flavors, Leprino Foods, Heinz Foods USA, TIC Gums, General Mills, Safeway, McCain Foods USA, Bolthouse Farms, Michelson Laboratories, Ecolab, Weichuan USA, Schwann's, Darigold, Wilcox Farms, Ventura Food, Trident Seafoods, Disney Consumer Products, Idaho Pacific Corp., Nestle Nutrition, Heinz North America, Cargill, and J.R. Simplot. Attend University for Ph.D. degree.

Contact Information

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Faculty

Byung-Kee Baik, Carolyn Bohach, Jeffri Bohlscheid, Boon Chew, Jeffrey Culbertson, Richard Dougherty, Charles Edwards, James Harbertson, Thomas Henick-Kling, Kerry Huber, Karen Killinger, Scott Minnich, Greg Moller, Craig Morris, Andrzej Paszczyński, Joseph Powers, Barbara Rasco, Carolyn Ross, Dojin Ryu, Denise Smith, Barry Swanson and Gulhan Unlu.

Food Science

FS

- 303 Food Processing** 3 Course Prerequisite: FS 110 or 220; MATH 140 or 171; STAT 212 or concurrent enrollment. Specialized techniques, concepts and practices of food processing.
- 304 Cereal Products** 2 Course Prerequisite: CHEM 345. Technical principles related to the production and commercial processing of legume and cereal foods. Field trip required.
- 416 Food Microbiology** 3 Course Prerequisite: MBIOS 304; MBIOS 305. Purpose for enumeration, detection and identification of microorganisms in food products; physical, chemical and environmental factors influencing growth and survival of foodborne microorganisms; pathogenic and spoilage microorganisms in food and their control.
- 417 Food Microbiology Laboratory** 2 (0-6) Course Prerequisite: Concurrent enrollment in FS 416. Methods for enumeration, detection, and identification of spoilage and pathogenic microorganisms in foods.
- 432 Food Engineering** 3 Course Prerequisite: FS 303; PHYSICS 101. Food engineering for improving the efficiency of food processing operations and quality processed food; heat transfer, steam, air-vapor mixtures, refrigeration and fluid flow.
- 433 Food Engineering Lab** 1 (0-3) Course Prerequisite: FS 432 or concurrent enrollment. To enhance the learning experience of the students taking FS 432 through laboratories, problem sessions and group discussions.

- 460 Food Chemistry 3** Course Prerequisite: CHEM 345; MBIOS 303. Fundamentals of food chemistry; composition of foods and the changes that occur during processing.
- 461 Food Chemistry Laboratory 1 (0-3)** Course Prerequisite: FS 460 or concurrent enrollment. Experiments related to the properties, reactions and interactions of chemical components of foods.
- 489 Food Product Development 3 (1-6)** Course Prerequisite: FS 303; FS 416; FS 460; senior standing. Course serves as a capstone experience for food science seniors, and will require the application of food chemistry, food processing/engineering, and microbiology course knowledge in formulating a new food product.
- Food Science**
- STAT**
- 412 Statistical Methods in Research I 3** Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 501 Topics in Food Science V 1-3** May be repeated for credit; cumulative maximum 6 hours. Selected topics in food science.
- 510 Functional Foods and Health 3** Benefits of foods beyond basic nutrition; bioactive compounds in functional foods and nutraceuticals relating to disease prevention and health promotion. Recommended preparation: BIOLOGY 101; BIOLOGY 102, or BIOLOGY 106; BIOLOGY 107; MBIOS 303.
- 511 Food Lipids 3** Occurrence, structure, chemical and physical properties; functions of lipids in foods. Recommended preparation: FS 460; MBIOS 303.
- 512 Food Proteins and Enzymes 2** Chemistry/biochemistry of proteins/enzymes applied to food research and industry; protein functionality/enzyme technology application to food industry. Recommended preparation: FS 460; MBIOS 303.
- 513 Food Carbohydrates 3** Structure function relationships of polysaccharides within food systems as a function of their respective molecular structures and physical characteristics.
- 516 Food Laws 2** Become familiar with government statutes and regulations that contribute to a safe, nutritious, and wholesome food supply. Understand more about the law and the US legal system relevant to the regulation of the manufacture and sale of food and supplements, including jurisdictional issues, administrative law, and tort, contract, corporate, environmental, labor, and criminal law issues.
- 517 Scientific Writing 2** May be repeated for credit. Fundamentals of good technical writing and presentation; preparing and writing thesis/dissertation, scientific publications, and research grants; bibliography organization and citing, statistical data analysis, and preparation of graphics, tables, and posters; reviewing and evaluating current research.
- 518 Oral Seminar 1** May be repeated for credit. Development of skills and communication tools and techniques for oral presentations of current food science research.
- 522 Sensory Evaluation of Food and Wine 3** Recommended preparation: STAT 212; FS 110 or VIT ENOL 113. Theory, principles and application of sensory evaluation techniques in appearance, aroma, flavor and texture of foods and wine. (Cross-listed course offered as FS 422, VIT ENOL 422).
- 529 Dairy Products 3** Dairy chemistry, microbiology, sanitation, product development and processing from cow to consumer. Credit not granted for both FS 429 and FS 529.
- 530 Dairy Products Lab 1 (0-3)** Course Prerequisite: Concurrent enrollment in FS 529. Hands-on skills formulating, processing, evaluating and analyzing dairy products using communication and critical thinking skills.
- 531 Advanced Food Safety and Quality 3** Analysis of the safety, regulation, protection, and quality of processed food products and their manufacturing environment.
- 538 Physical Properties of Food 2** Thermophysical behavior of foods and biopolymers, including water transport/activity, rheological, thermal, dielectric, and barrier properties; Newtonian and non-Newtonian flow; Viscous, viscoelastic, and Hookean behavior; relationship between rheology of food biopolymers and structure, composition, temperature, and plasticizer content.
- 564 Food Toxicology 3** General principles of toxicological evaluation of chemicals which enter the food chain; toxicology of food additives, colors, preservatives, drugs, pesticides and natural toxins in foods and risk characterization. Credit not granted for both FS 464 and FS 564.
- 565 Wine Microbiology and Processing 3** Technical principles related to the processing and fermentation of wines with an emphasis on microbiology. (Cross-listed course offered as FS 465, VIT ENOL 465). Recommended preparation for graduate students: MBIOS 303; MBIOS 305; MBIOS 306.
- 570 Advanced Food Technology 3** Physical principles of food preservation and recent advances in food technology. Recommended preparation: FS 416; FS 432; FS 460.
- 583 Advances in Cereal Sciences and Technology 2** Chemistry and functionality of cereal grains as related to their processing and product quality. Recommended preparation: MBIOS 303, CHEM 345, or FS 460.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Foreign Languages and Cultures

Degree offered: Master of Arts in Foreign Languages and Cultures

Faculty working with graduate students: 7

Graduate students: 12

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL

Deadline: Fall: February 1
Spring: N/A

Program Description

The Department of Foreign Languages and Cultures offers a Master's program in Foreign Languages, with an emphasis in Spanish. The emphasis of the program is on Spanish (Peninsular) and Latin American literature, film and culture, but seminars on foreign language pedagogy and practical teaching experience are provided. Applicants should have majors in related areas, such as literature, linguistics, and pedagogy, but applicants from other humanities and social sciences disciplines will be considered on a case by case basis, as long as they have an advanced proficiency level in all Spanish-language skills, and a solid foundation and understanding of culture.

Degree Description

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Training and Professional Development Opportunities

Summer internships and/or teaching positions.

Contact Information

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Washington State University
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Telephone: 509 335-4135
Fax: 509 335-3708
E-mail: daviscm@wsu.edu

Faculty

Eloy Gonzalez, Michael Hubert, Francisco Manzo-Robledo, Vilma Navarro-Daniels, Maria Previto, Ana Rodriguez-Vivaldi and Inigo Serna.

FOR L

- 540 Methods of Teaching Foreign Languages 3** Survey of current methodology with emphasis on practical application in the classroom. Credit not granted for both FOR LANG 440 and FOR LANG 540.
- 541 Research and Methods of Technology Enhanced Foreign Language Learning 3** Taught in English. The use of technology in the foreign language classroom; hands-on experience with equipment and multi-media materials.
- 560 Seminar in Scholarly Methodology 2** Bibliography and formal aspects of scholarly writing; general introduction to literary criticism.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

SPAN

- 550 Medieval Literature 3** Selected works. Taught in Spanish.
- 551 Seminar in Golden Age Literature 3** Reading and discussion of representative works of the Spanish Golden Age. Taught in Spanish.
- 552 Topics in Nineteenth-Century Spanish Literature 3** May be repeated for credit; cumulative maximum 6 hours. Selected works and topics. Taught in Spanish.
- 553 Topics in Twentieth-Century Spanish Literature 3** May be repeated for credit; cumulative maximum 6 hours. Selected works and topics. Taught in Spanish.
- 554 Seminar in Spanish Literature and/or Culture V 1-3** May be repeated for credit.
- 555 Seminar in Colonial Spanish American Literature 3** May be repeated for credit; cumulative maximum 6 hours. Seminar on conquest and colonial literature in Hispanic America.
- 556 Seminar in Nineteenth-Century Spanish American Literature 3** May be repeated for credit; cumulative maximum 6 hours. Study of nineteenth-century Spanish American Literature. May be relegated for credit; cumulative maximum 6 hours.
- 557 Seminar in Twentieth-Century Spanish American Literature 3** May be repeated for credit; cumulative maximum 6 hours. Study of twentieth-century Spanish American literature and culture.
- 558 Seminar in Spanish American Literature and/or Culture V 1-3** May be repeated for credit.
- 559 Special Topics in Hispanic Studies and/or Linguistics V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special interdisciplinary topics in Hispanic studies and/or linguistics.
- 560 Beginning Instructional Practicum 2** May be repeated for credit; cumulative maximum 4 hours. An introduction to foreign language instruction for beginning teaching assistants.
- 561 Advanced Instructional Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised practical experience in foreign language teaching.
- 597 Graduate Internship V 1 (0-3) to 6 (0-18)** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SPANISH 560; FOR LANG 540; minimum GPA of 3.50. Supervised internship experience relating to career objectives; portfolio assignment required.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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Foreign Languages and Cultures

Degree offered: Master of Arts in Foreign Languages and Cultures – Non Thesis

Faculty working with graduate students: 7

Graduate students: 12

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall: February 1

Spring: N/A

Program Description

The Department of Foreign Languages and Cultures offers a Master's program in Foreign Languages, with an emphasis in Spanish. The emphasis of the program is on Spanish (Peninsular) and Latin American literature, film and culture, but seminars on foreign language pedagogy and practical teaching experience are provided. Applicants should have majors in related areas, such as literature, linguistics, and pedagogy, but applicants from other humanities and social sciences disciplines will be considered on a case by case basis, as long as they have an advanced proficiency level in all Spanish-language skills, and a solid foundation and understanding of culture.

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Faculty

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FOR L

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- 541 Research and Methods of Technology Enhanced Foreign Language Learning 3** Taught in English. The use of technology in the foreign language classroom; hands-on experience with equipment and multi-media materials.
- 560 Seminar in Scholarly Methodology 2** Bibliography and formal aspects of scholarly writing; general introduction to literary criticism.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

SPAN

- 550 Medieval Literature 3** Selected works. Taught in Spanish.
- 551 Seminar in Golden Age Literature 3** Reading and discussion of representative works of the Spanish Golden Age. Taught in Spanish.
- 552 Topics in Nineteenth-Century Spanish Literature 3** May be repeated for credit; cumulative maximum 6 hours. Selected works and topics. Taught in Spanish.
- 553 Topics in Twentieth-Century Spanish Literature 3** May be repeated for credit; cumulative maximum 6 hours. Selected works and topics. Taught in Spanish.
- 554 Seminar in Spanish Literature and/or Culture V 1-3** May be repeated for credit.
- 555 Seminar in Colonial Spanish American Literature 3** May be repeated for credit; cumulative maximum 6 hours. Seminar on conquest and colonial literature in Hispanic America.
- 556 Seminar in Nineteenth-Century Spanish American Literature 3** May be repeated for credit; cumulative maximum 6 hours. Study of nineteenth-century Spanish American Literature. May be relegated for credit; cumulative maximum 6 hours.
- 557 Seminar in Twentieth-Century Spanish American Literature 3** May be repeated for credit; cumulative maximum 6 hours. Study of twentieth-century Spanish American literature and culture.
- 558 Seminar in Spanish American Literature and/or Culture V 1-3** May be repeated for credit.
- 559 Special Topics in Hispanic Studies and/or Linguistics V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special interdisciplinary topics in Hispanic studies and/or linguistics.
- 560 Beginning Instructional Practicum 2** May be repeated for credit; cumulative maximum 4 hours. An introduction to foreign language instruction for beginning teaching assistants.
- 561 Advanced Instructional Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised practical experience in foreign language teaching.
- 597 Graduate Internship V 1 (0-3) to 6 (0-18)** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SPANISH 560; FOR LANG 540; minimum GPA of 3.50. Supervised internship experience relating to career objectives; portfolio assignment required.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Geology

Degree offered: Doctor of Philosophy (Geology)

Faculty working with graduate students: 8

Graduate students: 7

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 15

Spring: October 15

Program Description

The School of Earth & Environmental Sciences (SEES) is a new unit established August, 2006 comprised of the former Program in Environmental Science & Regional Planning and Department of Geology. The School offers a: * Master of Science in Environmental Science, * Master of Science in Geology, * Doctor of Philosophy in Environmental and Natural Resource Sciences) and * Doctor of Philosophy in Geology. The Master's degree in Environmental Science is offered at WSU Tri-Cities and WSU Vancouver, as well as at WSU-Pullman.

Degree Description

The Ph.D. dissertation should be a significant contribution to the science of geology, worthy of publication in referred international journals. Geology Ph.D. candidates are required to choose an area of specialization in Geology listed below. Each specialization outlines required courses and provides additional help to design a program. The student's program should be one of, or a combination of not more than two areas. The choice of course options and electives on the program will be based on the student's research interest and needs. Undergraduate pre-requisites must be satisfied for all courses within the selected program, and will not count for graduate credit. It is expected that the Ph.D. degree requirements with previous M.S. degree be completed in three years (full-time enrollment, with assistantship); Ph.D. degree requirements without previous M.S. degree be completed in four years.

Contact Information

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Fax: (509) 335-3700
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Faculty

Catherine Cooper, David Gaylord, Chester Keller, Peter Larson, Dirk Schulze-Makuch, Jeffrey Vervoort, Anthony Watkinson and John Wolff.

GEOLOGY

- 505 Geophysics 4 (3-3)** Theory and application of geophysical methods for hydrology, environmental, engineering, exploration, and structural geology; review of techniques. (Cross-listed course offered as GEOLOGY 405).
- 520 Advanced Topics in Sedimentology 3 (2-3)** May be repeated for credit; cumulative maximum 6 hours. Modern aspects of sedimentary rocks. Field trip required.
- 521 Clastic Depositional Systems 3 (2-3)** Clastic sedimentary environments; architectural elements and facies analysis. Field trip required.
- 523 Advanced Topics in Stratigraphy 3** May be repeated for credit.
- 525 Carbonate Depositional Systems 3 (2-3)** Modern carbonate environments and processes; ancient carbonate rock sequences; carbonate platform-to-basin transition; diagenesis of carbonate rocks. Field trip required.
- 538 Orogenic Systems I 3** Field-base course examines tectonic processes active in the northern Cordillera. Field trip required and final research paper.
- 540 Tectonics 3** Nature and origin of the Earth's major tectonic features.
- 541 Structural Analysis 3 (2-3)** Structural analysis of complexly deformed rocks in orogenic belts. Field trip required.
- 545 Astrobiology 3** Origin, evolution, distribution and future of life in the universe; fundamental concepts of life and habitable environments on Earth and other planetary bodies within and outside of the solar system. Credit not granted for both GEOLOGY 445 and GEOLOGY 545.
- 550 Advanced Mineralogy 3** Elements of crystal chemistry and crystal physics.
- 552 Analytical Methods in Earth Sciences 3 (2-3)** Theory and practical experience in EMPA, XRD, XRF, and ICPMS analysis.
- 560 Advanced Igneous Petrology 3 (2-3)** Origin, evolution, and tectonic significance of igneous rocks. Field trip required.
- 562 Watershed Biogeochemistry 3** Sources, transformations, fates and impacts of biogeochemically important compounds as they move downstream through watersheds to the coastal zone.

- 567 Volcanology 3** (2-3) Volcanic process, eruption mechanisms, volcanic deposits, hazard assessment. Field trip required. Credit not granted for both GEOLOGY 467 and GEOLOGY 567.
- 578 Groundwater Geobiology 3** (2-3) Interaction of groundwater geology and the environment including microbial populations with emphasis on microbial transport in the sub-surface and bioremediation approaches.
- 579 Groundwater Geochemistry V** 2-4 May be repeated for credit; cumulative maximum 4 hours. Organic and inorganic aqueous geochemistry; controls on groundwater contaminant fate.
- 583 Radiogenic Isotopes and Geochronology 3** Radiogenic isotopes and their uses as chronometers (radiometric dating) and as tracers of earth evolution and differentiation.
- 584 Stable Isotope Geochemistry 3** Principles and applications of isotope geochemistry in the geological sciences.
- 588 Methods in Radiogenic Isotope Geochemistry 3** (1-6)
Course Prerequisite: GEOLOGY 583. Laboratory-based course in modern analytical methods in radiogenic isotope geochemistry.
- 595 Advanced Topics in Geology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 596 Advanced Topics in Geology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 597 Advanced Topics in Geology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 598 Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Research papers presented by students, faculty, and visiting scientists on geological research. Credit not granted for both GEOLOGY 498 and GEOLOGY 598.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Geology

Degree offered: Master of Science in Geology

Faculty working with graduate students: 8

Graduate students: 21

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 15

Spring: October 15

Requirements

Geology M.S. candidates must take 15 hours of 500-level graded major course work. The thesis program must consist of not less than 30 hours of approved graduate credit including a minimum of 21 hours of graded course work and 4 hours of Geol 700, Master's Research. Of these 21 hours of course work, up to 6 credits of non-graduate graded credit (300- or 400-level) may be used. The program may not include courses graded Pass/Fail, courses not approved for graduate credit, or courses that are audited. Courses taken to remove undergraduate deficiencies cannot be taken for a Pass/Fail grade. Any course included in the advanced degree program in which a grade of "C-" or below is earned must be repeated but not on a Pass/Fail basis. Geology M.S. candidates must enroll in Geol 598 (Seminar) a minimum of 2 semesters. A final oral exam is required to test the candidate's knowledge of geology with emphasis on the work presented in the thesis.

Program Description

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Contact Information

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Faculty

Catherine Cooper, David Gaylord, Chester Keller, Peter Larson, Dirk Schulze-Makuch, Jeffrey Vervoort, Anthony Watkinson and John Wolff.

GEOL

505 Geophysics 4 (3-3) Theory and application of geophysical methods for hydrology, environmental, engineering, exploration, and structural geology; review of techniques. (Cross-listed course offered as GEOLOGY 405).

- 520 Advanced Topics in Sedimentology** 3 (2-3) May be repeated for credit; cumulative maximum 6 hours. Modern aspects of sedimentary rocks. Field trip required.
- 521 Clastic Depositional Systems** 3 (2-3) Clastic sedimentary environments; architectural elements and facies analysis. Field trip required.
- 523 Advanced Topics in Stratigraphy** 3 May be repeated for credit.
- 525 Carbonate Depositional Systems** 3 (2-3) Modern carbonate environments and processes; ancient carbonate rock sequences; carbonate platform-to-basin transition; diagenesis of carbonate rocks. Field trip required.
- 538 Orogenic Systems I** 3 Field-base course examines tectonic processes active in the northern Cordillera. Field trip required and final research paper.
- 540 Tectonics** 3 Nature and origin of the Earth's major tectonic features.
- 541 Structural Analysis** 3 (2-3) Structural analysis of complexly deformed rocks in orogenic belts. Field trip required.
- 545 Astrobiology** 3 Origin, evolution, distribution and future of life in the universe; fundamental concepts of life and habitable environments on Earth and other planetary bodies within and outside of the solar system. Credit not granted for both GEOLOGY 445 and GEOLOGY 545.
- 550 Advanced Mineralogy** 3 Elements of crystal chemistry and crystal physics.
- 552 Analytical Methods in Earth Sciences** 3 (2-3) Theory and practical experience in EMPA, XRD, XRF, and ICPMS analysis.
- 560 Advanced Igneous Petrology** 3 (2-3) Origin, evolution, and tectonic significance of igneous rocks. Field trip required.
- 562 Watershed Biogeochemistry** 3 Sources, transformations, fates and impacts of biogeochemically important compounds as they move downstream through watersheds to the coastal zone.
- 567 Volcanology** 3 (2-3) Volcanic process, eruption mechanisms, volcanic deposits, hazard assessment. Field trip required. Credit not granted for both GEOLOGY 467 and GEOLOGY 567.
- 578 Groundwater Geobiology** 3 (2-3) Interaction of groundwater geology and the environment including microbial populations with emphasis on microbial transport in the sub-surface and bioremediation approaches.
- 579 Groundwater Geochemistry** V 2-4 May be repeated for credit; cumulative maximum 4 hours. Organic and inorganic aqueous geochemistry; controls on groundwater contaminant fate.
- 583 Radiogenic Isotopes and Geochronology** 3 Radiogenic isotopes and their uses as chronometers (radiometric dating) and as tracers of earth evolution and differentiation.
- 584 Stable Isotope Geochemistry** 3 Principles and applications of isotope geochemistry in the geological sciences.
- 588 Methods in Radiogenic Isotope Geochemistry** 3 (1-6) Course Prerequisite: GEOLOGY 583. Laboratory-based course in modern analytical methods in radiogenic isotope geochemistry.
- 595 Advanced Topics in Geology** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
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- 598 Seminar** 1 May be repeated for credit; cumulative maximum 3 hours. Research papers presented by students, faculty, and visiting scientists on geological research. Credit not granted for both GEOLOGY 498 and GEOLOGY 598.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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Geology

Degree offered: Master of Science in Geology – Non Thesis

Faculty working with graduate students: 8

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 15

Spring: October 15

Requirements

Geology M.S. candidates must take 17 hours of 500-level graded major course work. The thesis program must consist of not less than 30 hours of approved graduate credit including a minimum of 26 hours of graded course work and 4 hours of Geol 702, Master's Special Problems. Of these 26 hours of course work, up to 9 credits of non-graduate graded credit (300- or 400-level) may be used. The program may not include courses graded Pass/Fail, courses not approved for graduate credit, or courses that are audited. Courses taken to remove undergraduate deficiencies cannot be taken for a Pass/Fail grade. Any course included in the advanced degree program in which a grade of "C-" or below is earned must be repeated but not on a Pass/Fail

basis. Geology M.S. candidates must enroll in Geol 598 (Seminar) a minimum of 2 semesters.

Program Description

The School of Earth & Environmental Sciences (SEES) is a new unit established August, 2006 comprised of the former Program in Environmental Science & Regional Planning and Department of Geology. The School offers a: * Master of Science in Environmental Science, * Master of Science in Geology, * Doctor of Philosophy in Environmental and Natural Resource Sciences) and * Doctor of Philosophy in Geology. The Master's degree in Environmental Science is offered at WSU Tri-Cities and WSU Vancouver, as well as at WSU-Pullman.

Degree Description

In the M.S. non-thesis option, a formal written project report as well as an oral exam are required. Geology M.S. candidates are required to choose an area of specialization in Geology listed below. Each specialization outlines required courses and provides additional help to design a program. The student's program should be one of, or a combination of not more than two areas. The choice of course options and electives on the program will be based on the student's research interest and needs. Undergraduate pre-requisites must be satisfied for all courses within the selected program, and will not count for graduate credit. It is expected that the M.S. degree requirements be completed in two years (full-time enrollment, with assistantship).

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Faculty

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GEOL

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- 523 Advanced Topics in Stratigraphy 3** May be repeated for credit.
- 525 Carbonate Depositional Systems 3** (2-3) Modern carbonate environments and processes; ancient carbonate rock sequences; carbonate platform-to-basin transition; diagenesis of carbonate rocks. Field trip required.
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- 588 Methods in Radiogenic Isotope Geochemistry 3** (1-6) Course Prerequisite: GEOLOGY 583. Laboratory-based course in modern analytical methods in radiogenic isotope geochemistry.
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- 597 Advanced Topics in Geology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.

- 598 Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Research papers presented by students, faculty, and visiting scientists on geological research. Credit not granted for both GEOLOGY 498 and GEOLOGY 598.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Global Justice and Security Studies – Cert in Glob Jus and Sec Studies

Degree offered: Graduate Certificate in Global Justice and Security Studies

Faculty working with graduate students: 7

Graduate students: 10

Deadline: :
Fall: January 10

Program Description

This terminal degree program is designed to provide students with a specialized qualification better suited for the pursuit of professional careers in federal, state, or local government. The GJSS program targets students intending to pursue largely non-academic, governmental careers as practitioners, whether it be in the field of homeland security, law enforcement, or as analysts within the U.S. intelligence or defense communities.

Degree Description

MA degree including the Graduate Certificate in Global and Security Studies

Training and Professional Development Opportunities

None at WSU

Post-Graduate Employment Opportunities

The GJSS program targets students intending to pursue largely non-academic, governmental careers as practitioners, whether it be in the field of homeland security, law enforcement, military

service, or as analysts within the U.S. foreign, intelligence, or defense communities.

Post-Graduate Career Placements

Many have gone on to careers in US government agencies, the military, or decided to pursue doctoral studies.

Contact Information

Dr. Thomas Preston

Dr. Martha Cottam

Faculty

David Brody, Martha Cottam, Faith Lutze, Otwin Marenin, John Preston, Steven Stehr and Bryan Vila.

POL S

- 400 Political Science Issues 3** May be repeated for credit; cumulative maximum 6 hours. Current issues in political science.
- 424 US National Security Policy 3** Substantive and theoretical research on issues relevant to formulation and requirements of post-Cold War, US national security and defense policy.
- 427 United States Foreign Relations 3** Ends and means in foreign policy; organization, management, control, and current policy issues. (Cross-listed course offered as POL S 427, HISTORY 486).
- 428 Issues in Political Psychology 3** Course Prerequisite: POL S 101 or PSYCH 105; junior standing. Introduction to the ways in which psychological factors influence political phenomena.
- 429 Special Topics in American Foreign and Defense Policy 3** May be repeated for credit; cumulative maximum 6 hours. Current issues in foreign policy.
- 505 Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 Leadership in Criminal Justice 3** Study of leadership models and theories as they apply to criminal justice institutions.
- 511 Criminal Justice Management 3** Examines the theoretical framework for understanding criminal justice organizations through examining management theory, organizational dynamics, and administration research.
- 512 Juvenile Justice 3** Examination of the major theories and contemporary issues related to juvenile delinquency, the juvenile justice system, gangs, and juvenile corrections.
- 513 Multicultural Issues in Criminal Justice 3** Critical examination of race, gender, and other diversity and cultural issues within the U.S. criminal justice system.
- 514 Professional Development in Criminal Justice and Criminology 1** Professional aspects of research, teaching, and service activities in criminal justice and criminology.
- 520 Criminal Justice Research Methods 3** The design and execution of criminal justice research; critical examination of current research methods in criminal justice.

- 521 Advanced Topics in Criminal Justice Research Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 520. Exploration of specialized topics in research methodology; topics may include qualitative methods, GIS, ethnography, and survey design.
- 522 Foundations of Quantitative Methods 3** Application of foundational quantitative methods utilized in the field of Criminal Justice and Criminology.
- 523 Intermediate Quantitative Methods 3** Course Prerequisite: CRM J 522. Intermediate-level quantitative methods including logistic regression, factor analysis, propensity scoring and model building.
- 524 Advanced Topics in Quantitative Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 523. Advanced quantitative methods used in criminal justice, including time series, HLM, multi-level modeling, spatial analysis, and repeated measures analysis.
- 530 Criminal Justice: Process and Institutions 3** Processes of criminal justice in the context of the social, political, and economic environments.
- 531 Drugs, Alcohol, and Crime 3** Examination of the research and theory surrounding the relationship between alcohol, drugs, crime, and the criminal justice system.
- 540 Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 541 Seminar in Corrections 3** Current issues related to the control, management, and sanctioning of criminal offenders.
- 542 Community Corrections 3** Examines correctional processes in a community setting, including probation, parole, and innovative community-based strategies for dealing with the offender.
- 555 Seminar in Criminological Theory 3** Individual, situational and ecological correlates of criminal behavior; data sources and empirical research.
- 560 Prosecution and Adjudication 3** The function of courts and the behavior of prosecutors, defense attorneys and judges within the criminal justice system.
- 570 The Police and Society 3** Community and selected social institutional factors as related to their influence on police systems.
- 572 Seminar in Comparative Policing 3** Study of the history, organization, and policies of policing systems in selected countries and of transnational policing.
- 580 Gender and Justice 3** Criminal justice system's treatment of women offenders, victims, and professionals.
- 590 PRACTICUM V 1-6** May be repeated for credit; cumulative maximum 6 hours. S, F Grading.
- 591 Seminar in the Administration of Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Current issues, problems, and critical concerns within the field of administration of criminal justice.
- 592 Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Same as POL S 542.
- 593 Special Topics in Criminological Theory 3** May be repeated for credit; cumulative maximum 6 hours. Intense examination of a contemporary criminological theory, school, or paradigm.
- 594 Special Topics in Comparative Criminology and Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of specific topics in comparative criminal justice or criminology.
- 595 Advanced Topics in Criminal Justice Institutions and Processes 3** May be repeated for credit; cumulative maximum 6 hours. In-depth study of issues associated with criminal justice institutions and processes.
- 596 Special Topics: Criminal Justice and Public Health 3** May be repeated for credit; cumulative maximum 6 hours. Examination of public health ramifications of criminal justice policy and practice; public health approaches to violence and substance abuse prevention.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 The Scope of Political Science 3** Historical development and present status of the discipline; contemporary issues and future trends.
- 502 Seminar in Normative Theory 3** Elements of normative theory developments; examination of bases of controversies and approaches in the modern literature using historical sources.
- 503 Research Methods in Political Science 3** Social science research design topics, measurement, sampling, data sources, experimental and quasi-experimental designs, field and historical designs, content analytic designs.
- 504 Quantitative Methods in Political Science 3** Applied statistical skills, enabling understanding of substantive political and social questions.

- 505 Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 Seminar on American Institutions and Processes 3** Seminar required of all graduate students using this field as a major or a minor; it is a prerequisite of all other graduate seminars in the field.
- 511 Seminar in American Political Thought 3** May be repeated for credit; cumulative maximum 6 hours. The genesis and development of political thought in the United States.
- 512 Seminar in American Institutions 3** May be repeated for credit; cumulative maximum 6 hours. Origin, development, and contemporary issues in political organization and structure in the United States.
- 513 Seminar in American Political Behavior 3** May be repeated for credit; cumulative maximum 6 hours. Theoretical approaches to, and empirical analysis of, mass political behavior in the US.
- 514 Seminar in Public Policy 3** Examination of central questions in public policy including the nature of public policy, policy analysis, and government intervention in society.
- 516 Seminar on Law, Courts, and Judicial Politics 3** Seminar on law, courts, and judicial politics.
- 530 American Foreign Policy: Theories and Applications 3** Theories of international politics applied to American foreign policy.
- 531 Seminar in International Security 3** International security and arms control politics, negotiations, agreements.
- 532 Seminar in International Political Economy 3** Institutions, politics, and decision-making processes in managing international economic relations.
- 533 Topics in Political Psychology 3** May be repeated for credit; cumulative maximum 6 hours. Psychological influences on political decision making, bargaining, conflict and conflict resolution options.
- 534 Seminar in Comparative Politics 3**
- 536 Special Topics in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced issues seminar in international and comparative politics.
- 537 Concepts and Methods in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Selected concepts (state, political participation), and methods (cross-national analysis, case study approaches) in comparative politics.
- 538 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 539 The Political Science Profession 1** Methods, problems, and purposes of teaching, research, and vocation in political science.
- 540 Proseminar in Public Administration 3** Proseminar over viewing basic theories of administrative organization, relationships, and behavior.
- 541 Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 542 Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Analytical perspectives and theoretical issues.
- 543 Topics in Public Administration and Policy 3** May be repeated for credit; cumulative maximum 6 hours. Examination of the literature on the politics of the American public policy process.
- 544 The Politics of Policy Process 3** American political process; policy making under the constraints of a democratic system; relationship to the (non) achievement of the public interest.
- 590 Policy Studio Course I 2** Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 591 Policy Studio Course II 2** Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 592 Policy Studio Course III 2** Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 597 Graduate Internship V 2-12** May be repeated for credit; cumulative maximum 12 hours. On/off campus internship in federal, state, or local government institutions; nonprofit or public organizations; written assignments and readings required.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18

May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Health Policy and Administration

Degree offered: Master of Health Policy and Administration

Faculty working with graduate students: 13

Graduate students: 34

Graduate students receiving assistantships or scholarships: 8%

Program offered: Spokane

Tests required: GMAT, GRE (Combined), IELTS, MELAB, TOEFL, TOEFLI

Deadline: Fall: Rolling
Spring: Rolling

Requirements

A student must earn a 3.0 grade point average for all course work. No work of C grade or less may be dropped from a program, nor can a course be repeated for a higher grade if the final grade is C or higher. Any course listed on the program in which a grade of C-, D, or F is earned must be repeated. Any graduate student who fails to maintain a cumulative grade point average of 3.00 or higher for all course work subsequent to admission to the Graduate School will be dropped from the University. Credits with a grade of B or higher that are awarded after a bachelor's degree and are earned in other accredited graduate schools may be transferred and applied toward a student's graduate degree program if they are also appropriate to HPA. The number of such credit hours is limited to no more than half of the total graded course credits required by the program. None of this credit may be applied toward another advanced degree.

Program Description

With CAHME accreditation, renowned faculty and a strong, distinguished curriculum, the HPA program offers students outstanding preparation for health policy and health management careers. What's more, our location in Spokane—a large tertiary medical center—fosters valuable connections with the medical community. The HPA Program believes that the health status of citizens is determined heavily by community and environmental characteristics, and individual behavior, in addition to the health care system. Thus, we think health care leaders and organizations should be closely linked to the community setting in which they work. The program provides significant opportunities for students to participate in community activities while learning how to undertake community health improvement. The faculty have a close working relationship with public officials and policy makers at the state level who work with health care reform issues. Students and faculty have the opportunity to work on policy projects providing rich and broadening experiences in health policy and management.

Degree Description

The core courses provide basic understanding and experience in managing health care systems in the context of enhancing community health status. A multidisciplinary systems perspective in many courses helps students develop knowledge and skills in communication, ethics, interpersonal relations, team building, management, and delivery of cost-effective health care. The learning environment is both rigorous and flexible. Students are encouraged to design individualized programs suitable to a variety of career goals and future employment opportunities. Practical and individualized experiences, through internships, fellowships, research assistantships, and special projects build students' skills and values in varied administrative settings.

Training and Professional Development Opportunities

HPA Seminar Series, ACHE Congress, AUPHA Full Graduate Membership Status, Academy Health, American Public Health Association, LEan Six Sigma Online Professional Development Certificates.

Post-Graduate Employment Opportunities

Post Graduate Fellowships, Hospitals or Health Systems, Physician Practices, Military or VA, Foundations, Long-term Care Facilities, Home Health Care Facilities, Consulting Firms, Insurance/HMOs, Doctoral Programs.

Post-Graduate Career Placements

Post Graduate Fellowships, Hospitals or Health Systems, Physician Practices, Military or VA, Foundations, Long-term Care Facilities, Home Health Care Facilities, Consulting Firms, Insurance/HMOs, Doctoral Programs.

Contact Information

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Faculty

Christopher Blodgett, Lawrence Cohen, Joseph Coyne, Joshua Engle, James Kennedy, Gerald Kobluk, Sterling McPherson, Sean Murphy, Fredrick Peterson, John Roll, Robert Short, Gary Smith and Brent Stanyer.

Health Policy And Administration

HPA

- 500 Introduction to the Health Care System** 3 Orientation to history and organization of the health care system.
- 501 Health Care Policy and Politics** 3 History, methods, results and evaluation of health-care-related policy and politics.
- 502 Law and Ethics of Health Management** 3 Private health law and ethics, including professional liability, relationship of physician and patient, malpractice reform, health institutions, and health access.
- 503 Government Regulation of Health Services** 3 Public law regulation; health care quality, personhood and individual autonomy, life/death decisions, antitrust, health care financing and cost control.
- 509 Health Care Economics** 3 The economics of allocating, financing and delivering health care services.
- 510 Health Care Cost Accounting** 3 Basic cost-accounting concepts, principles, and applications in the health care setting.
- 511 Health Care Finance** 3 Aspects of health care financial management fundamentals and managerial accounting for strategic financial management.
- 512 Health Management Decision Science** 3 Application of decision science technology to risk-analysis problems in healthcare for both investor-owned and non-profit entities.
- 515 Health Care Management** 3 Introduction to the knowledge, skills, and values associated with the practice of health management.
- 516 Health Quality Management** 3 Overview of the total field of health quality, including strategic quality management programs, quality assurance, quality control, and design.
- 517 Health Care and Human Resources Management** 3 Managing human resources and health professionals in diverse health care environments such as hospitals, clinics, home health care agencies and pharmaceutical firms.
- 519 Biostatistics and Epidemiology for the Health Sciences** 3 Application of quantitative methods to problems in the health sciences; statistical analysis software.
- 520 Research and Evaluation Methods** 3 Basic research and evaluation methods for health care professionals.
- 530 Health Care Information Systems** 3 Key attributes of health care information systems and their evolution in health care environment.
- 570 Marketing for Health Care Organizations** 3 Basic marketing concepts, principles, and issues related to marketing public and private health care.
- 572 Health Care Ethics** 3 Ethical issues affecting health care institutions, professionals and consumers.
- 573 Comparative International Health Care** 3 Analysis of key attributes of health care in selected countries and comparisons with the US health care system.
- 574 Rural Health Care in America** 3 The unique characteristics, professional opportunities, problems and reform alternatives in rural health care.

- 579 Mental Health Policy and Law** 3 Professions regulation, negligence, consent, privacy; civil commitment, treatment rights, guardianship, trial competency, insanity defense, sex offenders, execution capacity, entitlements, discrimination.
- 580 Disability and Aging Policy** 3 Policy aspects of disability, aging and chronic illness; including work disability, health and long term care, rationing, gender and class.
- 590 Strategic Management and Marketing** 3 Key components and processes in strategic planning.
- 597 Internship** V 1-5 May be repeated for credit; cumulative maximum 5 hours. Student experience in professional work settings.
- 599 Special Topics in Health Policy and Administration** V 1-3 May be repeated for credit; cumulative maximum 9 hours.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Health-Assistive Smart Environment Design – Cert in Hlth Asst Smrt Env Des

Degree offered: Graduate Certificate in Health-Assistive Smart Environment Design

Faculty working with graduate students: 5

Graduate students: 12

Graduate students receiving assistantships or scholarships: 100%

Requirements

Please see the program/department for more information.

Contact Information

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Faculty

Diane Cook, Lawrence Holder, Sankar Jayaram, Maureen Schmitter-Edgecombe and Behrooz Shirazi.

Civil Engineering

C E

- 501 Advanced Topics in Transportation Engineering V** 2-4 May be repeated for credit; cumulative maximum 9 hours. Special topics course in transportation engineering.
- 502 Applied Meteorology 3** Atmospheric physical behavior across spatial scales linking concepts of meteorological phenomena to engineering design principles. Credit not granted for both CE 402 and CE 502.
- 503 Air Quality Management 3** Air pollution from the perspective of an environmental manager; regulatory framework, management strategies, monitoring, modeling tools, and control technologies.
- 504 Sustainability Engineering I 3** Green building and sustainable development topics including low impact development (LID) storm water design and environmental life cycle assessment (LCA).
- 505 Sustainability: Green Engineering 3** Focus on the LEED green building rating system with topics on sustainable site selection, alternative transportation, heat island effect, light pollution, water and energy efficiency/use, regional and global climate/air issues, use/reuse of many material and resources, and indoor environmental quality.
- 506 Theory and Measurement of Turbulent Fluxes 3** Fundamental concepts of turbulence and turbulent fluxes in the atmospheric surface layer, the statistical description of turbulence and turbulent fluxes, eddy covariance systems, and post-processed flux data.
- 507 Sustainability: Life Cycle Assessment 3** Principles of life cycle assessment (LCA), environmental impacts categories, LCA system models, and methods for life cycle inventory.
- 509 Numerical Modeling of Geomaterials 3** Modeling of the response of geomaterials to changes in imposed stresses or strains under both static and dynamic conditions.
- 510 Advanced Geomaterial Characterization 3** Advanced mechanics of geomaterials; compressibility, concept of stress and strain; shear strength, stress/strain and time-dependent behavior; dynamic properties.
- 511 Advanced Topics in Geotechnical Engineering V** 2-4 May be repeated for credit; cumulative maximum 9 hours. Soil dynamics, theoretical soil mechanics, numerical methods in soil mechanics, and geohydrology, engineering geology, cold regions geoengineering. Required preparation must include CE 317.
- 512 Dynamics of Structures 3** Equations of motion, free vibration, damping mechanisms, harmonic, impulse, and seismic loading; shock and seismic response spectra, time and frequency domain analysis, modal analysis, structural dynamics in building codes.
- 514 Advanced Mechanics of Materials 3** Elastic stress-strain relations, shear center, unsymmetrical bending, curved beams, elastic stability, elastically supported beams, energy methods, thin plates, shells.
- 515 Environmental Measurements 3** (1-6) Theory and laboratory measurement techniques used in analyzing environmental quality parameters. Credit not granted for both CE 415 and CE 515. Required preparation must include CE 341.
- 517 Mechanics of Sediment Transport 3** Cohesive and non-cohesive sediments; initiation of sediment motion; sediment transport; suspended and bed load entrainment; models of sediment transport for alluvial and gravel bed streams, sediment-flow interaction; river morphology and ecological restoration.
- 518 Hazardous Waste Engineering V** 3-4 Hazardous waste properties, chemodynamics, and health effects; introduction to risk assessment and hazardous waste remediation. Credit not granted for both CE 418 and CE 518.
- 519 Hazardous Waste Treatment 3** Principles of operation and application of processes in design of technologies used in hazardous waste treatment and remediation. Credit not granted for both CE 419 and CE 519.
- 524 Geotechnical Earthquake Engineering 3** Faulting and seismicity; site response analysis; probabilistic seismic hazard assessment; influence of soil on ground shaking; response spectra; soil liquefaction; seismic earth pressures; seismic slope stability; earthquake resistant design.
- 525 Soil and Site Improvement 3** Compaction theory and methods; deep densification of soils; advanced consolidation theory, preloading, vertical drains, chemical stabilization, grouting; design with geosynthetics. Credit not granted for both CE 425 and CE 525. Required preparation must include CE 317.
- 527 Engineering Properties of Soils 3** Physical properties, compressibility and consolidation, shear strength, compaction, saturated and unsaturated soils, laboratory and field methods of measurement, relations of physical and engineering properties, introduction to critical-state soil mechanics. Required preparation must include CE 317.
- 530 Advanced Design of Steel Structures 3** Plate girder design; local and global buckling; plastic collapse analysis; shear and Moment-resisting connections; eccentrically-loaded connections. Required preparation must include CE 431.
- 531 Probability and Statistical Models in Engineering 3** Engineering applications of probability and statistics; Monte Carlo simulation; model estimation and testing; probabilistic characterizations of loads and material properties; risk and reliability analyses.
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).

- 533 Advanced Reinforced Concrete Design 3** Composite design; slab design; limit state design; footings; retaining walls; deep beams; brackets and corbels; torsion; seismic design; shear walls. Required preparation must include CE 433.
- 534 Prestressed Concrete and Reinforced Masonry Design 3** Behavior, analysis, and design of pretensioned and post-tensioned prestressed concrete structures; behavior and design of reinforced masonry structures. Credit not granted for both CE 434 and CE 534.
- 535 Advanced Finite Elements 3** Plate and shell analysis; nonlinear solution methods for finite strain/rotation and nonlinear materials.
- 536 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 537 Advanced Topics in Structural Engineering 3** May be repeated for credit; cumulative maximum 9 hours. Elastic stability, plates and shells, other relevant topics.
- 538 Earthquake Engineering 3** Seismology, size of earthquakes, seismic ground motion, seismic risk, behavior of structures subjected to earthquake loading seismic response spectra, seismic design codes, lateral force-resisting systems, detailing for inelastic seismic response.
- 539 Advanced Design of Timber Structures 3** Engineering properties of wood materials; theory and design of wood composites, connections and load-sharing systems; performance criteria and durability. Required preparation must include CE 436.
- 540 Instrumental Analysis of Environmental Contaminants 3** (1-6) Course Prerequisite: CE 515. Theory and methods of analysis of water and water suspensions for contaminants using electrometric, spectrophotometric, and chromatographic techniques.
- 541 Physicochemical Water and Wastewater Treatment 3** Principles of physical and chemical operations used in water and wastewater treatment, including chemical reactor theory, sedimentation, filtration, precipitation, mass transfer, coagulation/flocculation, disinfection, adsorption and ion exchange. Recommended preparation: CE 442.
- 542 Biochemical Wastewater Treatment 3** Principles of biochemical operations used in wastewater treatment including biochemical energetics, kinetics, activated sludge and fixed film reactors, nutrient removal, and sludge handling and treatment.
- 543 Advanced Topics in Environmental Engineering Practice V** 1-4 May be repeated for credit; cumulative maximum 9 hours. Analysis and evaluation of air/water/soil pollution problems, new measurement methods, hazardous waste treatment, global climate change, and water/wastewater treatments.
- 550 Hydroclimatology 3** Water and energy budgets as they relate to climate, dynamics; and remote sensing, statistical, and modeling techniques for hydroclimatology.
- 551 Open Channel Flow 3** Steady, non-uniform flow; controls and transitions in fixed-bed channels. Credit not granted for both CE 451 and CE 551.
- 552 Advanced Topics in Hydraulic Engineering V** 1-3 May be repeated for credit; cumulative maximum 9 hours. Cavitation, air entrainment, hydraulic machinery, similitude, mixing in rivers and estuaries, hydraulic design. Required preparation must include CE 351.
- 555 Natural Treatment Systems 3** Principles and design procedures of natural systems for wastewater treatment for agricultural and non-agricultural applications. (Cross-listed course offered as CE 555, BSYSE 555).
- 560 Advanced Hydrology 3** Components of the hydrologic cycle; conceptual models; watershed characteristics; probability/statistics in data analysis; hydrographs; computer models; and design applications. Credit not granted for both CE 460 and CE 560.
- 567 Properties of Highway Pavement Materials 3** Physical and mechanical properties of asphalt and Portland cement concrete materials; design of asphalt concrete mixes; introduction to viscoelastic theory; characterization methods, emphasizing fatigue, rutting, and thermal cracking; modification and upgrading techniques. Three 1-hr lect a wk and variable number of lab hrs for demonstration.
- 572 Advanced Pavement Design and Analysis 3** Design of new and rehabilitated asphalt and Portland Cement concrete pavements; mechanistic-empirical design procedures, performance models; deflection-based structural analysis, overlay design, environmental effect; long-term pavement performance (LTPP), and introduction to research topics in pavement engineering. Required preparation must include CE 473.
- 580 Graduate Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Lectures and reports on current developments in research and practice.
- 583 Aquatic Chemistry 3** Chemical principles as applied to natural environmental system, water supply and pollution and control engineering. (Cross-listed course offered as CE 583, BSYSE 560).
- 584 Environmental Microbiology 3** Provides a fundamental understanding of microbiology to engineering and environmental science students; cell structure and metabolism; microbial ecology and diversity.
- 585 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 586 Bioremediation of Hazardous Waste 3** Applications of bioremediations to in situ subsurface treatment of hazardous waste; subsurface microbial degradation as related to microbial ecology.
- 588 Atmospheric Turbulence and Air Pollution Modeling 3** Physical aspects of atmospheric turbulence, theoretical developments in atmospheric diffusion, and applied computer modeling with regulatory and research models.
- 589 Atmospheric Chemical and Physical Processes 3** Processes of removal of pollutants from the atmosphere; radical chain reactions, particle formation, model calculations.

- 590 Spectroscopy and Radiative Transfer of the Atmosphere 3** Concepts of radiative transfer and molecular spectra in the troposphere and stratosphere with applications to trace gas measurements.
- 591 Aerosol Dynamics and Chemistry 3** Chemical and physical properties of atmospheric aerosols; sources, sinks, and transformation processes.
- 593 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 594 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 595 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 596 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 597 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 598 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Civil Engineering**
- CPT S**
- 500 Proseminar 1** Faculty research interests, departmental computer systems, computer science research, report preparation.
- 516 Algorithmics 3** Discrete structures, automata, formal languages, recursive functions, algorithms, and computability.
- 527 Computer Security 3** Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CPT S 427 and CPT S 527.
- 530 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 531 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 534 Neural Network Design and Application 3** Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534.
- 538 Scientific Visualization 3** Data taxonomy; sampling; plotting; using and extending a visualization package; designing visualizations; domain-specific techniques.
- 540 Artificial Intelligence 3** An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540.
- 542 Computer Graphics 3** Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542.
- 543 Human-Computer Interaction 3** Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543.
- 548 Advanced Computer Graphics 3** Solid modeling, visual realism, light and color models, advanced surface generation techniques.

- 550 Parallel Computation 3** Parallel machine models, principles for the design of parallel algorithms, interconnection networks, systolic arrays, computational aspects to VLSI. Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 557 Advanced Computer Networks 3** ATM networks, optical WDM networks, and wireless/mobile networks; access, transport, and routing protocols.
- 560 Operating Systems 3** Structure of multiprogramming and multiprocessing; efficient allocation of systems resources; design implementation and performance measurement.
- 561 Computer Architecture 3** Parallel and distributed processors; multiprocessors; interconnection topologies; language-directed architecture; special-purpose architecture.
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 564 Distributed Systems Concepts and Programming 3** Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564.
- 566 Embedded Systems 3 (2-3)** The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566.
- 570 Machine Learning 3** Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 571 Computational Genomics 3** Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571.
- 572 Numerical Methods in Computational Biology 3** Computational methods for solving scientific problems related to information processing in biological systems at the molecular and cellular levels.
- 573 Bioinformatics Software Development 3** Provides programming skills needed to address current computational problems in bioinformatics; emphasis on mathematical development and software design.
- 580 Advanced Topics in Computer Science 3** May be repeated for credit.
- 595 Directed Study in Computer Science V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 6 hours. Current topics in computer science.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Civil Engineering**
- PSYCH**
- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.

- 511 Analysis of Variance and Experimental Design 3** Course
Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3**
May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.

- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Pre-requisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Pre-requisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Pre-requisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Higher Education – Community College Leadership

Degree offered: Doctor of Education (Community College Leadership)

Faculty working with graduate students: 8

Graduate students: 7

Program offered: Pullman, Spokane, Tri-Cities, Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Program Description

The graduate degree program in Higher Education Administration

includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education administration; Master of Education (Ed.M.), specializing in higher education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

Degree Description

The higher education program is dedicated to meeting students' needs as current and future leaders and faculty in colleges, universities, or in athletic programs throughout the country. The program provides a balance and integration of research, theory, policy, and practical experience. Students examine the range of historical, social, legal, political, economic, and ethical issues that impact the practice and administration of higher education. The Ed.D. is a professional degree awarded by the Department designed to prepare students whose primary interest is in the practice of education. Recognized as a professional degree, it is typically chosen by students who will occupy positions of leadership and applied specialties in public or private educational organizations or related fields. The Ed.D. with emphasis in Community College Leadership is designed to appeal to students who currently work in community colleges, or are interested in moving into administrative positions within the community college setting. The degree program has an emphasis on preparing people to move into positions of increasing leadership and responsibility in the community college sector of higher education

Post-Graduate Employment Opportunities

Faculty in higher education and student affairs programs; student affairs administrators; policy analysts; government relations; general university administrators; athletic administrators.

Post-Graduate Career Placements

Not yet available

Contact Information

Graduate Coordinator
Washington State University
Office of Graduate Studies
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.

- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.

- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- EDRES**
- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.

570 Action Research 3 Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.

571 Doctoral Dissertation Preparation 3 Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

Higher Education

Degree offered: Doctor of Education (Higher Ed Administration)

Faculty working with graduate students: 8

Graduate students: 5

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: September 1

Program Description

The graduate degree program in Higher Education Administration includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education administration; Master of Education (Ed.M.), specializing in higher education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

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Post-Graduate Employment Opportunities

Faculty in higher education and student affairs programs; student affairs administrators; policy analysts; government relations; general university administrators; athletic administrators.

Post-Graduate Career Placements

Vice-president for student affairs; faculty at research universities; university provost; community college president; assistant director of recreation; academic coordinator.

Contact Information

Graduate Coordinator
Washington State University
Office of Graduate Studies
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

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- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
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- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
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- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
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- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
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- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
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- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
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- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
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- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
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- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.

- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

Higher Education

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 8

Graduate students: 16

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: September 1

Program Description

The graduate degree program in Higher Education Administration includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education administration; Master of Education (Ed.M.), specializing in higher education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational

pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

Degree Description

The higher education program is dedicated to meeting students' needs as current and future leaders and faculty in colleges, universities, or in athletic programs throughout the country. The program provides a balance and integration of research, theory, policy, and practical experience. Students examine the range of historical, social, legal, political, economic, and ethical issues that impact the practice and administration of higher education. The Ph.D. degree, with specializations in higher education, student affairs, or higher education administration, is designed to appeal to students who currently work in college or university administration or related fields, and who want to become faculty members or who would like to move into higher-ranking administrative positions.

Post-Graduate Employment Opportunities

Faculty in higher education and student affairs programs; student affairs administrators; policy analysts; government relations; general university administrators; athletic administrators.

Post-Graduate Career Placements

Vice-president for student affairs; faculty at research universities; university provost; community college president; assistant director of recreation; academic coordinator.

Contact Information

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Fax: 509-335-2097
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Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.

- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
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- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.

- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.

- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

Higher Education

Degree offered: Master of Arts in Education

Faculty working with graduate students: 8

Graduate students: 9

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: September 1

Program Description

The graduate degree program in Higher Education Administration includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education admin-

istration; Master of Education (Ed.M.), specializing in higher education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

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The higher education program is dedicated to meeting students' needs as current and future leaders and faculty in colleges, universities, or in athletic programs throughout the country. The program provides a balance and integration of research, theory, policy, and practical experience. Students examine the range of historical, social, legal, political, economic, and ethical issues that impact the practice and administration of higher education. The M.A. in higher education is recommended for students who plan to continue work at the doctoral level.

Post-Graduate Employment Opportunities

Faculty in higher education and student affairs programs; student affairs administrators; policy analysts; government relations; general university administrators; athletic administrators.

Post-Graduate Career Placements

Vice-president for student affairs; faculty at research universities; university provost; community college president; assistant director of recreation; academic coordinator.

Contact Information

Graduate Coordinator
Washington State University
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Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

501 Philosophy of Education 3 Development of American educational philosophy.

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- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
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- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
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- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
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- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).

- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Higher Education

Degree offered: Master of Arts in Education – Non Thesis

Faculty working with graduate students: 8

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: September 1

Requirements

None

Program Description

The graduate degree program in Higher Education Administration includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education administration; Master of Education (Ed.M.), specializing in higher education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

Degree Description

The higher education program is dedicated to meeting students' needs as current and future leaders and faculty in colleges, universities, or in athletic programs throughout the country. The program provides a balance and integration of research, theory, policy, and practical experience. Students examine the range of historical, social, legal, political, economic, and ethical issues that impact the practice and administration of higher education. The Ed.M. in higher education is designed to prepare students to assume administrative roles within colleges and universities.

Post-Graduate Employment Opportunities

Faculty in higher education and student affairs programs; student affairs administrators; policy analysts; government relations;

general university administrators; athletic administrators.

Post-Graduate Career Placements

Vice-president for student affairs; faculty at research universities; university provost; community college president; assistant director of recreation; academic coordinator.

Contact Information

Graduate Coordinator
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E-mail: gradstudies@wsu.edu

Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.

- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.

- 565 Practicum in Higher Education 3** (0-9) Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V** 1-6 May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.

- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
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Higher Education

Degree offered: Master of Education

Faculty working with graduate students: 8

Graduate students: 19

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: September 1

Program Description

The graduate degree program in Higher Education Administration includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education administration; Master of Education (Ed.M.), specializing in higher

education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

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Post-Graduate Employment Opportunities

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Post-Graduate Career Placements

Vice-president for student affairs; faculty at research universities; university provost; community college president; assistant director of recreation; academic coordinator.

Contact Information

Graduate Coordinator
Washington State University
Office of Graduate Studies
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
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- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

502 Theoretical Foundations of Learning and Instruction 3 Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.

503 Advanced Educational Psychology 3 Contemporary theories, models, and empirical research in educational psychology.

504 Classroom-focused Research Methods 2 Methods, design, implementation, and application of results in classroom context.

505 Research Methods I 3 Research methods; literature review; design, implementation, and interpretation of results.

508 Educational Statistics 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.

509 Educational Measurements: Test Development and Assessment V 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.

510 Assessment of Learning 3 Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.

511 Classical and Modern Test Theory 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.

521 Topics in Educational Psychology V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.

563 Principles of Research 3 The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

564 Qualitative Research 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

565 Quantitative Research 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).

568 Quasi-Experimental Design 3 Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.

569 Seminar in Quantitative Techniques in Education V 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.

570 Introduction to Program Evaluation 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.

571 Advanced Program Evaluation 3 Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.

572 Introduction to Systematic Literature Reviews and Meta-Analyses 3 Introduction to the steps involved in conducting systematic reviews and meta-analyses.

573 Motivation Theories 3 Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.

574 Seminar in Educational Psychology 1 May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.

597 Educational Psychology Internship V 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18

May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Higher Education – Student Affairs

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 8

Graduate students: 3

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: September 1

Program Description

The graduate degree program in Higher Education Administration includes preparation at the master's and doctoral levels for students who plan to achieve positions of leadership in higher education administration and related fields or who wish to become faculty members. The Ph.D. in education offers specializations in higher education administration or student affairs. The Higher Education Administration Program offers five graduate degrees: Master of Arts (M.A.), specializing in higher education administration; Master of Education (Ed.M.), specializing in higher education administration; Doctor of Education (Ed.D.), specializing in community; college leadership; Doctor of Education (Ed.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in higher education administration; Doctor of Philosophy (Ph.D.), specializing in student affairs; As a graduate student, the College of Education's undergraduate leadership studies minor (with 100 to 150 undergraduate students) provides you with both research and teaching opportunities. In addition, other partnerships with university student affairs units provide further opportunities tied to the students' educational pursuits. Cleveland Hall is home to the George B. Brain Education Library, providing you with access to their main collection of education-related materials, a separate children's literature section, a media center, and a workroom.

Degree Description

The higher education program is dedicated to meeting students' needs as current and future leaders and faculty in colleges, universities, or in athletic programs throughout the country. The program provides a balance and integration of research, theory, policy, and practical experience. Students examine the range of historical, social, legal, political, economic, and ethical issues that impact the practice and administration of higher education. The Ph.D. degree, with specializations in higher education, student affairs, or higher education administration, is designed to appeal to students who currently work in college or university administration or related fields, and who want to become faculty members or who would like to move into higher-ranking administrative positions.

Post-Graduate Employment Opportunities

Faculty in higher education and student affairs programs; student affairs administrators; policy analysts; government relations; general university administrators; athletic administrators.

Post-Graduate Career Placements

Vice-president for student affairs; faculty at research universities; university provost; community college president; assistant director of recreation; academic coordinator.

Contact Information

Graduate Coordinator
Washington State University
Office of Graduate Studies
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Alton Jamison, Milton Lang, Xyanthe Neider, Paul Pitre, Jason Sievers, Patricia Sturko, Kelly Ward and Christian Wuthrich.

ED AD

- 501 **Philosophy of Education** 3 Development of American educational philosophy.
- 503 **Values and Ethics for Educational Leaders** 3 Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 **Social Context of Education** 2 The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 **Social Foundations of Education** 3 Educational adaptations to the economic and social trends and forces.
- 510 **Improvement of Instruction** 3 Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 **Leadership Studies for Social Justice** 3 Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 **Organizational Behavior** 3 Human behavior within various social and cultural organizational settings.
- 514 **Basic Principles of Curriculum Design** V 2-3 The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 **Curriculum Implementation** 3 Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 **Instructional and Curricular Leadership** V 2-3 Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.

- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.

- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

History

Degree offered: Doctor of Philosophy (History)

Faculty working with graduate students: 24

Graduate students: 37

Graduate students receiving assistantships or scholarships: 72%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10

Spring: November 1

Requirements

Total of 72 credit hours (graded + ungraded) required for degree. Dissertation requires oral examination. Must pass a foreign language competency exam by the 3rd semester of degree program. Minimum of 6 credits in coursework from one or two disciplines outside of history as a minor.

Program Description

The Department of History at Washington State University offers graduate study leading to the Master of Arts (in both thesis and non-thesis options) and Doctor of Philosophy degrees. Our graduate program in history seeks to train professional researchers who are competent in historical theory and methods

and prepares students for careers in historical research, public history, and teaching at colleges and universities. Specialized areas of study within the History Department include United States, early modern Europe, modern Europe, modern East Asia, environment, women, public, and world. Our department has long been recognized for its premiere graduate program in the American West—a region rich in cultural, social, and environmental diversity—as well as for its public history program. It also offers a unique pioneering program designed to grant a PhD in the field of world history.

Degree Description

The History Department offers programs of study for full time and part-time students leading to a Doctor of Philosophy (Ph.D.) degree. Students entering the Ph.D. program in History are expected to have completed a Master's degree in History or in a related field of study at an accredited college or university, and to show promise of doing excellent work at the doctoral level. All doctoral candidates conduct independent research leading to a written dissertation, with the objective of making a major contribution to the body of academic knowledge in History. Research will be focused on a specific Primary Field, which is embedded in a broader General Field that gives a geographical, chronological, and historiographical framework for the research. The student will also have a Comparative Field to provide a spatial and temporal context to the research. The program will culminate with a final oral examination. Financial aid in the form of an assistantship is available for dedicated, quality full time Ph.D. students.

Training and Professional Development Opportunities

History Dept has a committee dedicated to Graduate Professional Development. History grad students also organize a weekly colloquium in addition to weekly meetings of the History Graduate Students Association (HGSA). The HIST 595 course gives students knowledge and practice for teaching in higher education.

Post-Graduate Employment Opportunities

Students receiving a Doctor of Philosophy in History can go on to work with museums and curation, teach in secondary or higher education, and work as a historian at both private and governmental organizations providing research and cultural resource management expertise as well as litigation support.

Post-Graduate Career Placements

Tenured and adjunct faculty at research universities; chairs and deans of universities and community colleges; head librarians; self-employed researchers; historian for the NASA Johnson Space Center; president of a private historical organization.

Contact Information

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History
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Faculty

Emily Anderson, Robert Bauman, Peter Boag, Brigit Farley, Lydia Gerber, Candice Goucher, Steven Hoch, Theresa Jordan, Steven Kale, Noriko Kawamura, Robert McCoy, Laurie Mercier, Susan Peabody, David Pietz, Jeffrey Sanders, Jesse Spohnholz, Heather Streets, Raymond Sun, Matthew Sutton, Orlan Svingen, Jennifer Thigpen, Joel Tishken, Marina Tolmacheva and Xiuyu Wang.

HIST

- 509 Field Course: Foundations in US History 3** May be repeated for credit; cumulative maximum 12 hours. Chronological readings in US history.
- 510 Field Course in American History 3** May be repeated for credit. Readings and interpretive problems of American history.
- 511 American Diplomatic History, 1776-1914 3** Policies and principles characteristic of American diplomacy from 1776 to 1914. Credit not granted for both HISTORY 411 and HISTORY 511.
- 512 American Diplomatic History in the 20th Century 3** Credit not granted for both HISTORY 412 and HISTORY 512.
- 513 Theory and Method in American Studies 3** Major theories and methods currently used by American studies scholars; key concepts in cultural analysis. (Cross-listed course offered as AMER ST 513, ENGLISH 513, HISTORY 513).
- 515 Jeffersonian-Jacksonian America 3** Social and political history of the United States from 1789 to 1845; Jeffersonian and Jacksonian eras. Credit not granted for both HISTORY 415 and HISTORY 515.
- 516 Civil War and Reconstruction 3** The Civil War as a problem in historical causation and social, political, and economic impact of the war. Credit not granted for both HISTORY 416 and HISTORY 516.
- 517 Rise of Modern America 3** Response to industrialism in the Gilded Age and the reform movements of Populism and Progressivism. Credit not granted for both HISTORY 417 and HISTORY 517.
- 518 United States, 1914-1945 3** America through World War I, cultural tensions of the Twenties, and the crises of Depression and WWII. Credit not granted for both HISTORY 418 and HISTORY 518.
- 519 United States, 1945-Present 3** International and domestic impact of the Cold War, era of McCarthyism, American aspirations, tensions and conflicts in the post-industrial era. Credit not granted for both HISTORY 419 and HISTORY 519.
- 520 Field Course in the American West 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in the history of the American West.
- 521 The American West 3** Multicultural exploration of the frontier experience and western America; environment, economic development, gender, class and race emphasized. (Cross-listed course offered as HISTORY 421, WOMEN ST 421).

- 522 History of the Pacific Northwest 3** Political, social economic and environmental history of the Pacific Northwest. Fulfills the teaching certification requirement for Washington state history. Credit not granted for both HISTORY 422 and HISTORY 522.
- 523 Radicals, Reformers, and Romantics: The Impact 3** Changing thought and its impact in the United States from colonial times to the present. Credit not granted for both HISTORY 423 and HISTORY 523.
- 524 Seminar in the American West 3** May be repeated for credit; cumulative maximum 9 hours. Research seminar in the history of the American West.
- 525 Seminar in American History 3** May be repeated for credit.
- 527 Public History: Theory and Methodology 3** An introduction to the broad range of non-traditional careers in history. Credit not granted for both HISTORY 427 and HISTORY 527.
- 528 Seminar in Public History 3** May be repeated for credit; cumulative maximum 6 hours. The development of skills at the graduate level to be used in nontraditional careers for historians.
- 529 Interpreting History through Material Culture 3** May be repeated for credit; cumulative maximum 6 hours. Historical interpretation to work on major historic preservation and museum projects.
- 530 History of Mexico 3** War of independence, 19th century Mexico and the liberal-conservative struggle; modern Mexico since the Revolution of 1910. Credit not granted for both HISTORY 430 and HISTORY 530.
- 532 20th Century Latin America 3** Contemporary developments, policies and trends in the Latin American states. Credit not granted for both HISTORY 432 and HISTORY 532.
- 533 History of Cuba and the Caribbean 3** Historical development of the Caribbean, with emphasis on Cuba, from the Spanish arrival to Castro's revolution. Credit not granted for both HISTORY 433 and HISTORY 533.
- 534 Revolution in Latin America 3** Social and political development in Central America; reasons for dictatorships and revolutionary movements; comparison with other Latin American regions. Credit not granted for both HISTORY 434 and HISTORY 534.
- 535 Field Course in Latin American History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in Latin American history.
- 539 Slavery, Abolition and Emancipation in World History 3** History of slavery and abolition as a world-wide phenomena; trends and debates in historiographical literature. Credit not granted for both HISTORY 439 and HISTORY 539.
- 540 Seminar in History 3** May be repeated for credit.
- 547 Europe in the French Revolutionary and Napoleonic Era, 1789 to 1815 3** Credit not granted for both HISTORY 447 and HISTORY 547.
- 549 Europe and Two World Wars, 1914-1945 3** Political, intellectual, economic, and international aspects of European life during and between two world wars. Credit not granted for both HISTORY 449 and HISTORY 549.
- 550 Europe Since 1945 3** Europe from the end of World War II to the present; the Cold War, European integration, social and intellectual life. Credit not granted for both HISTORY 450 and HISTORY 550.
- 553 Conservatism, Liberalism, and Socialism: Europe, 1815-1870 3** The consolidation of industrial society and the nation-state in 19th-century Europe. Credit not granted for both HISTORY 453 and HISTORY 553.
- 554 Nationalism and National Conflict: Europe, 1870-1914 3** The rise of Europe to world predominance and the crisis of the European order. Credit not granted for both HISTORY 454 and HISTORY 554.
- 559 Modern Britain 3** Britain and the Empire from the Napoleonic wars to the present. Credit not granted for both HISTORY 459 and HISTORY 559.
- 560 Field Course in Early European History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and issues in early European history.
- 561 Field Course in Early Modern European History 3** Readings and interpretive problems in early modern European history (1450 - 1750).
- 562 History of Imperial Russia 3** History and culture of Imperial Russia from Peter the Great to the 1905 revolution. (Cross-listed course offered as HISTORY 462, RUSSIAN 462).
- 563 History of the Soviet Union 3** The Russian revolutions and the Soviet regime: 1905 to the present. (Cross-listed course offered as HISTORY 463, RUSSIAN 463).
- 564 Comparative Genocide 3** Study of the concepts, history, and consequences of genocide in the global perspective through theoretical and case study analysis. Credit not granted for both HISTORY 464 and HISTORY 564.
- 567 Modern France 3** The history of France from the revolution of 1789 to the present. Credit not granted for both HISTORY 467 and HISTORY 567.
- 568 Hitler and Nazi Germany 3** Origins and rise of Nazism; state, society and culture in the Third Reich; Nazi racial ideology; world war; the Holocaust. Credit not granted for both HISTORY 468 and HISTORY 568.
- 569 Field Course in Modern European History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in modern European history.
- 570 World History Theory and Methods 3** May be repeated for credit; cumulative maximum 9 hours. Historiographic overview of the field of world history.
- 571 Topics in World History 3** May be repeated for credit; cumulative maximum 6 hours. Readings in themes and literature of a global approach to history.
- 572 The Middle East Since World War I 3** Developments in the Middle East since World War I including nationalism, fundamentalism, and revolution. (Cross-listed course offered as HISTORY 472, ASIA 472).
- 573 Field Course in African History 3** May be repeated for credit; cumulative maximum 6 hours. Readings and interpretive problems in African history.

- 574 Modern South Asia: Community and Conflict 3** Historical transformation of communities and communal conflicts in modern South ASIA from 1500 to present; themes: caste, religion, geography, environment and economy. (Cross-listed course offered as HISTORY 474, ASIA 474).
- 575 Field Course in Women's History 3** May be repeated for credit; cumulative maximum 6 hours. Readings and interpretive problems in women's history.
- 576 Revolutionary China, 1800 to Present 3** Continuity and change in the political, social, cultural and economic experience of China since 1800. (Cross-listed course offered as HISTORY 476, ASIA 476, POL S 476).
- 577 Modern Japanese History 3** Examination of political, socioeconomic and cultural changes and the international crises in modern Japan since the 19th century. (Cross-listed course offered as HISTORY 477, ASIA 477).
- 578 Field Course in Asian History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in Asian history.
- 580 Historiography 3**
- 595 The Teaching of History in College 3** Theory, problems, and methods of teaching history at the college level.
- 596 Topics in American Studies 3** May be repeated for credit; cumulative maximum 9 hours. American Studies Summer Institute. (Cross-listed course offered as AMER ST 596, HISTORY 596). Credit not granted for both HISTORY 496 and HISTORY 596.
- 597 Seminar in History V 2-3** May be repeated for credit.
- 598 History Internship V 1-12** May be repeated for credit; cumulative maximum 12 hours. Participation as intern in public or private sectors. Credit not granted for both HISTORY 498 and HISTORY 598.
- 599 History Colloquium 1** May be repeated for credit; cumulative maximum 4 hours. Weekly discussions and presentations on historical topics or current faculty and graduate student research.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

History

Degree offered: Master of Arts in History

Faculty working with graduate students: 24

Graduate students: 23

Graduate students receiving assistantships or scholarships: 43%

Program offered: Pullman, Vancouver

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10 (January 10 international)
Spring: November 1 (July 1 international)

Requirements

Total of 30 credit hours (graded + ungraded) required for degree. Thesis option also requires oral examination.

Program Description

The Department of History at Washington State University offers graduate study leading to the Master of Arts (in both thesis and non-thesis options) and Doctor of Philosophy degrees. Our graduate program in history seeks to train professional researchers who are competent in historical theory and methods and prepares students for careers in historical research, public history, and teaching at colleges and universities. Specialized areas of study within the History Department include United States, early modern Europe, modern Europe, modern East Asia, environment, women, public, and world. Our department has long been recognized for its premiere graduate program in the American West—a region rich in cultural, social, and environmental diversity—as well as for its public history program. It also offers a unique pioneering program designed to grant a PhD in the field of world history.

Degree Description

The History Department offers programs of study for full time and part-time students leading to a Master's of Arts (MA) degree. Students entering the MA program in History are expected to show promise of doing excellent work at the graduate level. All MA students conduct independent research leading to a written thesis, with the objective of making a contribution to the body of academic knowledge in History. Research will be focused on a specific Primary Field, which is embedded in a broader General Field that gives a geographical, chronological, and historiographical framework for the research. The program will culminate with a final oral examination. The strong research emphasis and thesis experience prepare interested students for doctoral programs and careers in research and teaching. Financial aid in the form of an assistantship is available for dedicated, quality full time MA students.

Training and Professional Development Opportunities

History Dept has a committee dedicated to Graduate Professional Development. History grad students also organize a weekly colloquium in addition to weekly meetings of the History Graduate Students Association (HGSA). The HIST 595 course gives students knowledge and practice for teaching in higher education.

Post-Graduate Employment Opportunities

Students receiving a Master's in History can go on to work with museums and curation as well as teach in a secondary education setting and work as a research historian at both private and governmental organizations.

Post-Graduate Career Placements

Instructors in secondary education; curriculum development and educational publishing; assistant of education and curation at a museum; assistant director at a historic National Park Service site; research historians in private organizations.

Contact Information

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- 516 Civil War and Reconstruction 3** The Civil War as a problem in historical causation and social, political, and economic impact of the war. Credit not granted for both HISTORY 416 and HISTORY 516.
- 517 Rise of Modern America 3** Response to industrialism in the Gilded Age and the reform movements of Populism and Progressivism. Credit not granted for both HISTORY 417 and HISTORY 517.
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- 519 United States, 1945-Present 3** International and domestic impact of the Cold War, era of McCarthyism, American aspirations, tensions and conflicts in the post-industrial era. Credit not granted for both HISTORY 419 and HISTORY 519.
- 520 Field Course in the American West 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in the history of the American West.
- 521 The American West 3** Multicultural exploration of the frontier experience and western America; environment, economic development, gender, class and race emphasized. (Cross-listed course offered as HISTORY 421, WOMEN ST 421).
- 522 History of the Pacific Northwest 3** Political, social economic and environmental history of the Pacific Northwest. Fulfills the teaching certification requirement for Washington state history. Credit not granted for both HISTORY 422 and HISTORY 522.
- 523 Radicals, Reformers, and Romantics: The Impact 3** Changing thought and its impact in the United States from colonial times to the present. Credit not granted for both HISTORY 423 and HISTORY 523.
- 524 Seminar in the American West 3** May be repeated for credit; cumulative maximum 9 hours. Research seminar in the history of the American West.
- 525 Seminar in American History 3** May be repeated for credit.
- 527 Public History: Theory and Methodology 3** An introduction to the broad range of non-traditional careers in history. Credit not granted for both HISTORY 427 and HISTORY 527.
- 528 Seminar in Public History 3** May be repeated for credit; cumulative maximum 6 hours. The development of skills at the graduate level to be used in nontraditional careers for historians.
- 529 Interpreting History through Material Culture 3** May be repeated for credit; cumulative maximum 6 hours. Historical interpretation to work on major historic preservation and museum projects.
- 530 History of Mexico 3** War of independence, 19th century Mexico and the liberal-conservative struggle; modern Mexico since the Revolution of 1910. Credit not granted for both HISTORY 430 and HISTORY 530.

- 532 20th Century Latin America 3** Contemporary developments, policies and trends in the Latin American states. Credit not granted for both HISTORY 432 and HISTORY 532.
- 533 History of Cuba and the Caribbean 3** Historical development of the Caribbean, with emphasis on Cuba, from the Spanish arrival to Castro's revolution. Credit not granted for both HISTORY 433 and HISTORY 533.
- 534 Revolution in Latin America 3** Social and political development in Central America; reasons for dictatorships and revolutionary movements; comparison with other Latin American regions. Credit not granted for both HISTORY 434 and HISTORY 534.
- 535 Field Course in Latin American History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in Latin American history.
- 539 Slavery, Abolition and Emancipation in World History 3** History of slavery and abolition as a world-wide phenomena; trends and debates in historiographical literature. Credit not granted for both HISTORY 439 and HISTORY 539.
- 540 Seminar in History 3** May be repeated for credit.
- 547 Europe in the French Revolutionary and Napoleonic Era, 1789 to 1815 3** Credit not granted for both HISTORY 447 and HISTORY 547.
- 549 Europe and Two World Wars, 1914-1945 3** Political, intellectual, economic, and international aspects of European life during and between two world wars. Credit not granted for both HISTORY 449 and HISTORY 549.
- 550 Europe Since 1945 3** Europe from the end of World War II to the present; the Cold War, European integration, social and intellectual life. Credit not granted for both HISTORY 450 and HISTORY 550.
- 553 Conservatism, Liberalism, and Socialism: Europe, 1815-1870 3** The consolidation of industrial society and the nation-state in 19th-century Europe. Credit not granted for both HISTORY 453 and HISTORY 553.
- 554 Nationalism and National Conflict: Europe, 1870-1914 3** The rise of Europe to world predominance and the crisis of the European order. Credit not granted for both HISTORY 454 and HISTORY 554.
- 559 Modern Britain 3** Britain and the Empire from the Napoleonic wars to the present. Credit not granted for both HISTORY 459 and HISTORY 559.
- 560 Field Course in Early European History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and issues in early European history.
- 561 Field Course in Early Modern European History 3** Readings and interpretive problems in early modern European history (1450 - 1750).
- 562 History of Imperial Russia 3** History and culture of Imperial Russia from Peter the Great to the 1905 revolution. (Cross-listed course offered as HISTORY 462, RUSSIAN 462).
- 563 History of the Soviet Union 3** The Russian revolutions and the Soviet regime: 1905 to the present. (Cross-listed course offered as HISTORY 463, RUSSIAN 463).
- 564 Comparative Genocide 3** Study of the concepts, history, and consequences of genocide in the global perspective through theoretical and case study analysis. Credit not granted for both HISTORY 464 and HISTORY 564.
- 567 Modern France 3** The history of France from the revolution of 1789 to the present. Credit not granted for both HISTORY 467 and HISTORY 567.
- 568 Hitler and Nazi Germany 3** Origins and rise of Nazism; state, society and culture in the Third Reich; Nazi racial ideology; world war; the Holocaust. Credit not granted for both HISTORY 468 and HISTORY 568.
- 569 Field Course in Modern European History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in modern European history.
- 570 World History Theory and Methods 3** May be repeated for credit; cumulative maximum 9 hours. Historiographic overview of the field of world history.
- 571 Topics in World History 3** May be repeated for credit; cumulative maximum 6 hours. Readings in themes and literature of a global approach to history.
- 572 The Middle East Since World War I 3** Developments in the Middle East since World War I including nationalism, fundamentalism, and revolution. (Cross-listed course offered as HISTORY 472, ASIA 472).
- 573 Field Course in African History 3** May be repeated for credit; cumulative maximum 6 hours. Readings and interpretive problems in African history.
- 574 Modern South Asia: Community and Conflict 3** Historical transformation of communities and communal conflicts in modern South ASIA from 1500 to present; themes: caste, religion, geography, environment and economy. (Cross-listed course offered as HISTORY 474, ASIA 474).
- 575 Field Course in Women's History 3** May be repeated for credit; cumulative maximum 6 hours. Readings and interpretive problems in women's history.
- 576 Revolutionary China, 1800 to Present 3** Continuity and change in the political, social, cultural and economic experience of China since 1800. (Cross-listed course offered as HISTORY 476, ASIA 476, POL S 476).
- 577 Modern Japanese History 3** Examination of political, socioeconomic and cultural changes and the international crises in modern Japan since the 19th century. (Cross-listed course offered as HISTORY 477, ASIA 477).
- 578 Field Course in Asian History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in Asian history.
- 580 Historiography 3**
- 595 The Teaching of History in College 3** Theory, problems, and methods of teaching history at the college level.
- 596 Topics in American Studies 3** May be repeated for credit; cumulative maximum 9 hours. American Studies Summer Institute. (Cross-listed course offered as AMER ST 596, HISTORY 596). Credit not granted for both HISTORY 496 and HISTORY 596.
- 597 Seminar in History V 2-3** May be repeated for credit.

- 598 History Internship V 1-12** May be repeated for credit; cumulative maximum 12 hours. Participation as intern in public or private sectors. Credit not granted for both HISTORY 498 and HISTORY 598.
- 599 History Colloquium 1** May be repeated for credit; cumulative maximum 4 hours. Weekly discussions and presentations on historical topics or current faculty and graduate student research.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

History

Degree offered: Master of Arts in History – Non Thesis

Faculty working with graduate students: 24

Graduate students: 1

Program offered: Pullman, Vancouver

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10

Spring: November 1

Requirements

Total of 30 credit hours (graded + ungraded) required for degree. Non thesis option also requires oral examination.

Program Description

The Department of History at Washington State University offers graduate study leading to the Master of Arts (in both thesis and non-thesis options) and Doctor of Philosophy degrees. Our graduate program in history seeks to train professional re-

searchers who are competent in historical theory and methods and prepares students for careers in historical research, public history, and teaching at colleges and universities. Specialized areas of study within the History Department include United States, early modern Europe, modern Europe, modern East Asia, environment, women, public, and world. Our department has long been recognized for its premiere graduate program in the American West—a region rich in cultural, social, and environmental diversity—as well as for its public history program. It also offers a unique pioneering program designed to grant a PhD in the field of world history.

Degree Description

The History Department offers programs of study for full time and part-time students leading to a Master's of Arts (MA) degree with a non-thesis option. Students entering the MA program in History are expected to show promise of doing excellent work at the graduate level. All non-thesis MA students conduct independent research leading to a non-thesis project made up of several smaller essays. The program will culminate with a final oral examination. The strong research emphasis and writing experience prepare interested students for careers in research and teaching. Financial aid in the form of an assistantship is available for dedicated, quality full time MA students. The non-thesis MA is typically considered to be a terminal degree.

Training and Professional Development Opportunities

History Dept has a committee dedicated to Graduate Professional Development. History grad students also organize a weekly colloquium in addition to weekly meetings of the History Graduate Students Association (HGSA). The HIST 595 course gives students knowledge and practice for teaching in higher education.

Post-Graduate Employment Opportunities

Students receiving a Master's in History can go on to work with museums and curation as well as teach in a secondary education setting and work as a research historian at both private and governmental organizations.

Contact Information

Kenneth Anderson

Program Coordinator

History

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Faculty

Emily Anderson, Robert Bauman, Peter Boag, Brigit Farley, Lydia Gerber, Candice Goucher, Steven Hoch, Theresa Jordan, Steven Kale, Noriko Kawamura, Robert McCoy, Laurie Mercier, Susan Peabody, David Pietz, Jeffrey Sanders, Jesse Spohnholz, Heather Streets, Raymond Sun, Matthew Sutton, Orlan Svingen, Jennifer Thigpen, Joel Tishken, Marina Tolmacheva and Xiuyu Wang.

HIST

- 509 Field Course: Foundations in US History 3** May be repeated for credit; cumulative maximum 12 hours. Chronological readings in US history.
- 510 Field Course in American History 3** May be repeated for credit. Readings and interpretive problems of American history.
- 511 American Diplomatic History, 1776-1914 3** Policies and principles characteristic of American diplomacy from 1776 to 1914. Credit not granted for both HISTORY 411 and HISTORY 511.
- 512 American Diplomatic History in the 20th Century 3** Credit not granted for both HISTORY 412 and HISTORY 512.
- 513 Theory and Method in American Studies 3** Major theories and methods currently used by American studies scholars; key concepts in cultural analysis. (Cross-listed course offered as AMER ST 513, ENGLISH 513, HISTORY 513).
- 515 Jeffersonian-Jacksonian America 3** Social and political history of the United States from 1789 to 1845; Jeffersonian and Jacksonian eras. Credit not granted for both HISTORY 415 and HISTORY 515.
- 516 Civil War and Reconstruction 3** The Civil War as a problem in historical causation and social, political, and economic impact of the war. Credit not granted for both HISTORY 416 and HISTORY 516.
- 517 Rise of Modern America 3** Response to industrialism in the Gilded Age and the reform movements of Populism and Progressivism. Credit not granted for both HISTORY 417 and HISTORY 517.
- 518 United States, 1914-1945 3** America through World War I, cultural tensions of the Twenties, and the crises of Depression and WWII. Credit not granted for both HISTORY 418 and HISTORY 518.
- 519 United States, 1945-Present 3** International and domestic impact of the Cold War, era of McCarthyism, American aspirations, tensions and conflicts in the post-industrial era. Credit not granted for both HISTORY 419 and HISTORY 519.
- 520 Field Course in the American West 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in the history of the American West.
- 521 The American West 3** Multicultural exploration of the frontier experience and western America; environment, economic development, gender, class and race emphasized. (Cross-listed course offered as HISTORY 421, WOMEN ST 421).
- 522 History of the Pacific Northwest 3** Political, social economic and environmental history of the Pacific Northwest. Fulfills the teaching certification requirement for Washington state history. Credit not granted for both HISTORY 422 and HISTORY 522.
- 523 Radicals, Reformers, and Romantics: The Impact 3** Changing thought and its impact in the United States from colonial times to the present. Credit not granted for both HISTORY 423 and HISTORY 523.
- 524 Seminar in the American West 3** May be repeated for credit; cumulative maximum 9 hours. Research seminar in the history of the American West.
- 525 Seminar in American History 3** May be repeated for credit.
- 527 Public History: Theory and Methodology 3** An introduction to the broad range of non-traditional careers in history. Credit not granted for both HISTORY 427 and HISTORY 527.
- 528 Seminar in Public History 3** May be repeated for credit; cumulative maximum 6 hours. The development of skills at the graduate level to be used in nontraditional careers for historians.
- 529 Interpreting History through Material Culture 3** May be repeated for credit; cumulative maximum 6 hours. Historical interpretation to work on major historic preservation and museum projects.
- 530 History of Mexico 3** War of independence, 19th century Mexico and the liberal-conservative struggle; modern Mexico since the Revolution of 1910. Credit not granted for both HISTORY 430 and HISTORY 530.
- 532 20th Century Latin America 3** Contemporary developments, policies and trends in the Latin American states. Credit not granted for both HISTORY 432 and HISTORY 532.
- 533 History of Cuba and the Caribbean 3** Historical development of the Caribbean, with emphasis on Cuba, from the Spanish arrival to Castro's revolution. Credit not granted for both HISTORY 433 and HISTORY 533.
- 534 Revolution in Latin America 3** Social and political development in Central America; reasons for dictatorships and revolutionary movements; comparison with other Latin American regions. Credit not granted for both HISTORY 434 and HISTORY 534.
- 535 Field Course in Latin American History 3** May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in Latin American history.
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- 549 Europe and Two World Wars, 1914-1945 3** Political, intellectual, economic, and international aspects of European life during and between two world wars. Credit not granted for both HISTORY 449 and HISTORY 549.
- 550 Europe Since 1945 3** Europe from the end of World War II to the present; the Cold War, European integration, social and intellectual life. Credit not granted for both HISTORY 450 and HISTORY 550.
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- 554 Nationalism and National Conflict: Europe, 1870-1914** 3 The rise of Europe to world predominance and the crisis of the European order. Credit not granted for both HISTORY 454 and HISTORY 554.
- 559 Modern Britain** 3 Britain and the Empire from the Napoleonic wars to the present. Credit not granted for both HISTORY 459 and HISTORY 559.
- 560 Field Course in Early European History** 3 May be repeated for credit; cumulative maximum 9 hours. Readings and issues in early European history.
- 561 Field Course in Early Modern European History** 3 Readings and interpretive problems in early modern European history (1450 - 1750).
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- 563 History of the Soviet Union** 3 The Russian revolutions and the Soviet regime: 1905 to the present. (Cross-listed course offered as HISTORY 463, RUSSIAN 463).
- 564 Comparative Genocide** 3 Study of the concepts, history, and consequences of genocide in the global perspective through theoretical and case study analysis. Credit not granted for both HISTORY 464 and HISTORY 564.
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- 569 Field Course in Modern European History** 3 May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in modern European history.
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- 571 Topics in World History** 3 May be repeated for credit; cumulative maximum 6 hours. Readings in themes and literature of a global approach to history.
- 572 The Middle East Since World War I** 3 Developments in the Middle East since World War I including nationalism, fundamentalism, and revolution. (Cross-listed course offered as HISTORY 472, ASIA 472).
- 573 Field Course in African History** 3 May be repeated for credit; cumulative maximum 6 hours. Readings and interpretive problems in African history.
- 574 Modern South Asia: Community and Conflict** 3 Historical transformation of communities and communal conflicts in modern South ASIA from 1500 to present; themes: caste, religion, geography, environment and economy. (Cross-listed course offered as HISTORY 474, ASIA 474).
- 575 Field Course in Women's History** 3 May be repeated for credit; cumulative maximum 6 hours. Readings and interpretive problems in women's history.
- 576 Revolutionary China, 1800 to Present** 3 Continuity and change in the political, social, cultural and economic experience of China since 1800. (Cross-listed course offered as HISTORY 476, ASIA 476, POL S 476).
- 577 Modern Japanese History** 3 Examination of political, socioeconomic and cultural changes and the international crises in modern Japan since the 19th century. (Cross-listed course offered as HISTORY 477, ASIA 477).
- 578 Field Course in Asian History** 3 May be repeated for credit; cumulative maximum 9 hours. Readings and interpretive problems in Asian history.
- 580 Historiography** 3
- 595 The Teaching of History in College** 3 Theory, problems, and methods of teaching history at the college level.
- 596 Topics in American Studies** 3 May be repeated for credit; cumulative maximum 9 hours. American Studies Summer Institute. (Cross-listed course offered as AMER ST 596, HISTORY 596). Credit not granted for both HISTORY 496 and HISTORY 596.
- 597 Seminar in History** V 2-3 May be repeated for credit.
- 598 History Internship** V 1-12 May be repeated for credit; cumulative maximum 12 hours. Participation as intern in public or private sectors. Credit not granted for both HISTORY 498 and HISTORY 598.
- 599 History Colloquium** 1 May be repeated for credit; cumulative maximum 4 hours. Weekly discussions and presentations on historical topics or current faculty and graduate student research.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Horticulture

Degree offered: Doctor of Philosophy (Horticulture)

Faculty working with graduate students: 38

Graduate students: 23

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL, GRE (Quantitative), GRE (Verbal), TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The graduate program in horticulture has a long history of excellence in graduate education. Graduates from the program are employed in careers ranging from applied crop production to teaching and research in the molecular mechanisms controlling plant growth and development. Graduate work can be basic or applied, and students acquire experience in both teaching and research. Students generally focus their research on solving a production or postharvest quality issue for a particular commodity (vegetable crop, tree fruits, small fruits, viticulture and enology, ornamentals), or on the more basic areas of plant physiology, biochemistry, molecular genetics, genomics and breeding, and bioinformatics. Interdisciplinary areas such as plant pathology, soils, entomology, biological systems engineering, environmental science, foods and nutrition, and the social sciences are often included. Research projects may address problems or situations related to the growth, production, or utilization of any horticultural commodity. Thesis projects, course requirements, and teaching experiences are individualized to the specific interests and goals of the student. After completion of course work students may have the opportunity to conduct research at one of several Research & Extension Centers located throughout the state. Graduates are placed in highly regarded laboratories; in respected research, teaching, and extension programs at universities; in industry, and with government and non-governmental agencies.

Degree Description

All doctoral candidates conduct independent research leading to a dissertation, with the objective of making a major contribution to the body of scientific knowledge in Horticulture. Portions of the dissertation research are normally published in peer-reviewed journals. Students in this degree option are expected to have completed a research-based master's degree or to have equivalent research experience prior to enrolling in the doctoral program.

Post-Graduate Employment Opportunities

University faculty positions; Federal and state agricultural laboratories; Extension specialists; Management positions in allied and agricultural industries; Technical positions; Postdoctoral positions.

Post-Graduate Career Placements

Assistant professor/assistant landscape specialist, University of Hawaii; Assistant professor, Penn State University; Product specialist, Thermo Electron Corporation, San Jose, CA; Extension educator, WSU Extension, Adams/Grant county, WA; Director of new market development, AgroFresh, Inc., Springhouse, PA;

Research plant physiologist, Eastern Regional Research Laboratory, USDA/ARS, Philadelphia, PA

Contact Information

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Lisa Lujan
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E-mail: llujan@wsu.edu

Faculty

Preston Andrews, Chris Benedict, Bhaskar Bondada, Charles Brown, Linda Chalker-Scott, Joan Davenport, Amit Dhingra, Liqun Du, Gerald Edwards, Katherine Evans, John Fellman, Ines Hanrahan, Rita Hummel, Markus Keller, Norman Knowles, Teresa Koenig, Mohan Kumar, Desmond Layne, Virginia Lohr, Doreen Main, James Mattheis, James McFerson, Rebecca McGee, Donald McMoran, Carol Miles, Patrick Moore, Michelle Moyer, Stefano Musacchi, Nnadozie Oraguzie, Mark Pavek, Cameron Peace, B Poovaiah, David Rudell, Julie Tarara, Timothy Waters, Matthew Whiting, Carrie Wohleb and Yanmin Zhu.

HORT

- 503 Advanced Topics in Horticulture V 1-4** May be repeated for credit; cumulative maximum 8 hours. Current topics and research techniques in horticulture.
- 509 Seminar 1** May be repeated for credit; cumulative maximum 12 hours. Continuous enrollment required for regularly enrolled graduate students in horticulture. Recent developments in horticulture.
- 510 Graduate Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Literature reviews and research progress reports.
- 513 Advanced Viticulture 3** Wine and juice grape production in eastern Washington; wine and fruit physiology, climate and soils, and fruit quality. (Cross-listed course offered as HORT 413, VIT ENOL 413).
- 516 Advanced Horticultural Crop Physiology 3** Physiological processes related to growth, development, and productivity of horticultural crops; advances in recombinant DNA technology; the impact on horticultural practices. Credit not granted for both HORT 416 and HORT 516. Recommended preparation: BIOLOGY 420.
- 518 Post-harvest Biology and Technology 3 (2-3)** Physical and physiological basis for handling and storage practices; perishable organ ontogeny and physiological disorders; post-harvest environment requirements. Field trip required. Credit not granted for both HORT 418 and HORT 518. Recommended preparation: HORT 202.

- 521 Fruit Crops Management 3** Current research and management strategies for production and quality of temperate-zone fruit crops. Credit not granted for both HORT 421 and HORT 521. Recommended preparation: HORT 310 or HORT 313.
- 535 Chemistry and Biochemistry of Fruit and Wine 3** Study of the chemistry and biochemistry of fruits; biochemistry and physiology of individual fruit compounds, aspects of processing including winemaking. (Cross-listed course offered as HORT 435, VIT ENOL 435). Recommended preparation: Analytical chemistry.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Horticulture

Degree offered: Master of Science in Horticulture

Faculty working with graduate students: 39

Graduate students: 15

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The graduate program in horticulture has a long history of excellence in graduate education. Graduates from the program are employed in careers ranging from applied crop production to teaching and research in the molecular mechanisms controlling plant growth and development. Graduate work can be basic or applied, and students acquire experience in both teaching and research. Students generally focus their research on solving a production or postharvest quality issue for a particular commodity (vegetable crop, tree fruits, small fruits, viticulture and enology, ornamentals), or on the more basic areas of plant physiology, biochemistry, molecular genetics, genomics and breeding, and

bioinformatics. Interdisciplinary areas such as plant pathology, soils, entomology, biological systems engineering, environmental science, foods and nutrition, and the social sciences are often included. Research projects may address problems or situations related to the growth, production, or utilization of any horticultural commodity. Thesis projects, course requirements, and teaching experiences are individualized to the specific interests and goals of the student. After completion of course work students may have the opportunity to conduct research at one of several Research & Extension Centers located throughout the state. Graduates are placed in highly regarded laboratories; in respected research, teaching, and extension programs at universities; in industry, and with government and non-governmental agencies.

Degree Description

This is a research-based degree, involving a formal, major research project. The objectives are to train students in the experimental method and to prepare students for handling major projects after graduation or for entering a doctoral program.

Post-Graduate Employment Opportunities

Federal and state agricultural laboratories
Extension agents
Management positions in allied and agricultural industries
Teaching positions
Technical positions

Post-Graduate Career Placements

Wine Export Manager
Assistant Production Manager for Nursery
Assistant Winemaker
Research Associate
Doctoral Program

Contact Information

Debra Marsh
Sr Academic Coordinator
Johnson Hall Graduate Center
Pullman, WA
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Lisa Lujan
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HORT

- 503 Advanced Topics in Horticulture V 1-4** May be repeated for credit; cumulative maximum 8 hours. Current topics and research techniques in horticulture.

- 509 Seminar 1** May be repeated for credit; cumulative maximum 12 hours. Continuous enrollment required for regularly enrolled graduate students in horticulture. Recent developments in horticulture.
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- 535 Chemistry and Biochemistry of Fruit and Wine 3** Study of the chemistry and biochemistry of fruits; biochemistry and physiology of individual fruit compounds, aspects of processing including winemaking. (Cross-listed course offered as HORT 435, VIT ENOL 435). Recommended preparation: Analytical chemistry.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Individual Interdisciplinary

Degree offered: Doctor of Philosophy (Individual Interdisciplinary)

Faculty working with graduate students: 39

Graduate students: 23

Tests required: IELTS, MELAB, TOEFL, TOEFLI

Deadline: Fall: January 10

Program Description

The individual interdisciplinary doctoral program is designed to meet the professional interests and research endeavors of each student. Although the program maintains a high degree of flexibility, it is a rigorous program and requires the involvement of the Graduate School as well as several academic units on campus. The degree offers a unique opportunity for students seeking a breadth of knowledge not available within one particular discipline.

Degree Description

Each student works with an advisor and four additional members of the WSU faculty from at least three academic units. This committee oversees the development of the individual doctoral degree and works closely with the student to ensure a high quality doctoral education. The individual doctoral program must meet the following criteria: it will be of doctoral significance, no single recognized graduate degree-granting unit will be able to meet the student's needs, and the academic resources to complete the proposed program will be available at WSU.

Training and Professional Development Opportunities

IIDP is not able to offer assistantship funding; however many IIDP students do hold assistantships through one of their identified disciplines from their program.

Post-Graduate Employment Opportunities

Since 1983, approximately 85 individual interdisciplinary doctorates have been earned at WSU. Graduates of the program now work as university and college faculty as well as educational and business consultants and in government positions around the world.

Contact Information

Dr. Pat Sturko

Associate Dean

Graduate School

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UNIV

- 580 Leadership Development V** 1-3 Course Prerequisite: By permission only. Meetings and workshops designed to develop professional and leadership skills for doctoral students.
- 590 Preparation for College Teaching 2** Cross-discipline instructional development for graduate teaching assistants; course development teaching techniques, university policies and procedures.
- 591 Interdisciplinary Studies 1** May be repeated for credit. Contemporary issues in interdisciplinary education and research. Open to all interested students.
- 597 Preparing the Future Professoriate 2** Course Prerequisite: By permission only. Understanding and contextual knowledge of the professoriate and issues facing higher education.
- 598 Interdisciplinary Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Seminar on theory and practice of advanced interdisciplinary doctoral study.
- 698 Continuous Enrollment Status 0** This course (no credit earned) satisfies continuous enrollment status for graduate students who are not otherwise enrolled.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 899 Continuing Doctoral Status 0** May be repeated for credit; cumulative maximum 0 hours. Continuing Doctoral Status

Interior Design

Degree offered: Master of Arts in Interior Design

Faculty working with graduate students: 23

Graduate students: 10

Graduate students receiving assistantships or scholarships: 10%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: :

Fall: January 10

Requirements

Please see the MA Interior Design graduate handbook at <http://sdc.wsu.edu/interior-design> for detailed information about credit requirements, course descriptions and program information for each track (1, 2 and 3 year; thesis and non-thesis).

Program Description

The Master of Arts Degree in Interior Design is offered through the School of Design and Construction on the Pullman campus of Washington State University. The MA focuses on environment and design applications within the context of a cross-disciplinary

program. The program increases students' understanding of the relationship between human behavior and interior environments through advanced study and hands-on research. The program also builds on the design studio experience to provide students an opportunity for further exploration and discovery in the field. Students gain knowledge and skills that prepare them to analyze information and relationships, evaluate issues, and set priorities, while creating functional and high quality design solutions for complex projects. The Interior Design faculty mentor graduate students in advising and teaching, serving on graduate committees, making contributions to readings and research methods seminars, supervising independent study projects and serving on graduate committees.

Degree Description

The philosophy of the Interior Design program is based on a concern for human beings and the creation of interior settings that support human activities and values. Graduates of the program in Interior Design should be able to think clearly and creatively and to solve problems in a professionally competent manner. Above all, an interior design education will help the student to develop intellectual curiosity, which allows the graduate to continue to develop as a person and as a designer throughout life. Upon completion of the MA program students are able to analyze information and relationships, evaluate issues and set priorities while generating creative design solutions for projects of a complex scale. Graduates have the ability to take initiative, make critical judgments of their own work and that of others, and contribute to the overall well-being of people as they interact with interior environments. The MA combines studio design experience with qualitative and quantitative research methodologies to further understanding and increase awareness of the interface between human behavior and interior environments. The MA builds on the studio design experience to expand students' understanding of the theoretical and analytical frameworks applicable to the pursuit of discovery in the field. Students pursuing a post professional graduate degree (2-year program) will complete a written thesis, while students pursuing the 1-year program and the first professional graduate degree (3-year program) will complete a research project.

Training and Professional Development Opportunities

Internship

Post-Graduate Employment Opportunities

Graduates of this program are prepared for successful careers as interior design practitioners, educators and researchers.

Post-Graduate Career Placements

FACULTY POSITIONS: Assistant Professor, Utah State University; Assistant Professor, Washington State University; Interior Design Department Chair, Monterey Community College; Instructor, University of New Haven Connecticut; Instructor, Art Institute (Portland); Instructor, Highline Community College (Tacoma) DOCTORAL PROGRAMS: Doctor of Design (Washington State University); PhD in Architecture (University of Hawaii) PROFESSIONAL PRACTICE: ADN Designs (Seattle); Avery Brooks & Associates (Las Vegas); Callison (Seattle); Carletti Architects (Mount Vernon); Carrier Johnson (San Diego); Collins Woerman (Seattle); Decorum Design (Spokane); Design Naturale (Boise); Evans Design Firm (Kansas); Executive Director, Habitat

for Humanity (N. Idaho); Holland Roth (Canada); JAD (South Korea); JC Interior Design Studio (Seattle); Jennifer Randall (Seattle); John Rovtar (Spokane); KDF (Yakima); Main Street Manager (Oregon); Myhre Group (Portland); Milieu (Spokane); NBBJ (Seattle); OMS (Spokane); San Diego State Capital Planning; Wagner Architects (Seattle); Weber Thompson (Seattle)

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Faculty

John Abell, Kerry Brooks, J Burnett, Rick Cherf, Matthew Cohen, Darrin Griecken, Jason Gruen, David Gunderson, Thomas Heustis, Paul Hirzel, Jolie Kaytes, Bashir Kazimee, Gregory Kessler, William Kirk, Robert Krikac, Matthew Melcher, Taiji Miyasaka, Jason Peschel, Ayad Rahmani, Kathleen Ryan, Ole Sleipness, Judith Theodorson and David Wang.

ARCH

- 510 Architectural Design Studio 6** (0-12) Graduate studio experience researching a single topic of architectural relevance (i.e. geology, material science, biological systems engineering). Field trip required.
- 511 Design VIII/Graduate Design Project 6** (0-12) Course Prerequisite: ARCH 403. Studio course divided between urban design and preliminary design on graduate project.
- 513 Graduate Design Project 6** (0-12) Course Prerequisite: ARCH 511; ARCH 515. Final graduate design studio focusing on individualized topics.
- 515 Research Methods and Programming 3** Exploration of traditional research methods and investigations for architects.
- 520 Directed Topics in Architecture V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics related to areas of emphasis in the program and student specialization.
- 525 History and Theory 3** History and theory of 20th century architecture focusing on cultural and philosophical principles related to design.
- 527 Site and Landscape Design 3** Exploration of issues of site context analysis, topography, planning, and landscape design.
- 530 Philosophies and Theories of the Built Environment 3**
Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).
- 531 Advanced Tectonics 3** Tectonic theory of concrete and metal construction with focus on skin design and technology as formative elements in architecture.
- 540 Research Methods 3** Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).
- 542 Issues in Architecture 3** Course Prerequisite: ARCH 525. Examination of issues in architecture related to society, culture, environment, politics, and philosophy.
- 560 Interdisciplinary Seminar 3** Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).
- 563 Architectural Structures III 3** Course Prerequisite: ARCH 515 or concurrent enrollment. Wind and seismic loads on architectural structures; high-rise systems; reinforced concrete and masonry structures. Credit not granted for both ARCH 463 and ARCH 563.
- 564 Architectural Structures IV 3** Course Prerequisite: ARCH 511 or concurrent enrollment. Deflection theory; classical and computer analysis for statically indeterminate architectural structure systems. Credit not granted for both ARCH 464 and ARCH 564.
- 570 Advanced Architectural Studio/Laboratory 6** (0-12) In-depth study of design problems relating to cultural, environmental, technological and other issues as related to the student's area of emphasis.
- 571 Advanced Architectural Studio II 6** (0-12) Course Prerequisite: ARCH 570. Drawing from architectural historical and theoretical research, urban architectural design case study, research in the arts, humanities and social sciences.
- 573 Ethics and Practice 3** Ethical and professional practice issues related to the business and practice of architecture; investigations into marketing client and business orientation.
- 577 Theories and Methods of Urban Construction 3** Morphology, theoretical concepts, planning and spatial structure of cities and analysis of the transformation of the city core in Europe and America.
- 580 Architecture Internship V** 1-4 May be repeated for credit. Course Prerequisite: Graduate student in M Architecture degree program. Placement in an approved industrial, professional, or governmental situation for specialized or general experience.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination.** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-6 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction** 3 Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology** 3 Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods** 2 Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I** 3 Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics** 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment** V 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning** 3 Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research** 3 The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research** 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research** 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design** 3 Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education** V 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation** 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation** 3 Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses** 3 Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories** 3 Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology** 1 May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship** V 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Interior Design

I D

- 520 Historical Perspectives of Interior Space 3** Historical perspectives of interior environments, spatial distributions, furnishings, and related design elements from ancient Egypt to the 18th century.
- 525 Interior Design Graduate Studio I 5 (0-10)** Graduate studio: application of advanced design theories, philosophies and research methodologies to enhance undergraduate design foundations through interdisciplinary studio experiences.
- 526 Interior Design Graduate Studio II 5 (0-10)** Graduate studio: individual thesis topics and the application of advanced design theories, philosophies, and research methodologies to student's focus topic.
- 530 Philosophies and Theories of the Built Environment 3**
Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).
- 540 Research Methods 3** Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).
- 560 Interdisciplinary Seminar 3** Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).
- 594 Readings in Interior Design 3** Exploration of current topics through readings in interior design.
- 598 Topics in Interior Design V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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702 Master's Special Problems, Directed Study and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Interior Design

Degree offered: Master of Arts in Interior Design – Non Thesis

Faculty working with graduate students: 23

Graduate students: 10

Graduate students receiving assistantships or scholarships: 10%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: :

Fall: January 10

Requirements

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contribute to the overall well-being of people as they interact with interior environments. The MA combines studio design experience with qualitative and quantitative research methodologies to further understanding and increase awareness of the interface between human behavior and interior environments. The MA builds on the studio design experience to expand students' understanding of the theoretical and analytical frameworks applicable to the pursuit of discovery in the field. Students pursuing a post professional graduate degree (2-year program) will complete a written thesis, while students pursuing the 1-year program and the first professional graduate degree (3-year program) will complete a research project.

Training and Professional Development Opportunities

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Faculty

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ARCH

472 Codes and Acoustics 3 Course Prerequisite: Certified major in Architecture or Construction Management. Building codes and specifications; sound theory, control, and acoustic systems applied to buildings.

DESGN

397 3-D Digital Modeling and Project Information Management I 3 3-D digital modeling as a medium to support design visualization, investigation and communication including project information management; emphasis on Revit suite software. Recommended preparation: ID 297 or graduate standing.

497 3-D Digital Modeling and Project Information Management II 3 Integration of advanced building information modeling (BIM) techniques utilizing complex applications within the Revit software suite. Recommended preparation: DESIGN 397.

Interior Design

I D

303 Immersion Studio 6 (1-10) Course Prerequisite: By permission only. Intense and concentrated experience in design of interior spaces from abstraction and concept to complex interiors of larger scale.

305 Freehand Sketching 3 (2-2) Development of knowledge and skills in freehand sketching to facilitate design exploration and further understanding of the built environment.

321 Interior Design Studio IV 4 (1-9) Course Prerequisite: Certified major in Interior Design. Interior design problem-solving grounded in place theories.

325 Interior Building Systems 3 Course Prerequisite: Certified major in Interior Design. Analysis, planning, and application of interior lighting; introduction to HVAC and plumbing systems.

333 Interior Design Studio V 4 (1-9) Course Prerequisite: I D 321. Interior design problem-solving grounded in organizational theories.

415 Advanced Interior Construction and Detailing 3 Course Prerequisite: Certified major in Interior Design. Analysis of building construction and detailing which impacts interior space design.

425 Interior Design Studio VI 5 (0-10) Course Prerequisite: I D 333 or I D 303. Interior design problem-solving integrating multidisciplinary theories within a community and/or global context.

426 Interior Design Studio VII 5 (0-10) Course Prerequisite: I D 425. Interior design problem-solving grounded in selected theories.

460 Portfolio and Representation 3 Develop communication skills and produce documents necessary to professionally present oneself to prospective employers within the fields of design.

SDC

- 350 Global History of Design II** 3 Course Prerequisite: ARCH 203 or concurrent enrollment, I D 203 or concurrent enrollment, or LND ARCH 263 or concurrent enrollment; certified major in Architectural Studies, Interior Design, or Landscape Architecture. Global developments in design from the seventeenth century CE to the present day.
- 510 Architectural Design Studio** 6 (0-12) Graduate studio experience researching a single topic of architectural relevance (i.e. geology, material science, biological systems engineering). Field trip required.
- 511 Design VIII/Graduate Design Project** 6 (0-12) Course Prerequisite: ARCH 403. Studio course divided between urban design and preliminary design on graduate project.
- 513 Graduate Design Project** 6 (0-12) Course Prerequisite: ARCH 511; ARCH 515. Final graduate design studio focusing on individualized topics.
- 515 Research Methods and Programming** 3 Exploration of traditional research methods and investigations for architects.
- 520 Directed Topics in Architecture** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics related to areas of emphasis in the program and student specialization.
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- 530 Philosophies and Theories of the Built Environment** 3 Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).
- 531 Advanced Tectonics** 3 Tectonic theory of concrete and metal construction with focus on skin design and technology as formative elements in architecture.
- 540 Research Methods** 3 Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).
- 542 Issues in Architecture** 3 Course Prerequisite: ARCH 525. Examination of issues in architecture related to society, culture, environment, politics, and philosophy.
- 560 Interdisciplinary Seminar** 3 Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).
- 563 Architectural Structures III** 3 Course Prerequisite: ARCH 515 or concurrent enrollment. Wind and seismic loads on architectural structures; high-rise systems; reinforced concrete and masonry structures. Credit not granted for both ARCH 463 and ARCH 563.
- 564 Architectural Structures IV** 3 Course Prerequisite: ARCH 511 or concurrent enrollment. Deflection theory; classical and computer analysis for statically indeterminate architectural structure systems. Credit not granted for both ARCH 464 and ARCH 564.
- 570 Advanced Architectural Studio/Laboratory** 6 (0-12) In-depth study of design problems relating to cultural, environmental, technological and other issues as related to the student's area of emphasis.
- 571 Advanced Architectural Studio II** 6 (0-12) Course Prerequisite: ARCH 570. Drawing from architectural historical and theoretical research, urban architectural design case study, research in the arts, humanities and social sciences.
- 573 Ethics and Practice** 3 Ethical and professional practice issues related to the business and practice of architecture; investigations into marketing client and business orientation.
- 577 Theories and Methods of Urban Construction** 3 Morphology, theoretical concepts, planning and spatial structure of cities and analysis of the transformation of the city core in Europe and America.
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- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-6 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 550 Applications: Using Research in the Inquiry Process** 3 Application of scientific research in the advanced design process.
- 561 Seminar in Design Thinking** 3 Course Prerequisite: Doctoral standing in Design. Understanding design thinking or design knowing and translating research and theory into practice.
- 562 Area Readings** 3 Course Prerequisite: DESIGN 561. Forum for the advancement of understanding and discussion of readings related to interdisciplinary design.

- 563 Directed Readings 3** Course Prerequisite: DESIGN 562. Advanced critical and comprehensive reviews of literature pertinent to student's focus area; development of specialization and expertise in identified area.
- 564 Design Research Methods 4** Course Prerequisite: DESIGN 562. Development and preparation of research proposals; identification of theories, exploration of research methods and strategies; development of thesis statement and literature review. Recommended preparation: Concurrent enrollment in DESIGN 563; DESIGN 565.
- 565 Dissertation Proposal Planning 2** Course Prerequisite: DESIGN 562. Write and present independent research proposal based on work in DESIGN 564 to prospective doctoral committee members. Recommended preparation: Concurrent enrollment in DESIGN 563; DESIGN 564.
- 570 Research Practicum 3** Course Prerequisite: DESIGN 564; DESIGN 565. Interdisciplinary research in design; focus on development and application of individual research.
- 590 Teaching Practicum V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Doctoral standing in Design. Supervised teaching experience integrating application of design knowledge and approaches.
- 598 Topics in Design V 1-3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Doctoral standing in Design. Topical issues in design responding to the shifting demands and needs of the design professions.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
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- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 520 Historical Perspectives of Interior Space 3** Historical perspectives of interior environments, spatial distributions, furnishings, and related design elements from ancient Egypt to the 18th century.
- 525 Interior Design Graduate Studio I 5** (0-10) Graduate studio: application of advanced design theories, philosophies and research methodologies to enhance undergraduate design foundations through interdisciplinary studio experiences.
- 526 Interior Design Graduate Studio II 5** (0-10) Graduate studio: individual thesis topics and the application of advanced design theories, philosophies, and research methodologies to student's focus topic.
- 530 Philosophies and Theories of the Built Environment 3**
Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).
- 540 Research Methods 3** Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).
- 560 Interdisciplinary Seminar 3** Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).
- 594 Readings in Interior Design 3** Exploration of current topics through readings in interior design.
- 598 Topics in Interior Design V** 1-3 May be repeated for credit; cumulative maximum 6 hours.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Landscape Architecture

Degree offered: Master of Science in Landscape Architecture

Faculty working with graduate students: 23

Graduate students: 5

Graduate students receiving assistantships or scholarships: 20%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The Master of Science in Landscape Architecture is offered by the School of Design and Construction on the Pullman campus of Washington State University. The MSLA program emphasizes the relationship between landscape architecture, environmental sciences and natural resources, urban/suburban/rural design, interdisciplinary design, and ecological design and planning. A Geographic Information Systems and Simulation Laboratory supports teaching, research, and service learning activities.

Degree Description

The Master of Science in Landscape Architecture provides students with a foundation in the theory and practice of landscape architecture. The MSLA program also provides students with the opportunity to focus on a particular area of landscape architectural investigation. The MSLA prepares students to achieve their professional goals in the private sector, academic settings, government, and other design and planning venues. The program focuses on advanced studies in landscape architecture and landscape planning within the geographical context of the Interior Northwest and the Northern Rocky Mountain Regions.

Training and Professional Development Opportunities

MSLA candidates have opportunities to receive training in design, digital and hand drawing, GIS, community and regional planning,

natural resources management, undergraduate teaching.

Post-Graduate Employment Opportunities

MSLA graduates have opportunities to work in private landscape architecture firms (of all sizes), government and community entities (from small municipalities to the National Park Service), universities, multidisciplinary environmental consulting firms.

Post-Graduate Career Placements

Rainier National Park - forestry technician, Washington State DOT NW Region - landscape manager, design-build contractor - landscape design, municipal parks and trails - design development manager, residential landscape firm - manager and designer.

Contact Information

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Faculty

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ARCH

- 510 Architectural Design Studio 6** (0-12) Graduate studio experience researching a single topic of architectural relevance (i.e. geology, material science, biological systems engineering). Field trip required.
- 511 Design VIII/Graduate Design Project 6** (0-12) Course Prerequisite: ARCH 403. Studio course divided between urban design and preliminary design on graduate project.
- 513 Graduate Design Project 6** (0-12) Course Prerequisite: ARCH 511; ARCH 515. Final graduate design studio focusing on individualized topics.
- 515 Research Methods and Programming 3** Exploration of traditional research methods and investigations for architects.

- 520 Directed Topics in Architecture V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics related to areas of emphasis in the program and student specialization.
- 525 History and Theory 3** History and theory of 20th century architecture focusing on cultural and philosophical principles related to design.
- 527 Site and Landscape Design 3** Exploration of issues of site context analysis, topography, planning, and landscape design.
- 530 Philosophies and Theories of the Built Environment 3**
Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).
- 531 Advanced Tectonics 3** Tectonic theory of concrete and metal construction with focus on skin design and technology as formative elements in architecture.
- 540 Research Methods 3** Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).
- 542 Issues in Architecture 3** Course Prerequisite: ARCH 525. Examination of issues in architecture related to society, culture, environment, politics, and philosophy.
- 560 Interdisciplinary Seminar 3** Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).
- 563 Architectural Structures III 3** Course Prerequisite: ARCH 515 or concurrent enrollment. Wind and seismic loads on architectural structures; high-rise systems; reinforced concrete and masonry structures. Credit not granted for both ARCH 463 and ARCH 563.
- 564 Architectural Structures IV 3** Course Prerequisite: ARCH 511 or concurrent enrollment. Deflection theory; classical and computer analysis for statically indeterminate architectural structure systems. Credit not granted for both ARCH 464 and ARCH 564.
- 570 Advanced Architectural Studio/Laboratory 6** (0-12) In-depth study of design problems relating to cultural, environmental, technological and other issues as related to the student's area of emphasis.
- 571 Advanced Architectural Studio II 6** (0-12) Course Prerequisite: ARCH 570. Drawing from architectural historical and theoretical research, urban architectural design case study, research in the arts, humanities and social sciences.
- 573 Ethics and Practice 3** Ethical and professional practice issues related to the business and practice of architecture; investigations into marketing client and business orientation.
- 577 Theories and Methods of Urban Construction 3** Morphology, theoretical concepts, planning and spatial structure of cities and analysis of the transformation of the city core in Europe and America.

- 580 Architecture Internship V** 1-4 May be repeated for credit. Course Prerequisite: Graduate student in M Architecture degree program. Placement in an approved industrial, professional, or governmental situation for specialized or general experience.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination. V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-6 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

EDPSY

- 502 Theoretical Foundations of Learning and Instruction** 3 Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology** 3 Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods** 2 Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I** 3 Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics** 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V** 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning** 3 Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory** 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research** 3 The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research** 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research** 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design** 3 Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation** 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation** 3 Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses** 3 Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories** 3 Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology** 1 May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Landscape Architecture

L A

520 The Northern Rocky Mountain Regional Landscape 4 (2-4) Biophysical characteristics of the Northern Rocky Mountain regional landscape.

521 Cultural Interpretation of the Regional Landscape 4 (2-4) Cultural characteristics of the Northern Rocky Mountain regional landscape.

525 Landscape Modeling 3 (1-6) Visual and cartographic landscape modeling through application of GIS and visualization technologies to landscape changes.

530 Philosophies and Theories of the Built Environment 3 Course Prerequisite: Graduate standing in Architecture, Interior Design, or Landscape Architecture. Focus on systematic thought which may describe behavior of the built environment. (Cross-listed course offered as ARCH 530, I D 530, LND ARCH 530).

540 Research Methods 3 Research methods, from quantitative to technical to philosophical, directed toward qualitative research. (Cross-listed course offered as ARCH 540, I D 540, LND ARCH 540).

560 Interdisciplinary Seminar 3 Explores approaches to design thinking in the topic areas of people and place, history, theory and criticism, and physical design. (Cross-listed course offered as ARCH 560, I D 560, LND ARCH 560).

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

Manufacturing Leadership – Cert in Manufacturing Leadership

Degree offered: Graduate Certificate in Manufacturing Leadership

Graduate students: 5

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)

Spring: November 15 (July 1 international)

summer: April 1 (Default international)

Requirements

Students must apply for graduation for the certificate the final semester according to graduate school deadlines.

Program Description

The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs. Rather than completing all the course requirements for an ETM master's degree, students may take four courses (12-credit hours) in specialized areas. A certificate is awarded upon completion of these courses. Course credits earned for a certificate may also apply to a master's degree in the ETM Program or other graduate degree programs. A student may earn more than one certificate and may work on the certificate and master's program concurrently. Eight certificates are available in the Master of Engineering and Technology Management degree program.

Degree Description

Manufacturing and technical managers in today's manufacturing environments must demonstrate multifaceted leadership combined with a high level of technical expertise in order to compete in a world-class manufacturing arena. The four courses in this certificate provide a unique but essential foundation for understanding and optimizing a manufacturing organization. While many courses in manufacturing focus on the mechanical operations and processes, this certificate focuses on maximizing the performance of the entire system. Achieving the highest levels of performance starts with design of products and systems, integrating the contributions of a complex network of suppliers, and coordinating production according to key constraints throughout the supply chain. Finally, the most effective route to achieving continuous improvement in this environment is the integrated application of Lean, Six Sigma, and Theory of Constraints.

Contact Information

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Engineering Management

E M

- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.
- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.

- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.

- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Materials Science – Materials Science and Engineering

Degree offered: Doctor of Philosophy (Materials Science)

Faculty working with graduate students: 25

Graduate students: 60

Graduate students receiving assistantships or scholarships: 96%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

No additional requirements.

Program Description

Washington State University (WSU) has the largest interdisciplinary doctoral program in Materials Science and Engineering in the Northwest. Since its establishment in the 1960s as the doctoral program in Chemical Physics and re-christening as the Materials Science program in the 1980s, it has evolved into a strongly collaborative, vibrant interdisciplinary program with the participation of faculty from several departments and schools in the College of Engineering and Architecture (CEA) and the College of Sciences (COS). This cross-disciplinary approach enables students to have access to a wide range of state-of-the-art research facilities from Mechanical, Materials, Civil, Chemical and Bio Engineering, as well as Physics and Chemistry. In addition, some of our faculty members have collaborations with the highly ranked Life Sciences programs (Plant Sciences,

Veterinary Medicine and Agriculture) in WSU. More than 50% of our internationally renowned faculty members are fellows of their professional societies, and many have leadership roles in professional organizations, industrial consulting, and various federal government panels. Most of our students go on to work in academia, Fortune 500 companies and the national laboratories.

Degree Description

This program offers a PhD in Materials Science and Engineering.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

None

Post-Graduate Career Placements

None

Contact Information

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Materials Science and Engineering

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Faculty

David Bahr, Amit Bandyopadhyay, Susmita Bose, James Brozik, Aurora Clark, Gary Collins, Susan Dexheimer, Indranath Dutta, Karl Englund, David Field, Yi Gu, Kerry Hipps, Mark Kuzyk, Jacob Leachman, Kelvin Lynn, Ursula Mazur, Matthew McCluskey, Jeanne McHale, Sinisa Mesarovic, M Norton, Louis Scudiero, Michael Wolcott, Hussein Zbib, Jinwen Zhang and Weihong Zhong.

Civil Engineering

C E

400 Highway Materials Engineering 3 (2-3) Course Prerequisite: MATH 360 or concurrent enrollment or MATH 370 or concurrent enrollment; senior standing; certified major in Civil Engineering. Basic properties and mix designs of aggregates, asphalt, concrete and recycled materials; quality assurance, quality control.

401 Climate Change Science and Engineering 3 Course Prerequisite: CHEM 105; MATH 172; PHYSICS 201. Engineering solutions for climate change problems; basic science of climate change, engineering for mitigation and adaptation, and climate change policy.

402 Applied Meteorology 3 Course Prerequisite: MATH 172 or 182; PHYSICS 201. Atmospheric physical behavior across spatial scales linking concepts of meteorological phenomena to engineering design principles. Credit not granted for both CE 402 and CE 502.

403 Air Quality Management 3 Air pollution from the perspective of an environmental manager; regulatory framework, management strategies, monitoring, modeling tools, and control technologies.

- 404 Sustainability Engineering I** 3 Course Prerequisite: Senior standing; certified major in Architecture, Construction Management, Civil Engr, Electrical Engr, Bioengineering, Chemical Engr, Mechanical Engr, Computer Science, Materials Science Engr, or Computer Engr. Green building and sustainable development topics including low impact development (LID) stormwater design and environmental life cycle assessment (LCA).
- 405 Sustainability: Green Engineering** 3 Course Prerequisite: Senior standing; certified major in Architecture, Construction Management, Civil Engr, Electrical Engr, Bioengineering, Chemical Engr, Mechanical Engr, Computer Science, Materials Science Engr, or Computer Engr. Focus on the LEED green building rating system with topics on sustainable site selection, alternative transportation, heat island effect, light pollution, water and energy efficiency/use, regional and global climate/air issues, use/reuse of many material and resources, and indoor environmental quality.
- 414 Structural Design Laboratory** 3 (2-3) Course Prerequisite: CE 330; MATH 360 or concurrent enrollment, or MATH 370 or concurrent enrollment; certified major in Civil Engineering. Senior lab requiring integration of previous course work into the execution of design projects and the assessment of experimental test data; design codes and standards, load determination, load path, influence lines; applications in concrete, masonry, steel, and wood.
- 415 Environmental Measurements** 3 (1-6) Course Prerequisite: CE 341; MATH 360 or concurrent enrollment or MATH 370 or concurrent enrollment; certified major in Civil Engineering. Theory and laboratory measurement techniques used in analyzing environmental quality parameters. Credit not granted for both CE 415 and CE 515. Required preparation must include CE 341.
- 416 Hydraulic Engineering Laboratory** 3 (1-6) Course Prerequisite: CE 315; MATH 360 or concurrent enrollment or MATH 370 or concurrent enrollment; certified major in Civil Engineering. Experiments related to fluid flow principles and their application to hydraulic engineering.
- 418 Hazardous Waste Engineering V** 3-4 Course Prerequisite: CE 341 with a C or better; certified major in Civil Engineering. Hazardous waste properties, chemodynamics, and health effects; introduction to risk assessment and hazardous waste remediation. Credit not granted for both CE 418 and CE 518.
- 419 Hazardous Waste Treatment** 3 Course Prerequisite: CE 418 with a C or better; certified major in Civil Engineering. Principles of operation and application of processes in design of technologies used in hazardous waste treatment and remediation. Credit not granted for both CE 419 and CE 519.
- 425 Soil and Site Improvement** 3 Course Prerequisite: CE 317 with a C or better; certified major in Civil Engineering. Compaction theory and methods; deep densification of soils; advanced consolidation theory, preloading, vertical drains, chemical stabilization, grouting; design with geosynthetics. Credit not granted for both CE 425 and CE 525. Required preparation must include CE 317.
- 430 Analysis of Indeterminate Structures** 3 Course Prerequisite: CE 330 with a C or better; MATH 220; E 221; certified major in Civil Engineering. Stiffness methods for the analysis of trusses, beams, and frames; matrix models; and computer applications.
- 431 Structural Steel Design** 3 Course Prerequisite: CE 330 with a C or better; certified major in Civil Engineering. Design of steel structures by load and resistance factor design (LRFD); behavior and design of beams, columns, tension members and connections.
- 433 Reinforced Concrete Design** 3 Course Prerequisite: CE 330 with a C or better; certified major in Civil Engineering. Behavior, analysis, and design of reinforced concrete structures; flexure; shear; bond; serviceability requirements; design of beams, columns, and slabs.
- 434 Prestressed Concrete and Reinforced Masonry Design** 3 Course Prerequisite: CE 433 with a C or better; certified major in Civil Engineering. Behavior, analysis, and design of pretensioned and post-tensioned prestressed concrete structures; behavior and design of reinforced masonry structures. Credit not granted for both CE 434 and CE 534.
- 435 Foundations** 3 Course Prerequisite: CE 317 with a C or better; certified major in Civil Engineering. Site investigation; bearing capacity, settlement and design of shallow foundations, piles and piers; design of retaining walls.
- 436 Design of Timber Structures** 3 Course Prerequisite: CE 330 with a C or better; certified major in Civil Engineering. Engineering properties of wood materials; analysis and design of members, connections, trusses, shearwalls and structural diaphragms; durability and moisture effects on engineered wood products.
- 437 Structural Composites Design** 3 Course Prerequisite: CE 330. Behavior, analysis and design of fiber-reinforced plastic composite structures; micro, ply and laminate mechanics; reinforcement of concrete and wood.
- 442 Water and Wastewater Treatment Design** 3 Course Prerequisite: CE 341 with a C or better; certified major in Civil Engineering, or Environmental Science. Water and wastewater treatment processes and design.
- 450 Hydraulic Engineering Design** 3 Course Prerequisite: CE 351 with a C or better; certified major in Civil Engineering. Hydraulic design and planning of facilities associated with gravity controlled and pressurized flow.
- 451 Open Channel Flow** 3 Course Prerequisite: CE 351 with a C or better; certified major in Civil Engineering. Steady, non-uniform flow; controls and transitions in fixed-bed channels. Credit not granted for both CE 451 and CE 551.
- 456 Sustainable Development in Water Resources** 3 Course Prerequisite: CE 351 with a C or better; certified major in Civil Engineering. Sources of freshwater in Pacific Northwest; water demands; climate change impacts on water availability; approaches for developing sustainable water yield.

- 460 Advanced Hydrology 3** Course Prerequisite: CE 351 with a C or better; certified major in Civil Engineering. Components of the hydrologic cycle; conceptual models; watershed characteristics; probability/statistics in data analysis; hydrographs; computer models; and design applications. Credit not granted for both CE 460 and CE 560.
- 463 Engineering Administration 3** Engineering economy; annual cost, present worth, rate of return, and benefit-cost ratio in engineering decision making; basic contract law.
- 465 Integrated Civil Engineering Design 3 (1-6)** Course Prerequisite: Senior standing; certified major in Civil Engineering. Civil engineering applications to planning and design; problem synthesis, data analysis, decision making and reporting; design of complete projects that include local and worldwide problems through interdisciplinary teams.
- 466 Fundamentals of Engineering Examination Review 1** Course Prerequisite: Senior standing; certified major in Civil Engr, Electrical Engr, Bioengineering, Chemical Engr, Mechanical Engr, Computer Science, Materials Science Engr, or Computer Engr. Review of topics to prepare for the Fundamentals of Engineering Examination.
- 473 Pavement Design 3** Course Prerequisite: CE 317; ECONS 101 or ECONS 102; CE 322 or concurrent enrollment. Pavement performance evaluation, material characterization, traffic analysis, pavement structural response analysis, transfer function application, and pavement design procedures for both flexible and rigid pavements.
- 474 Traffic Systems Design 3 (2-3)** Analysis and design of network traffic systems, system evaluation using computer optimization and simulation; development and testing of alternative system design. Two lectures and one 3-hour lab a week; field data collection and field site visits.
- 475 Groundwater 3 (2-3)** Course Prerequisite: CE 317 or GEOLOGY 315; MATH 140 or concurrent enrollment, or MATH 172 or 182 or concurrent enrollment. Introduction to groundwater occurrence, movement, quality, and resource management, emphasizing physical and biogeochemical principles. Field trip required. (Cross-listed course offered as GEOLOGY 475, CE 475).
- 480 Ethics and Professionalism 1** Course Prerequisite: Senior status; certified major in Civil Engineering. Professional aspects of civil engineering.
- 495 Engineering Internship V 1-4** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: By interview only. Placement in a professional, governmental, or industrial situation for specialized or general experience.
- 498 Special Topics in Civil Engineering V 1-4** May be repeated for credit; cumulative maximum 6 hours. Contemporary topics in civil engineering.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

Civil Engineering

CH E

- 432 Chemical Engineering Lab I 3 (1-6)** Course Prerequisite: CHE 321 with a C or better; CHE 332 with a C or better; CHE 334 with a C or better. Statistical design and analysis of experiments; safety; experiments in heat and mass transfer; separations, other unit operations, kinetics, control; technical reports and presentations.
- 433 Chemical Engineering Lab II 2 (0-6)** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: CHE 432 with a C or better. Laboratory experiments in heat and mass transfer; separations, other unit operations, kinetics, control; design calculations; technical reports and presentations.
- 441 Process Control 3** Course Prerequisite: CHE 211 with a C or better, or CHE 310 with a C or better. Measuring instruments, automatic control, process and instrument characteristics and theory applied to industrial control problems.
- 450 Chemical Process Analysis and Design I 3** Course Prerequisite: CHE 321 with a C or better; CHE 332 with a C or better; CHE 334 with a C or better. Chemical engineering design; computer tools; safety and environmental constraints; cost and equipment optimization.
- 451 Chemical Process Analysis and Design II 3** Course Prerequisite: CHE 450 with a C or better. Development, design, and economic evaluation of chemical and related processes as practiced in industry.
- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 465 Integrated Envirochemical Engineering 3** Course Prerequisite: CHE 321 with a C or better; CHE 334 with a C or better. Application of chemical engineering principles in assessment and remediation of industrial problems in air pollution, water pollution, and solid and hazardous waste.
- 475 Introduction to Biochemical Engineering 3** Course Prerequisite: CHE 321 with a C or better; CHE 332 with a C or better. Application of chemical engineering principles to the processing of biological and biochemical materials.
- 476 Biomedical Engineering Principles 3** Course Prerequisite: CHE 310 with a C or better. The application of chemical engineering principles to biomedical processes.
- 481 Special Topics in Chemical Engineering V 1-3** Interfacial phenomena, high temperature material processing, integrated circuit manufacturing, in situ destruction of hazardous waste.
- 495 Chemical Engineering Internship 2** May be repeated for credit; cumulative maximum 4 hours. Students work full time in engineering assignments in approved industries with prior approval of advisor and industrial supervisor.
- 498 Technical Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Senior standing; certified Chemical Engineering major.

499 Special Problems V 1-4 May be repeated for credit. Course Prerequisite: Sophomore standing. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

Civil Engineering

CHEM

401 Modern Inorganic Chemistry 3 Course Prerequisite: CHEM 332 with a C or better or concurrent enrollment. Properties of substances; periodic systems; oxidation-reduction and acid-base characteristics interpreted on the basis of atomic and molecular structure.

410 Advanced Synthesis and Characterization 3 (1-6) Course Prerequisite: CHEM 346 with a C or better, or CHEM 348 with a C or better; CHEM 332 with a C or better. Synthesis and characterization of organic and inorganic compounds and solid-state materials; modern synthetic technology, characterization methods, and laboratory techniques.

425 Quantitative Instrumental Analysis 2 Course Prerequisite: CHEM 332 with a C or better or concurrent enrollment. Computer interfacing applicable to chemical instrumentation; principles and applications of modern chromatography, spectrophotometry and electrochemical techniques.

426 Quantitative Instrumental Analysis Laboratory 2 (0-6) Course Prerequisite: CHEM 425 with a C or better or concurrent enrollment. Laboratory experience in modern analytical methods.

480 Solid State Chemistry 3 Course Prerequisite: CHEM 332 with a C or better. Properties, bonding and synthesis of solid state material; crystalline and amorphous solids and coatings.

490 Current Topics in Chemistry V 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By department permission. Recent advances in the understanding and application of chemical systems.

495 Directed Research 1 Course Prerequisite: By department permission. Poster presentation of final research project.

499 Special Problems V 1-4 May be repeated for credit. Course Prerequisite: By department permission. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

Mechanical Engineering

M E

401 Mechatronics 3 (2-3) Course Prerequisite: E E 304; ME 348. Integration of mechanical and microprocessor-based systems; control theory implemented with data acquisition systems; sensors; actuators, signal conditioning, programmable logic controllers.

402 Thermal Systems Design 3 Course Prerequisite: ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Design and analysis of thermofluid systems using principles of thermodynamics, fluid mechanics and heat transfer.

404 Heat Transfer 3 Course Prerequisite: ME 301; ME 303; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Conduction, radiation, and convection heat transfer; analytical, numerical, experimental results for solids, liquids, and gases; heat exchanger design.

406 Experimental Design 3 (1-6) Course Prerequisite: ME 220; ME 305; ME 316; ME 404. Designing, conducting, and reporting of experimental investigations involving mechanical equipment. Recommended preparation: ME 348.

407 Computational Fluid Dynamics 3 Course Prerequisite: ME 303. Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.

413 Mechanics of Solids 3 Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).

414 Machine Design 3 Course Prerequisite: CE 215; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Optimal design of machinery; analysis for prevention of machine elements failure. Recommended preparation: ME 220.

416 Mechanical Systems Design 3 (1-6) Course Prerequisite: ME 316; ME 348; ME 404; ME 414 or concurrent enrollment; senior standing. Integrative design in mechanical engineering; multidisciplinary design project considering both technical and non-technical contexts; organizational dynamics and communications.

419 Air Conditioning 3 Course Prerequisite: ME 404. Principles of heat and moisture transfer; air motion and purity in buildings; design of systems.

431 Design of Solar Thermal Systems 3 Course Prerequisite: ME 301; ME 303; ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, Electrical Engineering, or Architecture. Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes and distillation.

436 Combustion Engines 3 Course Prerequisite: ME 303. Internal combustion engines; spark ignition engines, diesels, and gas turbines.

439 Applied Aerodynamics 3 Course Prerequisite: ME 303. Aerodynamic lift and drag; circulation; boundary layers, application to subsonic aircraft wing design.

449 Mechanical Vibration 3 Course Prerequisite: ME 348. Vibrating systems and noise producing mechanisms; design for noise and vibration control.

- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 472 Finite Element Methods in Design 3** Course Prerequisite: ME 414. Design of selected mechanical systems components using finite element analysis.
- 473 Advanced CAD and Geometric Modeling 3 (2-3)** Course Prerequisite: ME 316. Parametric and feature based CAD/CAM; geometric modeling and its mathematical basis; integration of CAD with design processes and other software.
- 474 Design for Manufacture and Modern Manufacturing Strategies 3** Course Prerequisite: ME 310. Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
- 475 Manufacturing Enterprise Systems -- Automation and Product Realization 3 (2-3)** Course Prerequisite: ME 313; ME 316. Manufacturing automation and product realization; role of information technology and electronic data in manufacturing enterprise systems; product life-cycle management (PLM) and related tools and processes; sustainable and green manufacturing.
- 481 Control Systems 3** Course Prerequisite: ME 348. Analysis and design of feedback control systems.
- 483 Topics in Mechanical Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 495 Internship in Mechanical Industry V 3-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. By interview only. Students work full time on engineering assignment in approved industries with industrial and faculty supervision.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

Mechanical Engineering

MATH

- 401 Introduction to Analysis I 3** Course Prerequisite: MATH 301 with a C or better. Properties of sets and sequences of real numbers; limits, continuity, differentiation and integration of functions; metric spaces.
- 402 Introduction to Analysis II 3** Course Prerequisite: MATH 401. Sequences of functions, power series, multivariable calculus, inverse and implicit function theorems, Lagrange multipliers, change of variable in multiple integrations.
- 415 Intermediate Differential Equations 3** Course Prerequisite: MATH 315. Linear systems; qualitative theory (existence, uniqueness, stability, periodicity); boundary value problems; applications.
- 416 Simulation Methods 3** Course Prerequisite: MATH 360; CPT S 121, CPT S 251, or MATH 300. Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 420 Linear Algebra 3** Course Prerequisite: MATH 220 with a C or better, or MATH 230 with a C or better; MATH 301 with a C or better. Advanced topics in linear algebra including similarity transformations, canonical forms, bilinear forms.
- 421 Algebraic Structures 3** Course Prerequisite: MATH 301 with a C or better. Properties of algebraic structures and their homomorphisms, semi-groups, groups, rings, unique factorization domains, fields.
- 423 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 425 Conceptual Aspects of Mathematics 3** Course Prerequisite: By instructor permission. Exploration of conceptual models for thinking about mathematical ideas; activities and discussions of mathematical thinking and instruction. (Cross-listed course offered as TCH LRN 425, MATH 425).
- 431 Intersections of Culture and Mathematics 3** Course Prerequisite: MATH 301 with a C or better. Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 432 Mathematics for College and Secondary Teachers 3** Course Prerequisite: MATH 301 with a C or better. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 440 Applied Mathematics I 3** Course Prerequisite: MATH 315. Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 441 Applied Mathematics II 3** Course Prerequisite: MATH 315. Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 443 Applied Probability 3** Course Prerequisite: MATH 172 or MATH 182; MATH 220 or MATH 230. Axioms of probability theory; random variables; expectation; generating function; law of large numbers; central limit theorem; Markov chains. (Cross-listed course offered as STAT 443, MATH 443).

- 448 Numerical Analysis 3** Course Prerequisite: MATH 315; CPT S 121, CPT S 251, or MATH 300. Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 453 Graph Theory 3** Course Prerequisite: MATH 220 or MATH 230. Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 456 Introduction to Statistical Theory 3** Course Prerequisite: STAT 430 or 443. Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 464 Linear Optimization 3** Course Prerequisite: MATH 273 or MATH 283. Linear and integer programming; optimization problems; applications to economic and military strategies; rectangular games; minimax theory.
- 466 Optimization in Networks 3** Course Prerequisite: MATH 364. Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 486 Mathematical Modeling in the Natural Science 3** Course Prerequisite: MATH 315. Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 490 Topics in Mathematics V 1-3** Course Prerequisite: By instructor permission. Special topics in mathematics.
- 494 Seminar in Mathematical Biology 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: MATH 140 with a C or better, or MATH 172 with a C or better, or MATH 182 with a C or better; BIOLOGY 101, BIOLOGY 102, BIOLOGY 106, or BIOLOGY 107. Oral presentation of research approaches, research results and literature review of mathematical biology including mathematical modeling of biological systems. (Cross-listed course offered as MATH 494, BIOLOGY 494).
- 497 Instructional Practicum V 1-2** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: By instructor permission. May be repeated for credit; cumulative maximum 2 hours.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

Materials Science And Engineering

MSE

- 401 Metallic Materials 3** Course Prerequisite: MSE 201. Major alloy systems and manufacturing processes; materials selection.
- 402 Polymeric Materials 3** Course Prerequisite: MSE 201. Structural characterization, syntheses, and reactions of polymeric materials; relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
- 403 Ceramic Materials 3** Course Prerequisite: MSE 201. Processing, characteristics, microstructure, and properties of ceramic materials.
- 404 Engineering Composites 3** Course Prerequisite: MSE 201. Basic concept in design and specifications of engineering composites.
- 406 Biomaterials 3** Course Prerequisite: MSE 201. Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 425 Senior Thesis I 3 (0-9)** Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 426 Senior Thesis II 3 (0-9)** Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 440 Materials: The Foundations of Society and Technology 3** Course Prerequisite: Junior standing. History of materials; role that materials have played in human development; modern societal, technological, and economic impact of materials.
- 483 Topics in Materials Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

Materials Science And Engineering

PHYS

- 410 Electronics 3 (1-6)** Course Prerequisite: PHYSICS 202 or 206. Laboratory construction and investigation of electronic circuits employed in research instruments.

- 415 Quantum Physics Laboratory 3** (2-3) May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: PHYSICS 304. Experiments in modern and quantum physics, fundamental interactions of radiations with matter.
- 443 Optics 3** Course Prerequisite: PHYSICS 341 or concurrent enrollment. Polarization, interference, coherence, and diffraction phenomena of the electromagnetic spectrum; optics of solids; laser resonators; gaussian beams; ABCD matrices.
- 450 Introduction to Quantum Mechanics 3** Course Prerequisite: MATH 315; PHYSICS 303. Introduction to quantum theory with applications to atomic physics.
- 461 Introduction to Atomic and Molecular Physics 3** Course Prerequisite: PHYSICS 304. Introduction to atomic and molecular physics; spectroscopy.
- 463 Introduction to Solid State and Materials Physics 3** Course Prerequisite: PHYSICS 304. Introduction to the physics of solids; crystal structures, lattice vibrations, and electron theory.
- 465 Introductory Nuclear Physics 3** Nuclear systematics, apparatus of nuclear research, radioactivity, nuclear-atomic interactions, nuclear reactions and scattering; introductory particle physics.
- 466 Biological Physics 3** Course Prerequisite: CHEM 106 or 116; MATH 172 or 182; PHYSICS 202 or 206. Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 490 Undergraduate Thesis 1** Preliminary thesis draft of a laboratory or library research experience, oral presentation, and final draft.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.
- 501 Advanced Topics in Transportation Engineering V 2-4** May be repeated for credit; cumulative maximum 9 hours. Special topics course in transportation engineering.
- 502 Applied Meteorology 3** Atmospheric physical behavior across spatial scales linking concepts of meteorological phenomena to engineering design principles. Credit not granted for both CE 402 and CE 502.
- 503 Air Quality Management 3** Air pollution from the perspective of an environmental manager; regulatory framework, management strategies, monitoring, modeling tools, and control technologies.
- 504 Sustainability Engineering I 3** Green building and sustainable development topics including low impact development (LID) stormwater design and environmental life cycle assessment (LCA).
- 505 Sustainability: Green Engineering 3** Focus on the LEED green building rating system with topics on sustainable site selection, alternative transportation, heat island effect, light pollution, water and energy efficiency/use, regional and global climate/air issues, use/reuse of many material and resources, and indoor environmental quality.
- 506 Theory and Measurement of Turbulent Fluxes 3** Fundamental concepts of turbulence and turbulent fluxes in the atmospheric surface layer, the statistical description of turbulence and turbulent fluxes, eddy covariance systems, and post-processed processing of flux data.
- 507 Sustainability: Life Cycle Assessment 3** Principles of life cycle assessment (LCA), environmental impacts categories, LCA system models, and methods for life cycle inventory.
- 509 Numerical Modeling of Geomaterials 3** Modeling of the response of geomaterials to changes in imposed stresses or strains under both static and dynamic conditions.
- 510 Advanced Geomaterial Characterization 3** Advanced mechanics of geomaterials; compressibility, concept of stress and strain; shear strength, stress/strain and time-dependent behavior; dynamic properties.
- 511 Advanced Topics in Geotechnical Engineering V 2-4** May be repeated for credit; cumulative maximum 9 hours. Soil dynamics, theoretical soil mechanics, numerical methods in soil mechanics, and geohydrology, engineering geology, cold regions geoengineering. Required preparation must include CE 317.
- 512 Dynamics of Structures 3** Equations of motion, free vibration, damping mechanisms, harmonic, impulse, and seismic loading; shock and seismic response spectra, time and frequency domain analysis, modal analysis, structural dynamics in building codes.
- 514 Advanced Mechanics of Materials 3** Elastic stress-strain relations, shear center, unsymmetrical bending, curved beams, elastic stability, elastically supported beams, energy methods, thin plates, shells.
- 515 Environmental Measurements 3 (1-6)** Theory and laboratory measurement techniques used in analyzing environmental quality parameters. Credit not granted for both CE 415 and CE 515. Required preparation must include CE 341.
- 517 Mechanics of Sediment Transport 3** Cohesive and non-cohesive sediments; initiation of sediment motion; sediment transport; suspended and bed load entrainment; models of sediment transport for alluvial and gravel bed streams, sediment-flow interaction; river morphology and ecological restoration.
- 518 Hazardous Waste Engineering V 3-4** Hazardous waste properties, chemodynamics, and health effects; introduction to risk assessment and hazardous waste remediation. Credit not granted for both CE 418 and CE 518.
- 519 Hazardous Waste Treatment 3** Principles of operation and application of processes in design of technologies used in hazardous waste treatment and remediation. Credit not granted for both CE 419 and CE 519.
- 524 Geotechnical Earthquake Engineering 3** Faulting and seismicity; site response analysis; probabilistic seismic hazard assessment; influence of soil on ground shaking; response spectra; soil liquefaction; seismic earth pressures; seismic slope stability; earthquake resistant design.
- 525 Soil and Site Improvement 3** Compaction theory and methods; deep densification of soils; advanced consolidation theory, preloading, vertical drains, chemical stabilization, grouting; design with geosynthetics. Credit not granted for both CE 425 and CE 525. Required preparation must include CE 317.

- 527 Engineering Properties of Soils 3** Physical properties, compressibility and consolidation, shear strength, compaction, saturated and unsaturated soils, laboratory and field methods of measurement, relations of physical and engineering properties, introduction to critical-state soil mechanics. Required preparation must include CE 317.
- 530 Advanced Design of Steel Structures 3** Plate girder design; local and global buckling; plastic collapse analysis; shear and Moment-resisting connections; eccentrically-loaded connections. Required preparation must include CE 431.
- 531 Probability and Statistical Models in Engineering 3** Engineering applications of probability and statistics; Monte Carlo simulation; model estimation and testing; probabilistic characterizations of loads and material properties; risk and reliability analyses.
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 533 Advanced Reinforced Concrete Design 3** Composite design; slab design; limit state design; footings; retaining walls; deep beams; brackets and corbels; torsion; seismic design; shear walls. Required preparation must include CE 433.
- 534 Prestressed Concrete and Reinforced Masonry Design 3** Behavior, analysis, and design of pretensioned and post-tensioned prestressed concrete structures; behavior and design of reinforced masonry structures. Credit not granted for both CE 434 and CE 534.
- 535 Advanced Finite Elements 3** Plate and shell analysis; nonlinear solution methods for finite strain/rotation and nonlinear materials.
- 536 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 537 Advanced Topics in Structural Engineering 3** May be repeated for credit; cumulative maximum 9 hours. Elastic stability, plates and shells, other relevant topics.
- 538 Earthquake Engineering 3** Seismology, size of earthquakes, seismic ground motion, seismic risk, behavior of structures subjected to earthquake loading seismic response spectra, seismic design codes, lateral force-resisting systems, detailing for inelastic seismic response.
- 539 Advanced Design of Timber Structures 3** Engineering properties of wood materials; theory and design of wood composites, connections and load-sharing systems; performance criteria and durability. Required preparation must include CE 436.
- 540 Instrumental Analysis of Environmental Contaminants 3** (1-6) Course Prerequisite: CE 515. Theory and methods of analysis of water and water suspensions for contaminants using electrometric, spectrophotometric, and chromatographic techniques.
- 541 Physicochemical Water and Wastewater Treatment 3** Principles of physical and chemical operations used in water and wastewater treatment, including chemical reactor theory, sedimentation, filtration, precipitation, mass transfer, coagulation/flocculation, disinfection, adsorption and ion exchange. Recommended preparation: CE 442.
- 542 Biochemical Wastewater Treatment 3** Principles of biochemical operations used in wastewater treatment including biochemical energetics, kinetics, activated sludge and fixed film reactors, nutrient removal, and sludge handling and treatment.
- 543 Advanced Topics in Environmental Engineering Practice V** 1-4 May be repeated for credit; cumulative maximum 9 hours. Analysis and evaluation of air/water/soil pollution problems, new measurement methods, hazardous waste treatment, global climate change, and water/wastewater treatments.
- 550 Hydroclimatology 3** Water and energy budgets as they relate to climate, dynamics; and remote sensing, statistical, and modeling techniques for hydroclimatology.
- 551 Open Channel Flow 3** Steady, non-uniform flow; controls and transitions in fixed-bed channels. Credit not granted for both CE 451 and CE 551.
- 552 Advanced Topics in Hydraulic Engineering V** 1-3 May be repeated for credit; cumulative maximum 9 hours. Cavitation, air entrainment, hydraulic machinery, similitude, mixing in rivers and estuaries, hydraulic design. Required preparation must include CE 351.
- 555 Natural Treatment Systems 3** Principles and design procedures of natural systems for wastewater treatment for agricultural and non-agricultural applications. (Cross-listed course offered as CE 555, BSYSE 555).
- 560 Advanced Hydrology 3** Components of the hydrologic cycle; conceptual models; watershed characteristics; probability/statistics in data analysis; hydrographs; computer models; and design applications. Credit not granted for both CE 460 and CE 560.
- 567 Properties of Highway Pavement Materials 3** Physical and mechanical properties of asphalt and Portland cement concrete materials; design of asphalt concrete mixes; introduction to viscoelastic theory; characterization methods, emphasizing fatigue, rutting, and thermal cracking; modification and upgrading techniques. Three 1-hr lect a wk and variable number of lab hrs for demonstration.
- 572 Advanced Pavement Design and Analysis 3** Design of new and rehabilitated asphalt and Portland Cement concrete pavements; mechanistic-empirical design procedures, performance models; deflection-based structural analysis, overlay design, environmental effect; long-term pavement performance (LTPP), and introduction to research topics in pavement engineering. Required preparation must include CE 473.
- 580 Graduate Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Lectures and reports on current developments in research and practice.
- 583 Aquatic Chemistry 3** Chemical principles as applied to natural environmental system, water supply and pollution and control engineering. (Cross-listed course offered as CE 583, BSYSE 560).
- 584 Environmental Microbiology 3** Provides a fundamental understanding of microbiology to engineering and environmental science students; cell structure and metabolism; microbial ecology and diversity.

- 585 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 586 Bioremediation of Hazardous Waste 3** Applications of bioremediations to in situ subsurface treatment of hazardous waste; subsurface microbial degradation as related to microbial ecology.
- 588 Atmospheric Turbulence and Air Pollution Modeling 3** Physical aspects of atmospheric turbulence, theoretical developments in atmospheric diffusion, and applied computer modeling with regulatory and research models.
- 589 Atmospheric Chemical and Physical Processes 3** Processes of removal of pollutants from the atmosphere; radical chain reactions, particle formation, model calculations.
- 590 Spectroscopy and Radiative Transfer of the Atmosphere 3** Concepts of radiative transfer and molecular spectra in the troposphere and stratosphere with applications to trace gas measurements.
- 591 Aerosol Dynamics and Chemistry 3** Chemical and physical properties of atmospheric aerosols; sources, sinks, and transformation processes.
- 593 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 594 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 595 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 596 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 597 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 598 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 510 Transport Processes 3** Transport of mass, energy, and momentum; unsteady and steady states as applied to chemical processing; macroscopic and microscopic analyses.
- 527 Chemical Thermodynamics 3** Thermodynamic laws for design and optimization of thermodynamic systems, equations of state, properties of ideal and real fluids and fluid mixtures, stability, phase equilibrium, chemical equilibrium; applications of thermodynamic principles.
- 529 Chemical Engineering Kinetics 3** Interpretation of kinetic data and design of nonideal chemical reactors; fundamentals of heterogeneous catalysis, catalyst preparation, characterization, and theory.
- 541 Chemical Engineering Analysis 3** Mathematical analysis of chemical engineering operations and processes; mathematical modeling and computer application.
- 549 Biochemical Conversion Laboratory 2 (1-3)** Analytical techniques in biomass characterization; bioproduct/biofuel production from renewable biomass including biochemical processes.
- 560 Biochemical Engineering 3** Chemical engineering applied to biological systems; fermentation processes, biochemical reactor design, downstream processing, transport phenomena in biological systems, biochemical technology.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.

- 581 Advanced Topics in Chemical Engineering V** 1-3 May be repeated for credit; cumulative maximum 9 hours. Filtration, reaction engineering, two-phase flow, non-Newtonian fluids, interfacial phenomena, fluidization, novel separations, biomedical engineering.
- 585 Interfacial Phenomena 3** Chemical and physical nature of the interface including the molecular basis for interfacial forces and resulting macroscopic phenomena.
- 596 Research Methods and Presentation I 2** Establish sound practices for graduate research and presentation of results; techniques used for performing through literature searching and establishing and testing research hypotheses.
- 597 Research Methods and Presentation II 2** Establishing sound practices for presentation of research programs and research results.
- 598 Research Seminar 1** May be repeated for credit. Seminar presentations on current topics in chemical engineering research.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Advanced Inorganic Chemistry I 3** Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry V** 1-3 May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory 3** Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics 2** Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis 2** Methods for the measurement of biological compounds.
- 514 Mass Spectrometry 2** Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography 2** Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry 2** Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry 3** Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers 2** Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory 1** (0-3) Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry 2** Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry V** 1-3 May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I 3** Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II 3** Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics 3** Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry 3** Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V** 1-3 May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V** 1-3 May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.

- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.

- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V 1-3** May be repeated for credit. Recent advances and current research at the forefront of materials science.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V 1-3** May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.
- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar** 1 May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis** 3 Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis** 3 Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis** 3 Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration** 3 Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra** 3 Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers** 3 May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis** 3 Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra** 3 Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations** 3 Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods** 3 Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology** 3 Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics** 3 Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers** 3 Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics** 1 May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics** 3 Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education** 3 Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing** 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I** 3 Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II** 3 Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory** 3 Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations** 3 Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.

- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.

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- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.

- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastic-to-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.

- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 501 Graduate Seminar 1** Introduction to graduate and interdisciplinary research.
- 514 Optoelectronics Lab I 1 (0-3)** May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I 3** Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II 3** Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.
- 533 Thermal and Statistical Physics I 3** Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II 3** Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
- 541 Electromagnetic Theory 3** Special relativity and the classical electromagnetic field; emission, propagation, and absorption of electromagnetic waves.
- 542 Electrodynamics 3** Interaction of matter and electromagnetic radiation; classical and quantum electrodynamics.
- 545 Nonlinear Optics 3** Nonlinear wave propagation theory applied to several nonlinear-optical phenomena; experimental techniques that probe a material's nonlinearity.
- 546 Quantum Electronics 3** The physics of lasers and of coherent optical radiation generation and propagation.
- 550 Quantum Theory I 3** Introduction to quantum theory; physical and mathematical foundations; application to atomic systems.
- 551 Quantum Theory II 3** Symmetry and invariance; angular momentum theory; approximation methods.
- 552 Quantum Theory III 3** Scattering theory; relativistic wave mechanics; quantum field theory.
- 561 Atomic and Molecular Physics 3** Physics of atoms and molecules using quantum theory.
- 563 Physics of the Solid State 3** Lattice vibrations and defects; ionic and electronic conductivities; band theory; magnetic properties; luminescence.
- 566 Biological Physics 3** Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics 3** Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.
- 575 Advanced Solid State Physics 3** Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics 3** May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar 1** May be repeated for credit.

- 592 Wave Propagation Seminar 2** May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories 1** May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Graduate Seminar 1** Introduction to graduate and interdisciplinary research.
- 514 Optoelectronics Lab I 1 (0-3)** May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I 3** Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II 3** Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.
- 533 Thermal and Statistical Physics I 3** Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II 3** Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
- 541 Electromagnetic Theory 3** Special relativity and the classical electromagnetic field; emission, propagation, and absorption of electromagnetic waves.
- 542 Electrodynamics 3** Interaction of matter and electromagnetic radiation; classical and quantum electrodynamics.
- 545 Nonlinear Optics 3** Nonlinear wave propagation theory applied to several nonlinear-optical phenomena; experimental techniques that probe a material's nonlinearity.
- 546 Quantum Electronics 3** The physics of lasers and of coherent optical radiation generation and propagation.
- 550 Quantum Theory I 3** Introduction to quantum theory; physical and mathematical foundations; application to atomic systems.
- 551 Quantum Theory II 3** Symmetry and invariance; angular momentum theory; approximation methods.
- 552 Quantum Theory III 3** Scattering theory; relativistic wave mechanics; quantum field theory.
- 561 Atomic and Molecular Physics 3** Physics of atoms and molecules using quantum theory.
- 563 Physics of the Solid State 3** Lattice vibrations and defects; ionic and electronic conductivities; band theory; magnetic properties; luminescence.
- 566 Biological Physics 3** Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics 3** Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.
- 575 Advanced Solid State Physics 3** Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics 3** May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar 1** May be repeated for credit.
- 592 Wave Propagation Seminar 2** May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories 1** May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Materials Science and Engineering

Degree offered: Master of Science in Materials Science and Engineering

Faculty working with graduate students: 28

Graduate students: 17

Graduate students receiving assistantships or scholarships: 58%

Tests required: TOEFL, TOEFLI, GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Requirements

Of the minimum 21 graded credit hours, the student must take 1) 3 credit hours of Math 440 or 540, 2) a minimum of 6 credit hours at the 400- or 500-level (MME or non-MME), and 3) a minimum of 12 credit hours of 500-level MSE or ME courses (at least 9 of these must be MSE courses). Note: a maximum of 6 credit hours of graded coursework at the 300- and 400-level can be included in the program. Also required: 1) a minimum of 4 credit hours of MSE 700 and 2) 2 credit hours of ME 598 or MatS 593 (seminar). All programs must have a minimum total credits of 30.

Program Description

The graduate program in the School of Mechanical and Materials Engineering has a long history of excellence in graduate education. Our School offers specialization in a variety of disciplines in which graduate students develop cutting-edge knowledge and techniques using state-of-the-art research facilities. Our mission is to educate engineering students to be successful, world-class professionals capable of dynamic contributions in contemporary engineering practice and research and development.

Degree Description

Our School offers programs of study for full time and part-time students leading to the degrees of Master of Science (MS) in

Mechanical Engineering (Pullman and Tri-Cities campuses), MS in Materials Science & Engineering (Pullman campus), and Doctor of Philosophy (Ph.D.) in Mechanical Engineering (Pullman campus). Our School participates in the interdisciplinary degree programs of MS in Engineering, Ph.D. in Engineering Science, and Ph.D. in Materials Science & Engineering. Thesis and non-thesis options are available for the MS degree. Programs of study are individualized with an interdisciplinary focus. Students are expected to pursue their degree programs with success and to earn the MS degree in two years and the Ph.D. in four years. The program will culminate with a final oral examination and a written thesis (MS thesis option), project report (MS non-thesis option), or dissertation (Ph.D.). Financial aid in the form of an assistantship is available for dedicated, quality full time MS and Ph.D. students.

Training and Professional Development Opportunities

Our School offers state-of-the-art research facilities enabling students to work on cutting-edge research over a wide range of topics, presenting and publishing results along with our world-class faculty. Leadership, communication, and instructional experience can be gained by PhD students through the option of serving as a teaching assistant for one or more courses during their program. Serving on University committees promotes professional development. Presenting papers at or attending regional conferences and international conferences and proceedings enriches scholarly development. Low-cost or free workshops on grant writing and leadership/professional development are routinely offered by the University. Opportunities exist for internships in industry and national labs.

Post-Graduate Employment Opportunities

University research and teaching positions, research positions in national laboratories, postdoctoral positions in national laboratories, and technical positions in leading companies.

Post-Graduate Career Placements

Recent graduates are working at Boeing, Hewlett-Packard, Hitachi, Intel, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Micron Technology, PACCAR, Pacific Northwest National Laboratory, Parametric Technology Corp, Tektronix, U.S. Army, ARDEC, Boise State University, Princeton University, University of California Berkeley, University of Kentucky, University of New Mexico, and Sandia National Laboratory.

Contact Information

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Gaurav Ameta, Amit Bandyopadhyay, Soumik Banerjee, Xiaopeng Bi, Susmita Bose, Jow-Lian Ding, Indranath Dutta, Prashanta Dutta, David Field, Sankar Jayaram, Uma Jayaram, William Kinsel, Jacob Leachman, Jin Liu, Kelvin Lynn, Konstantin Matveev, Sinisa Mesarovic, Changki Mo, M Norton, Charles Pezeshki, Marvin Pitts, Cecilia Richards, Robert Richards, Lloyd Smith, Brad Thompson, Hussein Zbib, Jinwen Zhang and Weihong Zhong.

Mechanical Engineering

M E

- 301 Fundamentals of Thermodynamics 3** Course Prerequisite: PHYSICS 201 with a grade of C or better. Thermodynamic properties of matter, ideal and real gases, work and heat, first and second laws and their application to engineering systems.
- 303 Fluid Mechanics 3** Course Prerequisite: ME 212. Fluid statics, laminar and turbulent flow, similitude, pipe flow, boundary layers, lift and drag and measurement techniques.
- 305 Thermal and Fluids Laboratory 2 (1-3)** Course Prerequisite: ME 301; ME 303; MATH 370 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Instrumentation, data acquisition, and theory verification in the thermal and fluid sciences.
- 310 Manufacturing Processes 2** Course Prerequisite: MSE 201; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes, material fabrication, and nontraditional processing.
- 311 Manufacturing Processes Laboratory 1 (0-3)** Course Prerequisite: ME 310 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes laboratory in machining, welding, forming; manufacturing project.
- 313 Engineering Analysis 3 (2-3)** Course Prerequisite: MATH 315 or concurrent enrollment; CE 215; E E 221, CPT S 121, or CPT S 251. Analysis and modeling of engineering problems utilizing numerical and mathematical techniques and computers.
- 316 Systems Design 3** Course Prerequisite: CE 215; ME 216; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Systems and component design; product development from specifications to manufacturing; team-based CAD design projects; engineering economics; engineering professional skills.
- 348 Dynamics Systems 3** Course Prerequisite: ME 212; ME 313; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Fundamentals of vibration analysis, control systems, system modeling and dynamics analysis.
- 401 Mechatronics 3 (2-3)** Course Prerequisite: E E 304; ME 348. Integration of mechanical and microprocessor-based systems; control theory implemented with data acquisition systems; sensors; actuators, signal conditioning, programmable logic controllers.
- 402 Thermal Systems Design 3** Course Prerequisite: ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Design and analysis of thermofluid systems using principles of thermodynamics, fluid mechanics and heat transfer.
- 404 Heat Transfer 3** Course Prerequisite: ME 301; ME 303; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Conduction, radiation, and convection heat transfer; analytical, numerical, experimental results for solids, liquids, and gases; heat exchanger design.
- 406 Experimental Design 3 (1-6)** Course Prerequisite: ME 220; ME 305; ME 316; ME 404. Designing, conducting, and reporting of experimental investigations involving mechanical equipment. Recommended preparation: ME 348.
- 407 Computational Fluid Dynamics 3** Course Prerequisite: ME 303. Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 414 Machine Design 3** Course Prerequisite: CE 215; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Optimal design of machinery; analysis for prevention of machine elements failure. Recommended preparation: ME 220.
- 416 Mechanical Systems Design 3 (1-6)** Course Prerequisite: ME 316; ME 348; ME 404; ME 414 or concurrent enrollment; senior standing. Integrative design in mechanical engineering; multidisciplinary design project considering both technical and non-technical contexts; organizational dynamics and communications.
- 419 Air Conditioning 3** Course Prerequisite: ME 404. Principles of heat and moisture transfer; air motion and purity in buildings; design of systems.
- 431 Design of Solar Thermal Systems 3** Course Prerequisite: ME 301; ME 303; ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, Electrical Engineering, or Architecture. Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes and distillation.
- 436 Combustion Engines 3** Course Prerequisite: ME 303. Internal combustion engines; spark ignition engines, diesels, and gas turbines.
- 439 Applied Aerodynamics 3** Course Prerequisite: ME 303. Aerodynamic lift and drag; circulation; boundary layers, application to subsonic aircraft wing design.

- 449 Mechanical Vibration 3** Course Prerequisite: ME 348. Vibrating systems and noise producing mechanisms; design for noise and vibration control.
- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 472 Finite Element Methods in Design 3** Course Prerequisite: ME 414. Design of selected mechanical systems components using finite element analysis.
- 473 Advanced CAD and Geometric Modeling 3 (2-3)** Course Prerequisite: ME 316. Parametric and feature based CAD/CAM; geometric modeling and its mathematical basis; integration of CAD with design processes and other software.
- 474 Design for Manufacture and Modern Manufacturing Strategies 3** Course Prerequisite: ME 310. Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
- 475 Manufacturing Enterprise Systems -- Automation and Product Realization 3 (2-3)** Course Prerequisite: ME 313; ME 316. Manufacturing automation and product realization; role of information technology and electronic data in manufacturing enterprise systems; product life-cycle management (PLM) and related tools and processes; sustainable and green manufacturing.
- 481 Control Systems 3** Course Prerequisite: ME 348. Analysis and design of feedback control systems.
- 483 Topics in Mechanical Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- Materials Science And Engineering**
- MSE**
- 302 Electronic Materials 3** Course Prerequisite: CHEM 105; PHYSICS 202 or concurrent enrollment. Structure of materials, electronic structure of solids; thermal, electrical, dielectric, and magnetic properties of materials; semiconductor processing.
- 316 Thermodynamics and Kinetics of Materials 3** Course Prerequisite: MSE 201. Laws of thermodynamics, solution thermodynamics, free energy composition diagrams, mechanisms and kinetics of diffusion; solidification behavior, interfaces and phase boundaries, phase transformations in solids, oxidation, and corrosion.
- 320 Materials Structure - Properties Lab 3 (1-6)** Course Prerequisite: MSE 201 or concurrent enrollment. Principles and techniques of optical metallography and other laboratory methods used in modern materials science and engineering.
- 321 Materials Characterization 3** Course Prerequisite: MSE 201. Properties of x-rays, scattering and diffraction; crystal structures; x-ray diffraction methods, transmission electron microscopy and scanning electron microscopy.
- 323 Materials Characterization Lab 2 (1-3)** Course Prerequisite: MSE 321 or concurrent enrollment. Laboratory exercises on materials characterization: x-ray, TEM, SEM.
- 401 Metallic Materials 3** Course Prerequisite: MSE 201. Major alloy systems and manufacturing processes; materials selection.
- 402 Polymeric Materials 3** Course Prerequisite: MSE 201. Structural characterization, syntheses, and reactions of polymeric materials; relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
- 403 Ceramic Materials 3** Course Prerequisite: MSE 201. Processing, characteristics, microstructure, and properties of ceramic materials.
- 404 Engineering Composites 3** Course Prerequisite: MSE 201. Basic concept in design and specifications of engineering composites.
- 406 Biomaterials 3** Course Prerequisite: MSE 201. Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 425 Senior Thesis I 3 (0-9)** Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 426 Senior Thesis II 3 (0-9)** Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 440 Materials: The Foundations of Society and Technology 3** Course Prerequisite: Junior standing. History of materials; role that materials have played in human development; modern societal, technological, and economic impact of materials.
- 483 Topics in Materials Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).

- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elasto-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V 1-3** May be repeated for credit. Recent advances and current research at the forefront of materials science.

- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V 1-3** May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.
- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.

- 536 Statistical Computing 3** (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.

- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastic-to-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).

- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Materials Science and Engineering

Degree offered: Master of Science in Materials Science and Engineering
– Non Thesis

Faculty working with graduate students: 28

Graduate students: 4

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Of the minimum 26 graded credit hours, the student must take 1) 3 credit hours of Math 440 or 540, 2) a minimum of 8 credit hours at the 400- or 500-level (MME or non-MME), and 3) a minimum of 15 credit hours of 500-level MSE or ME courses. Note: a maximum of 9 credit hours of graded coursework at the 300- and 400-level can be included in the program. Also required: 1) a minimum of 4 credit hours of MSE 702 and 2) 2 credit hours of ME 598 or MatS 593 (seminar). All programs must have a minimum total credits of 30.

Program Description

The graduate program in the School of Mechanical and Materials Engineering has a long history of excellence in graduate education. Our School offers specialization in a variety of disciplines in which graduate students develop cutting-edge knowledge and techniques using state-of-the-art research facilities. Our mission is to educate engineering students to be successful, world-class professionals capable of dynamic contributions in contemporary engineering practice and research and development.

Degree Description

Our School offers programs of study for full time and part-time students leading to the degrees of Master of Science (MS) in Mechanical Engineering (Pullman and Tri-Cities campuses), MS in Materials Science & Engineering (Pullman campus), and Doctor of Philosophy (Ph.D.) in Mechanical Engineering (Pullman campus). Our School participates in the interdisciplinary degree programs of MS in Engineering, Ph.D. in Engineering Science, and Ph.D. in Materials Science & Engineering. Thesis and non-thesis options are available for the MS degree. Programs of study are individualized with an interdisciplinary focus. Students are expected to pursue their degree programs with success and to earn the MS degree in two years and the Ph.D. in four years. The program will culminate with a final oral examination and a written thesis (MS thesis option), project report (MS non-thesis option), or dissertation (Ph.D.). Financial aid in the form of an assistantship is available for dedicated, quality full time MS and Ph.D. students.

Training and Professional Development Opportunities

Our School offers state-of-the-art research facilities enabling students to work on cutting-edge research over a wide range of topics, presenting and publishing results along with our world-class faculty. Leadership, communication, and instructional experience can be gained by PhD students through the option of serving as a teaching assistant for one or more courses during their program. Serving on University committees promotes professional development. Presenting papers at or attending regional conferences and international conferences and pro-

ceedings enriches scholarly development. Low-cost or free workshops on grant writing and leadership/professional development are routinely offered by the University. Opportunities exist for internships in industry and national labs.

Post-Graduate Employment Opportunities

University research and teaching positions, research positions in national laboratories, postdoctoral positions in national laboratories, and technical positions in leading companies.

Post-Graduate Career Placements

Recent graduates are working at Boeing, Hewlett-Packard, Hitachi, Intel, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Micron Technology, PACCAR, Pacific Northwest National Laboratory, Parametric Technology Corp, Tektronix, U.S. Army, ARDEC, Boise State University, Princeton University, University of California Berkeley, University of Kentucky, University of New Mexico, and Sandia National Laboratory.

Contact Information

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Mechanical Engineering

M E

- 301 Fundamentals of Thermodynamics 3** Course Prerequisite: PHYSICS 201 with a grade of C or better. Thermodynamic properties of matter, ideal and real gases, work and heat, first and second laws and their application to engineering systems.
- 303 Fluid Mechanics 3** Course Prerequisite: ME 212. Fluid statics, laminar and turbulent flow, similitude, pipe flow, boundary layers, lift and drag and measurement techniques.
- 305 Thermal and Fluids Laboratory 2 (1-3)** Course Prerequisite: ME 301; ME 303; MATH 370 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Instrumentation, data acquisition, and theory verification in the thermal and fluid sciences.

- 310 Manufacturing Processes 2** Course Prerequisite: MSE 201; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes, material fabrication, and nontraditional processing.
- 311 Manufacturing Processes Laboratory 1 (0-3)** Course Prerequisite: ME 310 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes laboratory in machining, welding, forming; manufacturing project.
- 313 Engineering Analysis 3 (2-3)** Course Prerequisite: MATH 315 or concurrent enrollment; CE 215; E E 221, CPT S 121, or CPT S 251. Analysis and modeling of engineering problems utilizing numerical and mathematical techniques and computers.
- 316 Systems Design 3** Course Prerequisite: CE 215; ME 216; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Systems and component design; product development from specifications to manufacturing; team-based CAD design projects; engineering economics; engineering professional skills.
- 348 Dynamics Systems 3** Course Prerequisite: ME 212; ME 313; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Fundamentals of vibration analysis, control systems, system modeling and dynamics analysis.
- 401 Mechatronics 3 (2-3)** Course Prerequisite: E E 304; ME 348. Integration of mechanical and microprocessor-based systems; control theory implemented with data acquisition systems; sensors; actuators, signal conditioning, programmable logic controllers.
- 402 Thermal Systems Design 3** Course Prerequisite: ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Design and analysis of thermofluid systems using principles of thermodynamics, fluid mechanics and heat transfer.
- 404 Heat Transfer 3** Course Prerequisite: ME 301; ME 303; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Conduction, radiation, and convection heat transfer; analytical, numerical, experimental results for solids, liquids, and gases; heat exchanger design.
- 406 Experimental Design 3 (1-6)** Course Prerequisite: ME 220; ME 305; ME 316; ME 404. Designing, conducting, and reporting of experimental investigations involving mechanical equipment. Recommended preparation: ME 348.
- 407 Computational Fluid Dynamics 3** Course Prerequisite: ME 303. Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).

- 414 Machine Design 3** Course Prerequisite: CE 215; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Optimal design of machinery; analysis for prevention of machine elements failure. Recommended preparation: ME 220.
- 416 Mechanical Systems Design 3 (1-6)** Course Prerequisite: ME 316; ME 348; ME 404; ME 414 or concurrent enrollment; senior standing. Integrative design in mechanical engineering; multidisciplinary design project considering both technical and non-technical contexts; organizational dynamics and communications.
- 419 Air Conditioning 3** Course Prerequisite: ME 404. Principles of heat and moisture transfer; air motion and purity in buildings; design of systems.
- 431 Design of Solar Thermal Systems 3** Course Prerequisite: ME 301; ME 303; ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, Electrical Engineering, or Architecture. Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes and distillation.
- 436 Combustion Engines 3** Course Prerequisite: ME 303. Internal combustion engines; spark ignition engines, diesels, and gas turbines.
- 439 Applied Aerodynamics 3** Course Prerequisite: ME 303. Aerodynamic lift and drag; circulation; boundary layers, application to subsonic aircraft wing design.
- 449 Mechanical Vibration 3** Course Prerequisite: ME 348. Vibrating systems and noise producing mechanisms; design for noise and vibration control.
- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 472 Finite Element Methods in Design 3** Course Prerequisite: ME 414. Design of selected mechanical systems components using finite element analysis.
- 473 Advanced CAD and Geometric Modeling 3 (2-3)** Course Prerequisite: ME 316. Parametric and feature based CAD/CAM; geometric modeling and its mathematical basis; integration of CAD with design processes and other software.
- 474 Design for Manufacture and Modern Manufacturing Strategies 3** Course Prerequisite: ME 310. Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
- 475 Manufacturing Enterprise Systems -- Automation and Product Realization 3 (2-3)** Course Prerequisite: ME 313; ME 316. Manufacturing automation and product realization; role of information technology and electronic data in manufacturing enterprise systems; product life-cycle management (PLM) and related tools and processes; sustainable and green manufacturing.
- 481 Control Systems 3** Course Prerequisite: ME 348. Analysis and design of feedback control systems.
- 483 Topics in Mechanical Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- Materials Science And Engineering**
- MSE**
- 302 Electronic Materials 3** Course Prerequisite: CHEM 105; PHYSICS 202 or concurrent enrollment. Structure of materials, electronic structure of solids; thermal, electrical, dielectric, and magnetic properties of materials; semi-conductors processing.
- 316 Thermodynamics and Kinetics of Materials 3** Course Prerequisite: MSE 201. Laws of thermodynamics, solution thermodynamics, free energy composition diagrams, mechanisms and kinetics of diffusion; solidification behavior, interfaces and phase boundaries, phase transformations in solids, oxidation, and corrosion.
- 320 Materials Structure - Properties Lab 3 (1-6)** Course Prerequisite: MSE 201 or concurrent enrollment. Principles and techniques of optical metallography and other laboratory methods used in modern materials science and engineering.
- 321 Materials Characterization 3** Course Prerequisite: MSE 201. Properties of x-rays, scattering and diffraction; crystal structures; x-ray diffraction methods, transmission electron microscopy and scanning electron microscopy.
- 323 Materials Characterization Lab 2 (1-3)** Course Prerequisite: MSE 321 or concurrent enrollment. Laboratory exercises on materials characterization: x-ray, TEM, SEM.
- 401 Metallic Materials 3** Course Prerequisite: MSE 201. Major alloy systems and manufacturing processes; materials selection.
- 402 Polymeric Materials 3** Course Prerequisite: MSE 201. Structural characterization, syntheses, and reactions of polymeric materials; relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
- 403 Ceramic Materials 3** Course Prerequisite: MSE 201. Processing, characteristics, microstructure, and properties of ceramic materials.
- 404 Engineering Composites 3** Course Prerequisite: MSE 201. Basic concept in design and specifications of engineering composites.
- 406 Biomaterials 3** Course Prerequisite: MSE 201. Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 425 Senior Thesis I 3 (0-9)** Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.

- 426 Senior Thesis II 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 440 Materials: The Foundations of Society and Technology 3** Course Prerequisite: Junior standing. History of materials; role that materials have played in human development; modern societal, technological, and economic impact of materials.
- 483 Topics in Materials Engineering V 1** (0-4) to 4 (0-16) May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3** (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V** 1-3 May be repeated for credit. Recent advances and current research at the forefront of materials science.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V** 1-3 May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.
- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.

- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.

- 566 Optimization in Networks** 3 Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization** 3 Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I** 3 The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II** 3 Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization** 3 May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering** 3 Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management** 3 Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences** 3 Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics** V 1-3 May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics** V 1-3 May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science** 3 Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar** 1 May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering** V 1-3 May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science** 3 Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials** 3 Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities** 3 Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering** 3 (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity** 3 Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).

- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elasto-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Mathematics

Degree offered: Doctor of Philosophy (Mathematics)

Faculty working with graduate students: 26

Graduate students: 38

Graduate students receiving assistantships or scholarships: 97%

Tests required: TOEFL

Deadline: Fall: January 10

Spring: July 1

Program Description

The advanced degrees in mathematics offered at Washington State University are MS in Mathematics (which also has an Applied Mathematics Option and a Mathematics Teaching Option), PhD in Mathematics (which also has an Applied Mathematics), and PhD in Mathematics with Teaching Emphasis. In all of our degree programs we attempt to combine a sound general core of fundamental mathematics with electives that reflect individual interests, needs, and opportunities. People having one of these degrees will be better at some things than at others, but they will have a general grounding in mathematics that should be valuable to them in any mathematical work they do. Graduate students should accept much of the responsibility for their own training. This includes not only planning a meaningful program of study, studying for courses and examinations, and writing thesis, but also voluntarily and energetically devoting time to outside reading of both books and journals; attending colloquia and special lectures by local and visiting speakers; working on assigned problems; participating actively in credit and noncredit seminars and professional meetings; and frequently discussing mathematics with colleagues. Active mathematicians do these things as matter of course, and graduate school is not too soon to develop these habits. Further details about are our graduate program can be found at <http://www.math.wsu.edu/info/handbook.php>

Degree Description

The degree of Doctor of Philosophy (PhD) in Mathematics is awarded in recognition of distinctive scholarship and original contributions to knowledge in Mathematics. The PhD program is especially designed to prepare the student for teaching at the graduate level, and doing mathematical research in academic settings, and in industrial and business settings. The Requirements for the PhD in Mathematics (Applied Mathematics Option)The specialization of modern academic disciplines provides both a challenge to those who wish to do research at the interface of mathematics and its areas of application and many opportunities to make valuable contributions. The Applied Mathematics Option allows students from a range of backgrounds to pursue a traditional applied mathematics program, while retaining the option to thoroughly learn an area of application. Entering students may not necessarily have a bachelor's degree in Mathematics. However, they will be required to demonstrate a grasp of the core areas of advanced calculus and linear algebra at the level of a bachelor's degree in Mathematics. They will then be given great latitude to take specialized courses in Mathematics and their area of application. The Requirements for the PhD in Mathematics with Teaching Emphasis The degree of PhD in Mathematics with Teaching Emphasis certifies completion of a graduate program designed to provide exceptionally strong preparation for scholarship in the teaching and learning of mathematics. It differs from the PhD in Mathematics and PhD in Mathematics(Applied Mathematics Option) in its focus, but not in the expected level of competence. The requirements for the PhD in Mathematics with Teaching Emphasis include as much competence in core mathematics as the PhD in Mathematics and PhD in Mathematics (Applied Mathematics Option), as well as

study in the research methodologies applicable to pedagogical researching mathematics.

Post-Graduate Employment Opportunities

Teaching Professor, Software Developer, Bio-statistician, Risk Analyst, Technical Service, Post Doctorate

Post-Graduate Career Placements

Assistant Professor, Ateneo de Manila University, Philippines Post-Doctorate, University of Maryland - Tulane University, New Orleans, LA Lecturer, Eastern Washington University, Cheney, WA Technical Serices, Epic Systems, Madison, WI Assistant Professor, Eastern Oregon University, LaGrande, OR Assistant Professor, Cabrini College, Radnor, PA Software Developer, Bloomberg, New York, NY Biostatistician, Axio Research, Seattle, WA Assistant Professor, Whitworth, University, Spokane, WA Assistant Professor, George Fox University, Newberg, OR Senior Rick Analyst, J.P. Morgan Chase & Co., Columbus, OH

Contact Information

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Kuruppu Ariyawansa, Thomas Asaki, Sandra Cooper, Robert Dillon, Alexander Dimitrov, Alan Genz, Matthew Hudelson, Michael Kallaher, Alexander Khapalov, Libby Knott, Bala Krishnamoorthy, Sergey Lapin, Haijun Li, Valipuram Manoranjan, Judith McDonald, Robert Mifflin, Alexander Panchenko, Mark Schumaker, Elissa Schwartz, David Slavitt, Michael Tsatsomeros, Kevin Vixie, David Watkins, William Webb, David Wollkind and Hong-Ming Yin.

MATH

- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.

- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.

- 564 Nonlinear Optimization I** 3 Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II** 3 Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks** 3 Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization** 3 Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I** 3 The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II** 3 Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization** 3 May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering** 3 Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management** 3 Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences** 3 Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V** 1-3 May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V** 1-3 May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science** 3 Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar** 1 May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Mathematics

Degree offered: Master of Science in Mathematics

Faculty working with graduate students: 26

Graduate students: 5

Graduate students receiving assistantships or scholarships: 100%

Deadline: Fall: January 10

Spring: July 1

Requirements

The Requirements for the MS in Mathematics the degree of Master of Science (MS) in Mathematics represents substantial mathematical training beyond the baccalaureate, which is sufficient for many career goals. Doctoral students complete most of the

MS requirements in the course of their studies, and often receive an MS degree as an intermediate step en route to the doctorate. However, the MS degree is efficacious in its own right, and is not necessarily a stepping stone to a doctoral degree. Furthermore, attainment of the MS degree does not guarantee admission to a doctoral program. The Requirements for themes in Mathematics (Applied Mathematics Option) This is a two-year professional degree especially designed to train mathematicians and scientists/engineers with strong mathematics backgrounds in up-to-date applied mathematical, computational and statistical skills. Such training is intended to produce high caliber individuals who can confidently undertake interdisciplinary research. The focus will be in preparing talented individuals to face the mathematical and other research challenges in business and/or industrial sectors. In order to achieve these goals the program requires: a broad background in the areas of Numerical Analysis/Optimization, Modeling/Simulation, and Statistical Analysis; a concentration in one of the above areas; practice in both written and oral communication; both group and individual projects; a strong computing component. The Requirements for themes in Mathematics (Mathematics Teaching Option) this is a two-year professional degree designed to prepare teachers of mathematics at the community college, four-year College, or secondary levels. The program combines advanced work in mathematics with coursework in education and practice teaching, providing a foundation in both mathematical content and teaching methodology.

Program Description

The advanced degrees in mathematics offered at Washington State University are MS in Mathematics (which also has an Applied Mathematics Option and a Mathematics Teaching Option), PhD in Mathematics (which also has an Applied Mathematics), and PhD in Mathematics with Teaching Emphasis. In all of our degree programs we attempt to combine a sound general core of fundamental mathematics with electives that reflect individual interests, needs, and opportunities. People having one of these degrees will be better at some things than at others, but they will have a general grounding in mathematics that should be valuable to them in any mathematical work they do. Graduate students should accept much of the responsibility for their own training. This includes not only planning a meaningful program of study, studying for courses and examinations, and writing thesis, but also voluntarily and energetically devoting time to outside reading of both books and journals; attending colloquia and special lectures by local and visiting speakers; working on assigned problems; participating actively in credit and noncredit seminars and professional meetings; and frequently discussing mathematics with colleagues. Active mathematicians do these things as matter of course, and graduate school is not too soon to develop these habits. Further details about are our graduate program can be found at <http://www.math.wsu.edu/info/handbook.php>

Degree Description

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Faculty

Kuruppu Ariyawansa, Thomas Asaki, Sandra Cooper, Robert Dillon, Alexander Dimitrov, Alan Genz, Matthew Hudelson, Michael Kallahaer, Alexander Khapalov, Libby Knott, Bala Krishnamoorthy, Sergey Lapin, Haijun Li, Valipuram Manoranjan, Judith McDonald, Robert Mifflin, Alexander Panchenko, Mark Schumaker, Elissa Schwartz, David Slaviv, Michael Tsatsomeros, Kevin Vixie, David Watkins, William Webb, David Wollkind and Hong-Ming Yin.

MATH

- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.

- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.

- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.

- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Mechanical Engineering

Degree offered: Doctor of Philosophy (Mechanical Engineering)

Faculty working with graduate students: 28

Graduate students: 48

Graduate students receiving assistantships or scholarships: 87%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Of the minimum 24 graded credit hours, the student must take 1) 3 credit hours of Math 540 or equivalent, 2) a minimum of 12 credit hours of 500-level ME or MSE courses, and 3) 9 credit hours of additional 500-level courses approved by the student's advisor. Note: a maximum of 9 credit hours of graded coursework at the 300- and 400-level can be included in the program. Also required: 1) a minimum of 20 credit hours of ME 800 and 2) 3 credit hours of ME 598 or MatS 593 (seminar). All programs must have a minimum total credits of 72.

Program Description

The graduate program in the School of Mechanical and Materials Engineering has a long history of excellence in graduate education. Our School offers specialization in a variety of disciplines in which graduate students develop cutting-edge knowledge and techniques using state-of-the-art research facilities. Our mission is to educate engineering students to be successful, world-class professionals capable of dynamic contributions in contemporary engineering practice and research and development.

Degree Description

Our School offers programs of study for full time and part-time students leading to the degrees of Master of Science (MS) in Mechanical Engineering (Pullman and Tri-Cities campuses), MS in Materials Science & Engineering (Pullman campus), and Doctor of Philosophy (Ph.D.) in Mechanical Engineering (Pullman campus). Our School participates in the interdisciplinary degree programs of MS in Engineering, Ph.D. in Engineering Science, and Ph.D. in Materials Science & Engineering. Thesis and non-thesis options are available for the MS degree. Programs of study are individualized with an interdisciplinary focus. Students are expected to pursue their degree programs with success and to earn the MS degree in two years and the Ph.D. in four years. The program will culminate with a final oral examination and a written thesis (MS thesis option), project report (MS non-thesis option), or dissertation (Ph.D.). Financial aid in the form of an assistantship is available for dedicated, quality full time MS and Ph.D. students.

Training and Professional Development Opportunities

Our School offers state-of-the-art research facilities enabling students to work on cutting-edge research over a wide range of topics, presenting and publishing results along with our world-class faculty. Leadership, communication, and instructional experience can be gained by PhD students through the option of serving as a teaching assistant for one or more courses during their program. Serving on University committees promotes professional development. Presenting papers at or attending

regional conferences and international conferences and proceedings enriches scholarly development. Low-cost or free workshops on grant writing and leadership/professional development are routinely offered by the University. Opportunities exist for internships in industry and national labs.

Post-Graduate Employment Opportunities

University research and teaching positions, research positions in national laboratories, postdoctoral positions in national laboratories, and technical positions in leading companies.

Post-Graduate Career Placements

Recent graduates are working at Boeing, Hewlett-Packard, Hitachi, Intel, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Micron Technology, PACCAR, Pacific Northwest National Laboratory, Parametric Technology Corp, Tektronix, U.S. Army, ARDEC, Boise State University, Princeton University, University of California Berkeley, University of Kentucky, University of New Mexico, and Sandia National Laboratory.

Contact Information

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Faculty

Gaurav Ameta, Amit Bandyopadhyay, Soumik Banerjee, Xiaopeng Bi, Susmita Bose, Jow-Lian Ding, Indranath Dutta, Prashanta Dutta, David Field, Sankar Jayaram, Uma Jayaram, William Kinsel, Jacob Leachman, Jin Liu, Kelvin Lynn, Konstantin Matveev, Sinisa Mesarovic, Changki Mo, M Norton, Charles Pezeshki, Marvin Pitts, Cecilia Richards, Robert Richards, Lloyd Smith, Brad Thompson, Hussein Zbib, Jinwen Zhang and Weihong Zhong.

Mechanical Engineering

M E

- 301 Fundamentals of Thermodynamics 3** Course Prerequisite: PHYSICS 201 with a grade of C or better. Thermodynamic properties of matter, ideal and real gases, work and heat, first and second laws and their application to engineering systems.
- 303 Fluid Mechanics 3** Course Prerequisite: ME 212. Fluid statics, laminar and turbulent flow, similitude, pipe flow, boundary layers, lift and drag and measurement techniques.
- 305 Thermal and Fluids Laboratory 2 (1-3)** Course Prerequisite: ME 301; ME 303; MATH 370 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Instrumentation, data acquisition, and theory verification in the thermal and fluid sciences.

- 310 Manufacturing Processes 2** Course Prerequisite: MSE 201; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes, material fabrication, and nontraditional processing.
- 311 Manufacturing Processes Laboratory 1 (0-3)** Course Prerequisite: ME 310 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes laboratory in machining, welding, forming; manufacturing project.
- 313 Engineering Analysis 3 (2-3)** Course Prerequisite: MATH 315 or concurrent enrollment; CE 215; E E 221, CPT S 121, or CPT S 251. Analysis and modeling of engineering problems utilizing numerical and mathematical techniques and computers.
- 316 Systems Design 3** Course Prerequisite: CE 215; ME 216; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Systems and component design; product development from specifications to manufacturing; team-based CAD design projects; engineering economics; engineering professional skills.
- 348 Dynamics Systems 3** Course Prerequisite: ME 212; ME 313; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Fundamentals of vibration analysis, control systems, system modeling and dynamics analysis.
- 401 Mechatronics 3 (2-3)** Course Prerequisite: E E 304; ME 348. Integration of mechanical and microprocessor-based systems; control theory implemented with data acquisition systems; sensors; actuators, signal conditioning, programmable logic controllers.
- 402 Thermal Systems Design 3** Course Prerequisite: ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Design and analysis of thermofluid systems using principles of thermodynamics, fluid mechanics and heat transfer.
- 404 Heat Transfer 3** Course Prerequisite: ME 301; ME 303; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Conduction, radiation, and convection heat transfer; analytical, numerical, experimental results for solids, liquids, and gases; heat exchanger design.
- 406 Experimental Design 3 (1-6)** Course Prerequisite: ME 220; ME 305; ME 316; ME 404. Designing, conducting, and reporting of experimental investigations involving mechanical equipment. Recommended preparation: ME 348.
- 407 Computational Fluid Dynamics 3** Course Prerequisite: ME 303. Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 414 Machine Design 3** Course Prerequisite: CE 215; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Optimal design of machinery; analysis for prevention of machine elements failure. Recommended preparation: ME 220.
- 416 Mechanical Systems Design 3 (1-6)** Course Prerequisite: ME 316; ME 348; ME 404; ME 414 or concurrent enrollment; senior standing. Integrative design in mechanical engineering; multidisciplinary design project considering both technical and non-technical contexts; organizational dynamics and communications.
- 419 Air Conditioning 3** Course Prerequisite: ME 404. Principles of heat and moisture transfer; air motion and purity in buildings; design of systems.
- 431 Design of Solar Thermal Systems 3** Course Prerequisite: ME 301; ME 303; ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, Electrical Engineering, or Architecture. Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes and distillation.
- 436 Combustion Engines 3** Course Prerequisite: ME 303. Internal combustion engines; spark ignition engines, diesels, and gas turbines.
- 439 Applied Aerodynamics 3** Course Prerequisite: ME 303. Aerodynamic lift and drag; circulation; boundary layers, application to subsonic aircraft wing design.
- 449 Mechanical Vibration 3** Course Prerequisite: ME 348. Vibrating systems and noise producing mechanisms; design for noise and vibration control.
- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 472 Finite Element Methods in Design 3** Course Prerequisite: ME 414. Design of selected mechanical systems components using finite element analysis.
- 473 Advanced CAD and Geometric Modeling 3 (2-3)** Course Prerequisite: ME 316. Parametric and feature based CAD/CAM; geometric modeling and its mathematical basis; integration of CAD with design processes and other software.
- 474 Design for Manufacture and Modern Manufacturing Strategies 3** Course Prerequisite: ME 310. Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
- 475 Manufacturing Enterprise Systems -- Automation and Product Realization 3 (2-3)** Course Prerequisite: ME 313; ME 316. Manufacturing automation and product realization; role of information technology and electronic data in manufacturing enterprise systems; product life-cycle management (PLM) and related tools and processes; sustainable and green manufacturing.
- 481 Control Systems 3** Course Prerequisite: ME 348. Analysis and design of feedback control systems.

- 483 Topics in Mechanical Engineering V 1** (0-4) to 4 (0-16)
May be repeated for credit; cumulative maximum 7 hours.
Contemporary topics in materials engineering.
- Materials Science And Engineering**
- MSE**
- 302 Electronic Materials 3** Course Prerequisite: CHEM 105; PHYSICS 202 or concurrent enrollment. Structure of materials, electronic structure of solids; thermal, electrical, dielectric, and magnetic properties of materials; semi-conductors processing.
- 316 Thermodynamics and Kinetics of Materials 3** Course Prerequisite: MSE 201. Laws of thermodynamics, solution thermodynamics, free energy composition diagrams, mechanisms and kinetics of diffusion; solidification behavior, interfaces and phase boundaries, phase transformations in solids, oxidation, and corrosion.
- 320 Materials Structure - Properties Lab 3** (1-6) Course Prerequisite: MSE 201 or concurrent enrollment. Principles and techniques of optical metallography and other laboratory methods used in modern materials science and engineering.
- 321 Materials Characterization 3** Course Prerequisite: MSE 201. Properties of x-rays, scattering and diffraction; crystal structures; x-ray diffraction methods, transmission electron microscopy and scanning electron microscopy.
- 323 Materials Characterization Lab 2** (1-3) Course Prerequisite: MSE 321 or concurrent enrollment. Laboratory exercises on materials characterization: x-ray, TEM, SEM.
- 401 Metallic Materials 3** Course Prerequisite: MSE 201. Major alloy systems and manufacturing processes; materials selection.
- 402 Polymeric Materials 3** Course Prerequisite: MSE 201. Structural characterization, syntheses, and reactions of polymeric materials; relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
- 403 Ceramic Materials 3** Course Prerequisite: MSE 201. Processing, characteristics, microstructure, and properties of ceramic materials.
- 404 Engineering Composites 3** Course Prerequisite: MSE 201. Basic concept in design and specifications of engineering composites.
- 406 Biomaterials 3** Course Prerequisite: MSE 201. Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 425 Senior Thesis I 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 426 Senior Thesis II 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 440 Materials: The Foundations of Society and Technology 3** Course Prerequisite: Junior standing. History of materials; role that materials have played in human development; modern societal, technological, and economic impact of materials.
- 483 Topics in Materials Engineering V 1** (0-4) to 4 (0-16) May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3** (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.

- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V 1-3** May be repeated for credit. Recent advances and current research at the forefront of materials science.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V 1-3** May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.

- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.

- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.

- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastic-to-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.

- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Mechanical Engineering

Degree offered: Master of Science in Mechanical Engineering

Faculty working with graduate students: 28

Graduate students: 34

Graduate students receiving assistantships or scholarships: 73%

Program offered: Pullman, Tri-Cities

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Of the minimum 21 graded credit hours, the student must take 1) 3 credit hours of Math 540, 2) a minimum of 12 credit hours of 500-level ME or MSE courses (at least 9 of these must be ME courses), and 3) 6 credit hours of additional courses approved by the student's advisor. Note: a maximum of 6 credit hours of graded coursework at the 300- and 400-level can be included in the program. Also required: 1) a minimum of 4 credit hours of ME 700 and 2) 2 credit hours of ME 598 (seminar; Pullman students only). All programs must have a minimum total credits of 30.

Program Description

The graduate program in the School of Mechanical and Materials Engineering has a long history of excellence in graduate education. Our School offers specialization in a variety of disciplines in which graduate students develop cutting-edge knowledge and techniques using state-of-the-art research facilities. Our mission is to educate engineering students to be successful, world-class professionals capable of dynamic contributions in contemporary engineering practice and research and development.

Degree Description

Our School offers programs of study for full time and part-time students leading to the degrees of Master of Science (MS) in Mechanical Engineering (Pullman and Tri-Cities campuses), MS in Materials Science & Engineering (Pullman campus), and Doctor of Philosophy (Ph.D.) in Mechanical Engineering (Pullman campus). Our School participates in the interdisciplinary degree programs of MS in Engineering, Ph.D. in Engineering Science, and Ph.D. in Materials Science & Engineering. Thesis and non-thesis options are available for the MS degree. Programs of study are individualized with an interdisciplinary focus. Students are expected to pursue their degree programs with success and to earn the MS degree in two years and the Ph.D. in four years. The program will culminate with a final oral examination and a written thesis (MS thesis option), project report (MS non-thesis option), or dissertation (Ph.D.). Financial aid in the form of an assistantship is available for dedicated, quality full time MS and Ph.D. students.

Training and Professional Development Opportunities

Our School offers state-of-the-art research facilities enabling students to work on cutting-edge research over a wide range of topics, presenting and publishing results along with our world-class faculty. Leadership, communication, and instructional experience can be gained by PhD students through the option of serving as a teaching assistant for one or more courses during their program. Serving on University committees promotes professional development. Presenting papers at or attending regional conferences and international conferences and proceedings enriches scholarly development. Low-cost or free workshops on grant writing and leadership/professional development are routinely offered by the University. Opportunities exist for internships in industry and national labs.

Post-Graduate Employment Opportunities

University research and teaching positions, research positions in national laboratories, postdoctoral positions in national laboratories, and technical positions in leading companies.

Post-Graduate Career Placements

Recent graduates are working at Boeing, Hewlett-Packard, Hitachi, Intel, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Micron Technology, PACCAR, Pacific Northwest National Laboratory, Parametric Technology Corp, Tektronix, U.S. Army, ARDEC, Boise State University, Princeton University, University of California Berkeley, University of Kentucky, University of New Mexico, and Sandia National Laboratory.

Contact Information

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Mechanical Engineering

M E

- 301 Fundamentals of Thermodynamics 3** Course Prerequisite: PHYSICS 201 with a grade of C or better. Thermodynamic properties of matter, ideal and real gases, work and heat, first and second laws and their application to engineering systems.
- 303 Fluid Mechanics 3** Course Prerequisite: ME 212. Fluid statics, laminar and turbulent flow, similitude, pipe flow, boundary layers, lift and drag and measurement techniques.
- 305 Thermal and Fluids Laboratory 2 (1-3)** Course Prerequisite: ME 301; ME 303; MATH 370 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Instrumentation, data acquisition, and theory verification in the thermal and fluid sciences.
- 310 Manufacturing Processes 2** Course Prerequisite: MSE 201; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes, material fabrication, and nontraditional processing.
- 311 Manufacturing Processes Laboratory 1 (0-3)** Course Prerequisite: ME 310 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes laboratory in machining, welding, forming; manufacturing project.
- 313 Engineering Analysis 3 (2-3)** Course Prerequisite: MATH 315 or concurrent enrollment; CE 215; E E 221, CPT S 121, or CPT S 251. Analysis and modeling of engineering problems utilizing numerical and mathematical techniques and computers.
- 316 Systems Design 3** Course Prerequisite: CE 215; ME 216; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Systems and component design; product development from specifications to manufacturing; team-based CAD design projects; engineering economics; engineering professional skills.
- 348 Dynamics Systems 3** Course Prerequisite: ME 212; ME 313; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Fundamentals of vibration analysis, control systems, system modeling and dynamics analysis.
- 401 Mechatronics 3 (2-3)** Course Prerequisite: E E 304; ME 348. Integration of mechanical and microprocessor-based systems; control theory implemented with data acquisition systems; sensors; actuators, signal conditioning, programmable logic controllers.
- 402 Thermal Systems Design 3** Course Prerequisite: ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Design and analysis of thermofluid systems using principles of thermodynamics, fluid mechanics and heat transfer.
- 404 Heat Transfer 3** Course Prerequisite: ME 301; ME 303; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Conduction, radiation, and convection heat transfer; analytical, numerical, experimental results for solids, liquids, and gases; heat exchanger design.
- 406 Experimental Design 3 (1-6)** Course Prerequisite: ME 220; ME 305; ME 316; ME 404. Designing, conducting, and reporting of experimental investigations involving mechanical equipment. Recommended preparation: ME 348.
- 407 Computational Fluid Dynamics 3** Course Prerequisite: ME 303. Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 414 Machine Design 3** Course Prerequisite: CE 215; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Optimal design of machinery; analysis for prevention of machine elements failure. Recommended preparation: ME 220.

- 416 Mechanical Systems Design 3** (1-6) Course Prerequisite: ME 316; ME 348; ME 404; ME 414 or concurrent enrollment; senior standing. Integrative design in mechanical engineering; multidisciplinary design project considering both technical and non-technical contexts; organizational dynamics and communications.
- 419 Air Conditioning 3** Course Prerequisite: ME 404. Principles of heat and moisture transfer; air motion and purity in buildings; design of systems.
- 431 Design of Solar Thermal Systems 3** Course Prerequisite: ME 301; ME 303; ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, Electrical Engineering, or Architecture. Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes and distillation.
- 436 Combustion Engines 3** Course Prerequisite: ME 303. Internal combustion engines; spark ignition engines, diesels, and gas turbines.
- 439 Applied Aerodynamics 3** Course Prerequisite: ME 303. Aerodynamic lift and drag; circulation; boundary layers, application to subsonic aircraft wing design.
- 449 Mechanical Vibration 3** Course Prerequisite: ME 348. Vibrating systems and noise producing mechanisms; design for noise and vibration control.
- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 472 Finite Element Methods in Design 3** Course Prerequisite: ME 414. Design of selected mechanical systems components using finite element analysis.
- 473 Advanced CAD and Geometric Modeling 3** (2-3) Course Prerequisite: ME 316. Parametric and feature based CAD/CAM; geometric modeling and its mathematical basis; integration of CAD with design processes and other software.
- 474 Design for Manufacture and Modern Manufacturing Strategies 3** Course Prerequisite: ME 310. Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
- 475 Manufacturing Enterprise Systems -- Automation and Product Realization 3** (2-3) Course Prerequisite: ME 313; ME 316. Manufacturing automation and product realization; role of information technology and electronic data in manufacturing enterprise systems; product life-cycle management (PLM) and related tools and processes; sustainable and green manufacturing.
- 481 Control Systems 3** Course Prerequisite: ME 348. Analysis and design of feedback control systems.
- 483 Topics in Mechanical Engineering V 1** (0-4) to 4 (0-16) May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.

Materials Science And Engineering

MSE

- 302 Electronic Materials 3** Course Prerequisite: CHEM 105; PHYSICS 202 or concurrent enrollment. Structure of materials, electronic structure of solids; thermal, electrical, dielectric, and magnetic properties of materials; semiconductors processing.
- 316 Thermodynamics and Kinetics of Materials 3** Course Prerequisite: MSE 201. Laws of thermodynamics, solution thermodynamics, free energy composition diagrams, mechanisms and kinetics of diffusion; solidification behavior, interfaces and phase boundaries, phase transformations in solids, oxidation, and corrosion.
- 320 Materials Structure - Properties Lab 3** (1-6) Course Prerequisite: MSE 201 or concurrent enrollment. Principles and techniques of optical metallography and other laboratory methods used in modern materials science and engineering.
- 321 Materials Characterization 3** Course Prerequisite: MSE 201. Properties of x-rays, scattering and diffraction; crystal structures; x-ray diffraction methods, transmission electron microscopy and scanning electron microscopy.
- 323 Materials Characterization Lab 2** (1-3) Course Prerequisite: MSE 321 or concurrent enrollment. Laboratory exercises on materials characterization: x-ray, TEM, SEM.
- 401 Metallic Materials 3** Course Prerequisite: MSE 201. Major alloy systems and manufacturing processes; materials selection.
- 402 Polymeric Materials 3** Course Prerequisite: MSE 201. Structural characterization, syntheses, and reactions of polymeric materials; relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
- 403 Ceramic Materials 3** Course Prerequisite: MSE 201. Processing, characteristics, microstructure, and properties of ceramic materials.
- 404 Engineering Composites 3** Course Prerequisite: MSE 201. Basic concept in design and specifications of engineering composites.
- 406 Biomaterials 3** Course Prerequisite: MSE 201. Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 425 Senior Thesis I 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 426 Senior Thesis II 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.

- 440 Materials: The Foundations of Society and Technology 3**
Course Prerequisite: Junior standing. History of materials; role that materials have played in human development; modern societal, technological, and economic impact of materials.
- 483 Topics in Materials Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar** 1 May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis** 3 Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis** 3 Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis** 3 Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration** 3 Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra** 3 Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers** 3 May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis** 3 Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra** 3 Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations** 3 Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods** 3 Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology** 3 Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics** 3 Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers** 3 Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics** 1 May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics** 3 Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education** 3 Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing** 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I** 3 Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II** 3 Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory** 3 Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.

- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.

- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastic-to-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.

- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Mechanical Engineering

Degree offered: Master of Science in Mechanical Engineering – Non Thesis

Faculty working with graduate students: 28

Graduate students: 18

Program offered: Pullman, Tri-Cities

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Of the minimum 27 graded credit hours, the student must take 1) 3 credit hours of Math 540, 2) a minimum of 12 credit hours of 500-level ME or MSE courses (at least 9 of these must be ME courses), and 3) 12 credit hours of additional courses approved by the student's advisor. Note: a maximum of 9 credit hours of graded coursework at the 300- and 400-level can be included in the program. Also required: 1) a minimum of 4 credit hours of ME 702 and 2) 2 credit hours of ME 598 (seminar; Pullman students only). All programs must have a minimum total credits of 30.

Program Description

The graduate program in the School of Mechanical and Materials Engineering has a long history of excellence in graduate education. Our School offers specialization in a variety of disciplines in which graduate students develop cutting-edge knowledge and techniques using state-of-the-art research facilities. Our mission is to educate engineering students to be successful, world-class professionals capable of dynamic contributions in contemporary engineering practice and research and development.

Degree Description

Our School offers programs of study for full time and part-time students leading to the degrees of Master of Science (MS) in Mechanical Engineering (Pullman and Tri-Cities campuses), MS in Materials Science & Engineering (Pullman campus), and Doctor of Philosophy (Ph.D.) in Mechanical Engineering (Pullman campus). Our School participates in the interdisciplinary degree programs of MS in Engineering, Ph.D. in Engineering Science, and Ph.D. in Materials Science & Engineering. Thesis and non-thesis options are available for the MS degree. Programs of study are individualized with an interdisciplinary focus. Students are expected to pursue their degree programs with success and to earn the MS degree in two years and the Ph.D. in four years. The program will culminate with a final oral examination and a written thesis (MS thesis option), project report (MS non-thesis option), or dissertation (Ph.D.). Financial aid in the form of an assistantship is available for dedicated, quality full time MS and Ph.D. students.

Training and Professional Development Opportunities

Our School offers state-of-the-art research facilities enabling students to work on cutting-edge research over a wide range of topics, presenting and publishing results along with our world-class faculty. Leadership, communication, and instructional experience can be gained by PhD students through the option of serving as a teaching assistant for one or more courses during their program. Serving on University committees promotes professional development. Presenting papers at or attending regional conferences and international conferences and proceedings enriches scholarly development. Low-cost or free workshops on grant writing and leadership/professional development are routinely offered by the University. Opportunities exist for internships in industry and national labs.

Post-Graduate Employment Opportunities

University research and teaching positions, research positions in national laboratories, postdoctoral positions in national laboratories, and technical positions in leading companies.

Post-Graduate Career Placements

Recent graduates are working at Boeing, Hewlett-Packard, Hitachi, Intel, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Micron Technology, PACCAR, Pacific Northwest National Laboratory, Parametric Technology Corp, Tektronix, U.S. Army, ARDEC, Boise State University, Princeton University, University of California Berkeley, University of Kentucky, University of New Mexico, and Sandia National Laboratory.

Contact Information

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Mechanical Engineering

M E

- 301 Fundamentals of Thermodynamics 3** Course Prerequisite: PHYSICS 201 with a grade of C or better. Thermodynamic properties of matter, ideal and real gases, work and heat, first and second laws and their application to engineering systems.
- 303 Fluid Mechanics 3** Course Prerequisite: ME 212. Fluid statics, laminar and turbulent flow, similitude, pipe flow, boundary layers, lift and drag and measurement techniques.
- 305 Thermal and Fluids Laboratory 2 (1-3)** Course Prerequisite: ME 301; ME 303; MATH 370 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Instrumentation, data acquisition, and theory verification in the thermal and fluid sciences.
- 310 Manufacturing Processes 2** Course Prerequisite: MSE 201; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes, material fabrication, and nontraditional processing.
- 311 Manufacturing Processes Laboratory 1 (0-3)** Course Prerequisite: ME 310 or concurrent enrollment; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Manufacturing processes laboratory in machining, welding, forming; manufacturing project.
- 313 Engineering Analysis 3 (2-3)** Course Prerequisite: MATH 315 or concurrent enrollment; CE 215; E E 221, CPT S 121, or CPT S 251. Analysis and modeling of engineering problems utilizing numerical and mathematical techniques and computers.
- 316 Systems Design 3** Course Prerequisite: CE 215; ME 216; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Systems and component design; product development from specifications to manufacturing; team-based CAD design projects; engineering economics; engineering professional skills.
- 348 Dynamics Systems 3** Course Prerequisite: ME 212; ME 313; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Fundamentals of vibration analysis, control systems, system modeling and dynamics analysis.
- 401 Mechatronics 3 (2-3)** Course Prerequisite: E E 304; ME 348. Integration of mechanical and microprocessor-based systems; control theory implemented with data acquisition systems; sensors; actuators, signal conditioning, programmable logic controllers.
- 402 Thermal Systems Design 3** Course Prerequisite: ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Design and analysis of thermofluid systems using principles of thermodynamics, fluid mechanics and heat transfer.
- 404 Heat Transfer 3** Course Prerequisite: ME 301; ME 303; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Conduction, radiation, and convection heat transfer; analytical, numerical, experimental results for solids, liquids, and gases; heat exchanger design.
- 406 Experimental Design 3 (1-6)** Course Prerequisite: ME 220; ME 305; ME 316; ME 404. Designing, conducting, and reporting of experimental investigations involving mechanical equipment. Recommended preparation: ME 348.
- 407 Computational Fluid Dynamics 3** Course Prerequisite: ME 303. Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 414 Machine Design 3** Course Prerequisite: CE 215; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, or Electrical Engineering. Optimal design of machinery; analysis for prevention of machine elements failure. Recommended preparation: ME 220.

- 416 Mechanical Systems Design 3** (1-6) Course Prerequisite: ME 316; ME 348; ME 404; ME 414 or concurrent enrollment; senior standing. Integrative design in mechanical engineering; multidisciplinary design project considering both technical and non-technical contexts; organizational dynamics and communications.
- 419 Air Conditioning 3** Course Prerequisite: ME 404. Principles of heat and moisture transfer; air motion and purity in buildings; design of systems.
- 431 Design of Solar Thermal Systems 3** Course Prerequisite: ME 301; ME 303; ME 404; certified major in Mechanical Engineering, Materials Science Engineering, Civil Engineering, Electrical Engineering, or Architecture. Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes and distillation.
- 436 Combustion Engines 3** Course Prerequisite: ME 303. Internal combustion engines; spark ignition engines, diesels, and gas turbines.
- 439 Applied Aerodynamics 3** Course Prerequisite: ME 303. Aerodynamic lift and drag; circulation; boundary layers, application to subsonic aircraft wing design.
- 449 Mechanical Vibration 3** Course Prerequisite: ME 348. Vibrating systems and noise producing mechanisms; design for noise and vibration control.
- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 472 Finite Element Methods in Design 3** Course Prerequisite: ME 414. Design of selected mechanical systems components using finite element analysis.
- 473 Advanced CAD and Geometric Modeling 3** (2-3) Course Prerequisite: ME 316. Parametric and feature based CAD/CAM; geometric modeling and its mathematical basis; integration of CAD with design processes and other software.
- 474 Design for Manufacture and Modern Manufacturing Strategies 3** Course Prerequisite: ME 310. Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
- 475 Manufacturing Enterprise Systems -- Automation and Product Realization 3** (2-3) Course Prerequisite: ME 313; ME 316. Manufacturing automation and product realization; role of information technology and electronic data in manufacturing enterprise systems; product life-cycle management (PLM) and related tools and processes; sustainable and green manufacturing.
- 481 Control Systems 3** Course Prerequisite: ME 348. Analysis and design of feedback control systems.
- 483 Topics in Mechanical Engineering V 1** (0-4) to 4 (0-16) May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.

Materials Science And Engineering

MSE

- 302 Electronic Materials 3** Course Prerequisite: CHEM 105; PHYSICS 202 or concurrent enrollment. Structure of materials, electronic structure of solids; thermal, electrical, dielectric, and magnetic properties of materials; semiconductors processing.
- 316 Thermodynamics and Kinetics of Materials 3** Course Prerequisite: MSE 201. Laws of thermodynamics, solution thermodynamics, free energy composition diagrams, mechanisms and kinetics of diffusion; solidification behavior, interfaces and phase boundaries, phase transformations in solids, oxidation, and corrosion.
- 320 Materials Structure - Properties Lab 3** (1-6) Course Prerequisite: MSE 201 or concurrent enrollment. Principles and techniques of optical metallography and other laboratory methods used in modern materials science and engineering.
- 321 Materials Characterization 3** Course Prerequisite: MSE 201. Properties of x-rays, scattering and diffraction; crystal structures; x-ray diffraction methods, transmission electron microscopy and scanning electron microscopy.
- 323 Materials Characterization Lab 2** (1-3) Course Prerequisite: MSE 321 or concurrent enrollment. Laboratory exercises on materials characterization: x-ray, TEM, SEM.
- 401 Metallic Materials 3** Course Prerequisite: MSE 201. Major alloy systems and manufacturing processes; materials selection.
- 402 Polymeric Materials 3** Course Prerequisite: MSE 201. Structural characterization, syntheses, and reactions of polymeric materials; relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
- 403 Ceramic Materials 3** Course Prerequisite: MSE 201. Processing, characteristics, microstructure, and properties of ceramic materials.
- 404 Engineering Composites 3** Course Prerequisite: MSE 201. Basic concept in design and specifications of engineering composites.
- 406 Biomaterials 3** Course Prerequisite: MSE 201. Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 413 Mechanics of Solids 3** Course Prerequisite: CE 215; MSE 201. Elasticity, elastic stress distributions; plastic deformation of single and polycrystals; introduction to dislocation theory and its applications; creep, fracture, fatigue. (Cross-listed course offered as MSE 413, ME 413).
- 425 Senior Thesis I 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.
- 426 Senior Thesis II 3** (0-9) Course Prerequisite: MSE 320; MSE 323, senior standing; certified major in Materials Science Engineering. Research in materials science and engineering.

- 440 Materials: The Foundations of Society and Technology 3**
Course Prerequisite: Junior standing. History of materials; role that materials have played in human development; modern societal, technological, and economic impact of materials.
- 483 Topics in Materials Engineering V 1 (0-4) to 4 (0-16)** May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar** 1 May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis** 3 Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis** 3 Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis** 3 Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration** 3 Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra** 3 Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers** 3 May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis** 3 Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra** 3 Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations** 3 Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods** 3 Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology** 3 Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics** 3 Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers** 3 Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics** 1 May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics** 3 Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education** 3 Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing** 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I** 3 Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II** 3 Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory** 3 Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.

- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.

- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastic-to-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.

- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Mechanical Engineering – Vancouver

Degree offered: Master of Science in Mechanical Engineering

Faculty working with graduate students: 8

Graduate students: 18

Graduate students receiving assistantships or scholarships: 33%

Program offered: Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

Four credit hours of Mech 700 Master's Research and Examination required. Additional credits are required in consultation with the academic advisor to total 30 credit hours. Two credits of Mech 700 must be taken during the term in which the student intends to defend the thesis.

Program Description

The Master of Science in Mechanical Engineering program in the School of ENCS is a thesis program and requires a minimum of 30 credit hours. This includes 21 hours of graded coursework beyond the bachelor's plus a minimum of 4 thesis credits. The coursework and research are in the general areas of dynamics, robotics, solid mechanics, manufacturing and design, fluid dynamics, heat and mass transfer and micro and nanotechnology. Our laboratories are equipped with state-of-the-art equipment worth more than \$6 million. Teaching and research assistantships are available for qualified students. A Bachelor of Science degree from an accredited program in mechanical engineering provides a good background for the MSME graduate program. Students with bachelor degrees in other engineering disciplines, mathematics, and the physical sciences are routinely admitted, but may be required to make up requisite undergraduate deficiencies. An undergraduate grade point average of 3.0 is a minimum for admission to the MS program.

Degree Description

The Master of Science in Mechanical Engineering program in the School of ENCS is a thesis program and requires a minimum of 30 credit hours. This includes 21 hours of graded coursework beyond the bachelor's plus a minimum of 4 thesis credits. The coursework and research are in the general areas of dynamics, robotics, solid mechanics, manufacturing and design, fluid dynamics, heat and mass transfer and micro and nanotechnology. Our laboratories are equipped with state-of-the-art equipment worth more than \$6 million. Teaching and research assistantships are available for qualified students. A Bachelor of Science degree from an accredited program in mechanical engineering provides a good background for the MSME graduate program. Students with bachelor degrees in other engineering disciplines, mathematics, and the physical sciences are routinely admitted, but may be required to make up requisite undergraduate deficiencies. An undergraduate grade point average of 3.0 is a minimum for admission to the MS program.

Contact Information

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Faculty

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MECH

- 405 Introduction to Microcontrollers 3** Course Prerequisite: MECH 304. Microcontroller architecture, microcontroller programming, mechanical system design with embedded microcontrollers.
- 431 Semiconductor Devices 3** Course Prerequisite: CHEM 105; PHYSICS 202. Crystal properties, energy bands, semiconductor charge carriers, p-n junctions, field-effect transistors, bipolar junction transistors, optoelectronic devices, integrated circuits.
- 438 Microfabrication Technology 3** Course Prerequisite: CHEM 105; MATH 315; PHYSICS 202. Microelectronic fabrication technology, semiconductor material, diffusion, thermal oxidation, ion implantation, lithography, etching, thin film deposition, CMOS integration and MEMS. Credit not granted for both MECH 438 and MECH 538.
- 442 Advanced Thermal Systems 3** Course Prerequisite: MECH 404. Analysis and design of advanced thermal systems at macro, mini and micro scales; applied design software packages; design projects. Credit not granted for both MECH 442 and MECH 542.
- 450 Advanced Topics in Micro and Nano Technology 3 (2-3)** Course Prerequisite: CHEM 106; PHYSICS 202. Micro-fabrication technology, bulk and surface micromachining, sensors and actuators, microelectromechanical systems (MEMS), nanofabrication technology, micro/nano scale material and device measurements. Credit not granted for both MECH 450 and MECH 550.
- 467 Automation 3 (2-3)** Course Prerequisite: MECH 304 or ECE 260; MECH 348. Automation systems, discrete event control using programmable logic controllers (PLC), robot programming, process control. Credit not granted for both MECH 467 and MECH 567.
- 468 Robotics 3** Course Prerequisite: MECH 304 or ECE 260; MECH 348. Industrial robots, kinematics, control, robot programming, interfacing, sensors, actuators, vision systems and mobile robots. Credit not granted for both MECH 468 and MECH 568.
- 476 Advanced Manufacturing Engineering 3** Course Prerequisite: MECH 310. Advanced topics in manufacturing processes, including interrelationships between the properties of the material, the manufacturing process and design of components. Credit not granted for both MECH 476 and MECH 576.
- 485 Computer-aided Engineering 3** Course Prerequisite: MECH 215; MECH 310 or concurrent enrollment. Introduction to the use of finite element techniques in engineering product design and analysis; basic concepts and applications in CAE.
- 489 Material Failure in Mechanical Design 3** Course Prerequisite: MECH 215; MECH 309. Analysis, design and prevention from failure of materials in mechanical design; mechanical behavior of materials such as fatigue, fracture and wear. Credit not granted for both MECH 489 and MECH 589.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.

- 532 Mathematics for College and Secondary Teachers 3** Course
Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course
Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.

- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II 3** Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems.
- 515 Advanced Heat Transfer 3** Energy conservation equations; forced convection with internal and external flow, free convection, boiling and condensation, mass transfer, numerical methods.
- 516 Micro/Nanoscale Thermal Engineering 3** Fundamentals and applications of micro/nanoscale thermal science and engineering.
- 521 Fundamentals of Fluids I 3** Mass and momentum conservation equations, Navier-Stokes equations, compressible flows, inviscid-potential flows, advanced viscous flows including boundary layer numerical methods.
- 529 Experimental Methods for Mechanical Engineering Research 3** Research methods for mechanical engineers, including experimental design, techniques, analysis, and presentation.
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements.
- 538 Microfabrication Technology 3** Microelectronic fabrication technology, semiconductor material, diffusion, thermal oxidation, ion implantation, lithography, etching, thin film deposition, CMOS integration and MEMS. Credit not granted for both MECH 438 and MECH 538.
- 540 Advanced Dynamics 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics, gyroscopic mechanics, other applications.
- 542 Advanced Thermal Systems 3** Analysis and design of advanced thermal systems at macro, mini and micro scales; applied design software packages; design projects. Credit not granted for both MECH 442 and MECH 542.
- 550 Advanced Topics in Micro and Nano Technology 3 (2-3)** Microfabrication technology, bulk and surface micromachining, sensors and actuators, microelectromechanical systems (MEMS), nanofabrication technology, micro/nano scale material and device measurements. Credit not granted for both MECH 450 and MECH 550.
- 567 Automation 3 (2-3)** Automation systems, discrete event control using programmable logic controllers (PLC), robot programming, process control. Credit not granted for both MECH 467 and MECH 567.

- 568 Robotics 3** Industrial robots, kinematics, control, robot programming, interfacing, sensors, actuators, vision systems and mobile robots. Credit not granted for both MECH 468 and MECH 568.
- 576 Advanced Manufacturing Engineering 3** Advanced topics in manufacturing processes, including interrelationships between the properties of the material, the manufacturing process and design of components. Credit not granted for both MECH 476 and MECH 576.
- 579 Advanced Topics in Design and Manufacturing V 1-3** May be repeated for credit.
- 585 Computer-aided Engineering 3** Introduction to the use of finite element techniques in engineering product design and analysis; basic concepts and applications in CAE.
- 589 Material Failure in Mechanical Design 3** Analysis, design and prevention from failure of materials in mechanical design; mechanical behavior of materials such as fatigue, fracture and wear. Credit not granted for both MECH 489 and MECH 589.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

Molecular Biosciences – Cert in Mol Bio Sci

Degree offered: Graduate Certificate in Molecular Biosciences

Faculty working with graduate students: 51

Graduate students: 2

Program offered: DDP, Pullman

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Students must complete a total of 11-12 credits of graded coursework made up of required and elective courses of which 9 credits are core/required and 2-3 credits are electives.

Program Description

Faculty in the School of Molecular Biosciences (SMB) explore the cellular, molecular, and structural basis of processes essential for proper function of bacteria, archaea, and eukaryota. The Ph.D. and M.S. degrees in SMB are interdisciplinary degrees in Molecular Biosciences. Trainees for Ph.D. and Master's degrees will choose one of three discipline-specific tracks in Biochemistry, Genetics, or Microbiology to ensure that their interdisciplinary training in molecular, cellular and structural biology builds on a solid discipline-specific foundation. The Professional Science Master's (PSM) within Molecular Biosciences is designed to help students transition into the workplace by training them in skills

that employers need. This master's degree (PSM) combines science with training in ethics and business, bridging the gap between academia and the workplace. An important career-oriented aspect of the program is that it requires an internship with practical training, rather than a thesis. In addition, SMB offers a Graduate Certificate in Molecular Biosciences. This certificate is geared for working professionals who seek additional training or educators requiring continued education for accreditation.

Degree Description

SMB offers a Graduate Certificate in Molecular Biosciences. This certificate is geared for working professionals who seek additional training or educators requiring continued education for accreditation.

Training and Professional Development Opportunities

Completion of the graduate certificate courses will be invaluable in career development in many different interdisciplinary fields.

Post-Graduate Employment Opportunities

Hoping this will aid people in their continuing education credits to promote themselves during employment.

Contact Information

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Faculty

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STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I** 3 DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II** 3 Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3** (2-2) State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V** 1-3 May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3** (2-3) Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V** 1-2 May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.

- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Advanced Logic 3** First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.
- 504 Special Topics in Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of a special topic not otherwise covered in depth in the curriculum.
- 507 Seminar in Philosophy of Religion 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topic-driven seminar. Critical analysis of traditional and contemporary religions and religious phenomena. Credit not granted for both PHIL 407 and PHIL 507.
- 510 Seminar in the History of Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Systematic exploration of the central works of an individual philosopher or philosophical movement.
- 520 Seminar in Ethical Theory 3** The major issues, views, and figures of ethical theory from ancient Greece to the present.
- 522 Seminar in Metaphysics 3** The nature of reality, through study of key concepts such as God, personhood, free will, causation, space, time, and identity.
- 524 Seminar in Epistemology 3** Classical problems, questions, and theories involving the concept of knowledge.
- 530 Bioethics 2** Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.
- 532 Seminar in Business Ethics 3** The major issues in business ethics, both domestic and international, from general principles to specific cases.
- 535 Advanced Biomedical Ethics 3** Current ethical issues in medical practice, medical research and public policy relating to health issues.
- 540 Ethics and Social Science Research 3** Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 Philosophy of Language 3** Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 Philosophy of Law 3** Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Molecular Biosciences

Degree offered: Doctor of Philosophy (Molecular Biosciences)

Faculty working with graduate students: 47

Graduate students: 47

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI, GRE (Quantitative), GRE (Verbal)

Deadline: Fall: December 15th

Requirements

Students admitted to the Ph.D. program will be required to

complete the required coursework, two proposals and three departmental seminars in addition to the submission of a final dissertation and dissertation defense.

Program Description

Faculty in the School of Molecular Biosciences (SMB) explore the cellular, molecular, and structural basis of processes essential for proper function of bacteria, archaea, and eukaryota. The Ph.D. and M.S. degrees in SMB are interdisciplinary degrees in Molecular Biosciences. Trainees for Ph.D. and Master's degrees will choose one of three discipline-specific tracks in Biochemistry, Genetics, or Microbiology to ensure that their interdisciplinary training in molecular, cellular and structural biology builds on a solid discipline-specific foundation. The Professional Science Master's (PSM) within Molecular Biosciences is designed to help students transition into the workplace by training them in skills that employers need. This master's degree (PSM) combines science with training in ethics and business, bridging the gap between academia and the workplace. An important career-oriented aspect of the program is that it requires an internship with practical training, rather than a thesis. In addition, SMB offers a Graduate Certificate in Molecular Biosciences. This certificate is geared for working professionals who seek additional training or educators requiring continued education for accreditation.

Degree Description

A Ph.D. interdisciplinary degree in Molecular Biosciences with tracks in Biochemistry, Genetics and Cell Biology and Microbiology

Training and Professional Development Opportunities

Molecular Biosciences is a dynamic continuum of disciplines which uses the approaches of chemistry, physics, and biology to understand the fundamental mechanisms of living organisms. The School of Molecular Biosciences offers many exciting opportunities for graduate students to explore the vast range of life science research while working toward degrees in the sub-disciplines of biochemistry, biophysics, cell biology, genetics, and microbiology. Entering students do rotations through research laboratories to choose a thesis advisor. Over 30 research laboratories are associated with the School of Molecular Biosciences, investigating problems in diverse systems, including bacteria, yeast, plants, and animals. Graduates acquire a breadth and depth of knowledge that allows them to adapt quickly to new information and approaches developed in the rapidly changing field of molecular biosciences.

Post-Graduate Employment Opportunities

Alumni have gone on to high-profile postdoctoral opportunities and successful careers in academic and industrial sciences, especially in the biotechnology industry. Career opportunities include positions in food, agricultural, pharmaceutical, and biotechnology industries, private or government laboratories and departments, and nonprofit institutions such as clinical and hospital laboratories and research institutes. With the advent of the "biological revolution," which will continue well into the 21st century, new opportunities with links to the worlds of public health, business, law, and government are ever expanding.

Post-Graduate Career Placements

Postdoctoral positions in nationally renowned laboratories at University of California, Berkeley, California Institute of Technology, University of Colorado Health Sciences Center, University of Minnesota, University of Pennsylvania Wistar Institute, Washington University in St. Louis, Stanford University, Johns Hopkins University, the Mayo Institute, and the Fred Hutchinson Cancer Research Center. Faculty positions at tier-one research universities and outstanding undergraduate institutions such as the University of Kansas, University of Minnesota, Texas Tech, and the U.S. Naval Academy. Industrial positions at Amgen, Battelle, Infections Disease Research Institute, Kemin Industries, Miltenyi Biotechnology, Myriad Genetics, PathoGenesis, and Sunesis.

Contact Information

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Faculty

Hector Aguilar-Carreno, John Alderete, Wenfeng An, Margaret Black, Kelly Brayton, Wendy Brown, John Browse, Douglas Call, Weihang Chai, Cynthia Cooper, William Davis, Lisa Gloss, Michael Griswold, Joseph Harding, Cynthia Haseltine, Terry Hassold, Chengtao Her, Matthias Hess, Patricia Hunt, Mary Hunzicker-Dunn, Michael Kahn, Chulhee Kang, Kwanhee Kim, Michael Konkel, Bernd Lange, Mary Lanier, Audrey Lau, Philip Mixer, Subra Muralidharan, Anthony Nicola, John Nilson, Jon Oatley, James Pru, Kenneth Roberts, Buel Rodgers, Eric Shelden, Michael Smerdon, Thomas Spencer, Linda Thomashow, Gary Thorgaard, Grant Trobridge, Viveka Vadyvaloo, Susan Wang, Jennifer Watts, John Wyrick, Luying Xun and Ping Ye.

MBIOS

- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
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- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
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- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

PHIL

- 501 Advanced Logic** 3 First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.
- 504 Special Topics in Philosophy** 3 May be repeated for credit; cumulative maximum 6 hours. Intensive study of a special topic not otherwise covered in depth in the curriculum.
- 507 Seminar in Philosophy of Religion** 3 May be repeated for credit; cumulative maximum 6 hours. Advanced topic-driven seminar. Critical analysis of traditional and contemporary religions and religious phenomena. Credit not granted for both PHIL 407 and PHIL 507.
- 510 Seminar in the History of Philosophy** 3 May be repeated for credit; cumulative maximum 6 hours. Systematic exploration of the central works of an individual philosopher or philosophical movement.
- 520 Seminar in Ethical Theory** 3 The major issues, views, and figures of ethical theory from ancient Greece to the present.
- 522 Seminar in Metaphysics** 3 The nature of reality, through study of key concepts such as God, personhood, free will, causation, space, time, and identity.
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- 530 Bioethics** 2 Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.
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- 535 Advanced Biomedical Ethics** 3 Current ethical issues in medical practice, medical research and public policy relating to health issues.

- 540 Ethics and Social Science Research** 3 Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 Philosophy of Language** 3 Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 Philosophy of Law** 3 Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
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Molecular Biosciences

Degree offered: Master of Science in Molecular Biosciences

Faculty working with graduate students: 59

Graduate students: 2

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI, GRE (Quantitative), GRE (Verbal)

Deadline: Fall: December 15th

Requirements

Students admitted to the Master of Sciences in Molecular Biosciences, thesis, program will be required to complete the required coursework, first proposal and one departmental seminar in addition to the submission of a final thesis and thesis defense.

Program Description

Faculty in the School of Molecular Biosciences (SMB) explore the cellular, molecular, and structural basis of processes essential for proper function of bacteria, archaea, and eukaryota. The Ph.D. and M.S. degrees in SMB are interdisciplinary degrees in Molecular Biosciences. Trainees for Ph.D. and Master's degrees will choose one of three discipline-specific tracks in Biochemistry, Genetics, or Microbiology to ensure that their interdisciplinary training in molecular, cellular and structural biology builds on a solid discipline-specific foundation. The Professional Science Master's (PSM) within Molecular Biosciences is designed to help students transition into the workplace by training them in skills that employers need. This master's degree (PSM) combines science with training in ethics and business, bridging the gap between academia and the workplace. An important ca-

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Degree Description

A Master of Science in Molecular Biosciences - thesis - interdisciplinary degree in Molecular Biosciences with tracks in Biochemistry, Genetics and Cell Biology and Microbiology.

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Master degree alumni have received many placements including the following: pursuing higher education degrees at Gonzaga University, School of Law; Washington State University, College of Veterinary Medicine; doctoral programs at Pennsylvania State University, Taiwan University, University of Denver; California State University, Davis; and many others. Alums have also gone into industry to renowned laboratories at Amgen, Fred Hutchinson Cancer Research Center, Battelle, Pacific Northwest Research Labs; Infectious Disease Research Institute, Seattle; and many academic research labs.

Contact Information

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800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

PHIL

501 Advanced Logic 3 First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.

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535 Advanced Biomedical Ethics 3 Current ethical issues in medical practice, medical research and public policy relating to health issues.

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Molecular Biosciences

Degree offered: Master of Science in Molecular Biosciences - Non Thesis

Faculty working with graduate students: 51

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: December 15th

Requirements

Students admitted to the Master of Sciences in Molecular Biosciences, non-thesis, program will be required to complete the required coursework, first proposal and one departmental seminar in addition to the submission of a project and project defense.

Program Description

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Master degree alumni have received many placements including the following: pursuing higher education degrees at Gonzaga University, School of Law; Washington State University, College of Veterinary Medicine; doctoral programs at Pennsylvania State University, Taiwan University, University of Denver; California State University, Davis; and many others. Alums have also gone into industry to renowned laboratories at Amgen, Fred Hutchinson Cancer Research Center, Battelle, Pacific Northwest Research Labs; Infectious Disease Research Institute, Seattle; and many academic research labs.

Contact Information

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- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.

- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- PHIL**
- 501 Advanced Logic 3** First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.
- 504 Special Topics in Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of a special topic not otherwise covered in depth in the curriculum.

- 507 Seminar in Philosophy of Religion 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topic-driven seminar. Critical analysis of traditional and contemporary religions and religious phenomena. Credit not granted for both PHIL 407 and PHIL 507.
- 510 Seminar in the History of Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Systematic exploration of the central works of an individual philosopher or philosophical movement.
- 520 Seminar in Ethical Theory 3** The major issues, views, and figures of ethical theory from ancient Greece to the present.
- 522 Seminar in Metaphysics 3** The nature of reality, through study of key concepts such as God, personhood, free will, causation, space, time, and identity.
- 524 Seminar in Epistemology 3** Classical problems, questions, and theories involving the concept of knowledge.
- 530 Bioethics 2** Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.
- 532 Seminar in Business Ethics 3** The major issues in business ethics, both domestic and international, from general principles to specific cases.
- 535 Advanced Biomedical Ethics 3** Current ethical issues in medical practice, medical research and public policy relating to health issues.
- 540 Ethics and Social Science Research 3** Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 Philosophy of Language 3** Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 Philosophy of Law 3** Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Faculty working with graduate students: 36

Graduate students: 18

Program offered: DDP, Pullman

Tests required: TOEFL, TOEFLI

Deadline: Fall: July 15th

Spring: November 15th

Summer: March 30th

Program Description

The Professional Science Master's (PSM) in molecular biosciences is designed to help students transition into the workplace by training them in skills that employers need. The interdisciplinary option is available online, or students can choose to take some courses on the Pullman campus. The PSM combines science with training in ethics and business, bridging the gap between academia and the workplace. One career-oriented aspect of the program is that it requires an internship with a business rather than a thesis. The nationwide shortage of scientists with managerial and business training means PSM graduates will be well positioned for employment.

Degree Description

The Professional Science Master's (PSM) within Molecular Biosciences is designed to help students transition into the workplace by training them in skills that employers need. This master's degree (PSM) combines science with training in ethics and business, bridging the gap between academia and the workplace. An important career-oriented aspect of the program is that it requires an internship with practical training, rather than a thesis.

Training and Professional Development Opportunities

Students must identify and participate in an 8 week full-time (40 hours per week) internship, with an identified internship mentor. The internship can be paid or unpaid, and will usually be conducted in a non-academic workplace. The objectives of the internship are to encourage students to integrate elements of the course work into the workplace and to capitalize on the transitional aspects of the PSM program. The internship will include an Internship Proposal, and an Internship Log. After completion of the internship an Internship Report will be written to show that the student was challenged; 1), to complete an assigned internship and 2), to interpret and integrate course work and the internship experience.

Post-Graduate Employment Opportunities

Industry, government and non-profit agencies involved in science and technology require science trained professionals with applied skills to help fuel innovation and ensure global competitiveness.

Post-Graduate Career Placements

VMRD, Inc.; Tacoma Hospital.

Molecular Biosciences – Professional

Degree offered: Master of Science in Molecular Biosciences – Professional (Non Thesis)

Contact Information

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Faculty

John Alderete, Wenfeng An, Margaret Black, Ronald Brosemer, Weihang Chai, Cynthia Cooper, William Davis, Lisa Gloss, Michael Griswold, Cynthia Haseltine, Terry Hassold, Consetta Helmick, Chengtao Her, John Hinz, Patricia Hunt, Mary Hunzicker-Dunn, Michael Kahn, Kwanhee Kim, Michael Konkel, Mary Lanier, Nancy Magnuson, Norah McCabe, Philip Mixter, Subra Muralidharan, John Nilson, Jon Oatley, Raymond Reeves, Kenneth Roberts, Eric Shelden, Michael Smerdon, Julie Stanton, Susan Wang, Jennifer Watts, John Wyrick, Luying Xun and Ping Ye.

ENTRP

- 486 Topics in New Venture Business Planning 3** Course Prerequisite: Certified major or minor in the College of Business. Business competition to understand new venture creation utilizing technology breakthroughs, entrepreneurial business functions, and business plan development.
- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.
- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.

- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.

- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 501 Seminar in the Teaching of Writing: Methodology of Composition 3** Development of a workable definition of the methods of composing through a review of relevant research and problem-solving exercises.
- 502 Seminar in the Teaching of Writing: Contemporary Theories 3** Course Prerequisite: ENGLISH 501. Contemporary theories of composition and their application to the classroom.
- 506 Seminar in 16th Century English Literature 3** May be repeated for credit; cumulative maximum 6 hours.
- 507 Shakespeare 3** Plays, poems, criticism, and background materials.
- 508 Seminar in Assessment of Writing 3** Problems involved in the diagnosis and assessment of student writing.
- 509 Seminar in Classical Rhetoric and its Influences 3** Study of GREEK and Roman rhetorical theories and their influences.
- 510 Backgrounds of American Literature 3** Studies of American writing in cultural contexts.
- 511 Seminar in 17th and 18th Century American Literature 3**
- 512 Introduction to Graduate Study 3**
- 513 Theory and Method in American Studies 3** Major theories and methods currently used by American studies scholars; key concepts in cultural analysis. (Cross-listed course offered as AMER ST 513, ENGLISH 513, HISTORY 513).
- 514 Seminar in 20th Century American Literature 3** May be repeated for credit; cumulative maximum 6 hours.
- 515 Contemporary Theories of Rhetoric 3** Contemporary critical theory and cultural studies and reconsiderations of suasive discursive practices.
- 521 Seminar in British Romantic Literature 3** May be repeated for credit; cumulative maximum 6 hours.
- 522 Seminar in Victorian Literature 3** May be repeated for credit; cumulative maximum 6 hours.
- 525 Seminar in English Literature of the 17th Century 3** May be repeated for credit; cumulative maximum 6 hours.
- 527 Seminar in English Literature of the Restoration and 18th Century 3** May be repeated for credit; cumulative maximum 6 hours.
- 529 Seminar in 19th Century American Literature 3** May be repeated for credit; cumulative maximum 6 hours.
- 531 Administering a Writing Program 3** Combining theory and practice in writing program supervision and management. Interns will work under direct faculty supervision.
- 532 Teaching Writing to Nontraditional Students 3** Course Prerequisite: ENGLISH 501. Theory and practice of the teaching of basic writers.
- 534 Theories and Methods of the Teaching of Technical and Professional Writing 3** Historical and theoretical bases for production of scientific discourse; training in its practical applications.
- 543 Phonology 3** Technical introductions to the analysis of the sound systems of human languages. Credit not granted for both ENGLISH 443 and 543.
- 544 Syntax 3** Technical introduction to the generative analysis of sentence structure with a focus on English. Credit not granted for both ENGLISH 444 and 544.
- 546 Topics in Teaching English as a Second Language 3** May be repeated for credit; cumulative maximum 6 hours. May be repeated for credit; cumulative maximum 6 hours. Topics and controversies related to second language acquisition theory and pedagogy.
- 548 Seminar in Critical and Cultural Theory 3** May be repeated for credit; cumulative maximum 6 hours. Critical and cultural theory relevant to advanced literary studies and /or the advanced study of rhetoric and composition.
- 549 Seminar in 20th Century British Literature 3** May be repeated for credit; cumulative maximum 6 hours.
- 550 Seminar in Poetry or Non-fiction Prose 3** May be repeated for credit; cumulative maximum 6 hours. Historical and generic studies in poetry and non-fiction prose.
- 554 History of the English Language 3** Language related to the origin, history, and literature of its speakers. Credit not granted for both ENGLISH 454 and ENGLISH 554.
- 567 Seminar in Prose Fiction 3** May be repeated for credit; cumulative maximum 6 hours. Historical and generic studies of prose fiction.
- 573 Seminar in American Literature 3** May be repeated for credit; cumulative maximum 12 hours. Major topics and figures.
- 580 Seminar in Medieval Literature 3** May be repeated for credit; cumulative maximum 6 hours. The literature of Western Europe from 450 to 1500.

- 584 English Literature of the 16th Century 3** Advanced study of English Renaissance literature, including More, Sidney, Spenser, Marlowe, and Shakespeare, in age of Humanism and Reformation. Credit not granted for both ENGLISH 484 and ENGLISH 584.
- 590 Research in English Studies 1** May be repeated for credit; cumulative maximum 6 hours. Directed reading and interpretive problems in English studies.
- 591 Topics in Pedagogy 3** Theory and practice of designing and teaching courses in literature, rhetoric, composition, theory, or cultural studies.
- 595 Topics in English 3** May be repeated for credit; cumulative maximum 6 hours. Language, English pedagogy, or literature of special or current interest; reading theories, teaching of writing, current literary theories.
- 597 Topics in Composition and Rhetoric 3** May be repeated for credit; cumulative maximum 6 hours. Rhetoric and composition theory and praxis.
- 598 Teaching Apprenticeship 1** May be repeated for credit.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Technology Entrepreneurship 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Basic business concepts and processes applied to technology commercialization and venture creation.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.

- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
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- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
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- 505 Survey of Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing management; relevance of marketing to company profitability and consumer satisfaction; decision regarding price, product, promotion, and distribution.
- 506 Marketing Strategy 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing analyses needed to recommend and implement a marketing strategy. Includes coverage of industry, competitor, and customer analysis as well as decision factors related to segmentation, positioning, and the marketing mix.
- 507 Consumer Behavior 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.

- 555 Marketing Analytics 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Development of marketing analytics skills utilizing large data sets to identify marketing and consumer trends in online and offline markets.
- 561 New Product Marketing 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Introduction of new products that are based on new technology; exploration of actual products in the market.
- 565 Seminar in Marketing 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Marketing structure and behavior from economic and behavioral perspectives; social evaluation and behavioral implications of marketing strategy.
- 577 Promotional Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Integrated promotion into the marketing plan; methods, organization, communications, media selection, and campaigns.
- 590 Seminar in Consumer Behavior 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in consumer behavior.
- 591 Seminar in Marketing Management 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing management.
- 592 Seminar in Marketing Theory 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in marketing theory.
- 593 Seminar in Research Design 3** Course Prerequisite: Admission to PhD programs in business. Advanced, doctoral-level topics in research design.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 524 Seminar in Epistemology 3** Classical problems, questions, and theories involving the concept of knowledge.
- 530 Bioethics 2** Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.
- 532 Seminar in Business Ethics 3** The major issues in business ethics, both domestic and international, from general principles to specific cases.
- 535 Advanced Biomedical Ethics 3** Current ethical issues in medical practice, medical research and public policy relating to health issues.
- 540 Ethics and Social Science Research 3** Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 Philosophy of Language 3** Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 Philosophy of Law 3** Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Molecular Plant Sciences

Degree offered: Doctor of Philosophy (Molecular Plant Sciences)

Faculty working with graduate students: 36

Graduate students: 50

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The research goal of this program is to understand how plants work, from basic biochemistry to the physiology of living plants in the field, impacting fundamental understanding of plants, their productivity, and impacts on the global economy and climate. To tackle such large interdisciplinary issues, MPS brings together world experts in diverse fields of plant sciences and a range of departments, encouraging collaborations that span multiple disciplines. MPS faculty are housed in many departments, including the Institute of Biological Chemistry, Crop and Soil Sciences, Horticulture and Landscape Architecture, Plant Pathology, the School of Biological Sciences, and the School of Molecular Biosciences. Each faculty member is strongly committed to graduate education and research and runs an internationally-recognized, well-funded and dynamic research program. The program itself is designed to give you the deep and broad experiences in research required to become a highly successful researcher in highly competitive fields of plant sciences. Our philosophy of education is that scientific principles are best learned in the context of individual scientific research, and thus our program emphasizes learning through your thesis project. In particular, the Accelerated Research Ph.D. option is designed to place students in their thesis laboratories up to a year earlier than other programs. This allows students to pursue their research interests more rapidly and in greater depth, leading to higher research productivity that will help our graduates to be more competitive in their careers. Solving scientific problems in modern plant biology can involve many disciplines, from basic biochemistry and biophysics to genomics, proteomics, bioinformatics, plant physiology, and ecophysiology. Individual students' coursework is targeted to enhance their research progress while providing the broad basic scientific foundation needed to understand the wider implications of their research.

Degree Description

Graduate study leading to the Doctor of Philosophy degree is offered as an interdepartmental curriculum by graduate faculty from the Departments of Crop and Soil Science, Food Science and Human Nutrition, Electrical Engineering and Computer

Science, Horticulture and Landscape Architecture, Molecular Biosciences, Plant Pathology, Biological Sciences, and the Institute of Biological Chemistry. The objectives of the program are to provide the graduate student with a broad knowledge in molecular plant sciences and with research experience in a chosen area within this discipline. Specialization includes cellular and subcellular physiology, the molecular biology and biochemistry of plant-related processes, photosynthesis and photorespiration, nitrogen fixation, phytochemistry, the physiology of vascular plants, metabolism, plant pathogen interactions, hormonal interactions and regulation of growth, crop production physiology, and physiological ecology as well as related areas in agriculture and biology. Students entering the program must have completed their baccalaureate degree with training in one year each of elementary biology or botany, and physics, chemistry through one semester of organic chemistry and biochemistry, one semester each of molecular plant sciences and genetics, and mathematics (through calculus). Limited undergraduate deficiencies may be remedied by taking the appropriate courses upon enrollment in the graduate program on a provisional basis. Degree requirements include courses in molecular biology, advanced molecular plant sciences, plant morphology and anatomy, and metabolism. To meet the minimum requirements of core course credit in the Graduate School, elective courses are chosen as approved by the student's advisor and the supervising committee of graduate faculty. There is no foreign language requirement. Course requirements are drawn from existing courses offered by MPS and cooperating departments and programs. In addition, a seminar is held weekly during each semester. Policies and procedures of the Graduate School apply to all admissions. Interested students may direct their inquiries to Molecular Plant Sciences or to any participating faculty member. Should the latter route be followed, preference for the Program in Molecular Plant Sciences must be indicated and, if possible, the research area of interest identified. The program offers flexibility for students with varied backgrounds in chemistry, biochemistry, molecular plant sciences, molecular biology, botany, genetics, biology, and the agricultural sciences to pursue advanced training in molecular plant sciences, with independent study and original research in areas of the student's own interests as the single most important component. The interdisciplinary nature of the program assures the student of interaction with molecular plant scientists representing a wide range of research interests and provides the student with a broad choice of specialized facilities which are available in the cooperating academic units. Students are typically supported by the program during the first academic year. Financial support during subsequent years will be managed by the administering academic unit. Participating faculty may provide support through individual grants and contracts. Every effort will be made to inform applicants of these opportunities.

Training and Professional Development Opportunities

NIH Biotechnology Training Program, Achievement Rewards for College Scientists (ARCS)

Post-Graduate Employment Opportunities

Post-doctoral researcher, research institute scientist, industry scientist, assistant professor (academic track)

Contact Information

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Molecular Plant Sciences

MPS

- 515 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 525 Plant Molecular Genetics 3** Introduction to plant genome organization and gene expression while acquiring knowledge of modern molecular techniques and experimental approaches.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 570 Advanced Topics in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 3 hours. Oral presentation of a current research paper.
- 587 Advanced Topics in Plant Biochemistry 3** Course Prerequisite: MBIOS 514. Same as MBIOS 571.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Dissertation and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation and/or Examination V 1-18

May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Music

Degree offered: Master of Arts in Music

Faculty working with graduate students: 27

Graduate students: 18

Graduate students receiving assistantships or scholarships: 66%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

A graduate recital is required in the performance emphasis, including the conducting emphasis.

Program Description

The School of Music offers the degree Master of Arts in Music, which may be earned through studies in the areas of music education, composition, music history and literature, conducting, and performance studies. Though selection of an emphasis is not required, four emphases are available. The emphasis in music education provides advanced studies for experience and prospective teachers. The emphases in performance and composition are selected by students wishing to teach at the college level or intending to enter such professions as music performance, conducting, composing and arranging. Students electing the jazz emphasis focus on one or more aspects of jazz music - performance, composition, arranging, pedagogy, or history for example - in preparation for careers in jazz. The program offers both thesis and non-thesis options, designed according to the goals of the student. Composition emphasis students must complete the thesis option. The Master of Arts in Music degree offered by the Music Program is flexible and provides students the opportunity to develop a unique program of study to satisfy individual interests and goals. The intention of the Music Program and its Graduate Faculty is to provide the best of instruction to our graduate students, maintaining the highest of standards.

Degree Description

The music program in the School of Music offers the degree of Master of Arts in music, which may be earned through study in areas of music education, composition, music history and literature, conducting, and performance studies. Four emphases are available: -Music education--Provides advanced studies for experienced or prospective teachers. -Performance--Selected by students wishing to teach at the college level or enter professions such as music performance and conducting. -Composition--prepares students to enter professions in music such as composition and arranging. -Jazz emphasis--focuses on one or more aspects of jazz - performance, composition, arranging, pedagogy, or history - in

preparation for careers in jazz. The degree may also be completed without an emphasis. The program offers both thesis and non-thesis options, designed according to the goals of the student. Composition emphasis students must complete the thesis option.

Training and Professional Development Opportunities

Graduate students have opportunities to conduct and rehearse ensembles; teach undergraduate courses; perform and make recordings with world acclaimed faculty artists; prepare for major competitions in performance and composition; and tour nationally and internationally with performance ensembles. WSU graduate students have won numerous awards in major competitions for performance and composition. Recent graduates have been featured in *Jazziz* magazine and been successful in publishing their compositions.

Post-Graduate Employment Opportunities

Graduates are prepared for professional careers in music including work as performers, composers, arrangers, recording artists and educators.

Post-Graduate Career Placements

Graduate students in music have achieved teaching positions at major universities, community colleges and public schools throughout the United States, including the Director of Jazz Studies at West Valley College in Saratoga, CA; teaching position at the Joy of Music Academy in Boston; and teacher position at the American School in Rome, Italy. Other students have continued their postgraduate work at other prestigious schools of music and performed at major music festivals.

Contact Information

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MUS

- 362 History of Jazz 3** History of jazz in chronological sequence; social and political contexts of the African-American origins of jazz; stylistic developments.
- 363 Women in Music 3** Intersections of gender, class, race, and culture with popular and country music. (Cross-listed course offered as MUS 363, WOMEN ST 363).

- 364 Introduction to Sound Recording Technology 3** Music, audio and recording technology throughout history and its influence on society and culture.
- 371 Diction for Singers I 2** Italian and English; International Phonetic Alphabet; fundamental diction principles, applied to each language and oriented to needs of the singer.
- 372 Diction for Singers II 2** Course Prerequisite: MUS 371. French and German; International Phonetic Alphabet; fundamental diction principles, applied to each language and oriented to needs of the singer.
- 388 Music for the Classroom Teacher 2** Course Prerequisite: Certified major in Elementary Education; MUS 153. Singing, movement, listening and instrumental methods/resources for K-8 grades.
- 432 University Singers 1 (0-4)** May be repeated for credit. Public performance may be required. Non-auditioned choir consisting of 70+ singers. The majority of this group is made up of non-music majors.
- 444 Marching Band/Varsity Band 1 (0-4)** May be repeated for credit.
- 451 Seminar in Counterpoint 2** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: MUS 351 or concurrent enrollment. Contrapuntal techniques of the 16th and 18th century with original stylistic writing.
- 452 Electronic Music 2 (1-3)** Course Prerequisite: MUS 353 or concurrent enrollment. Introduction to computer-controlled digital, analog, and sampling synthesis; topics include sequencing, waveform editing, and creative projects.
- 455 Seminar in Instrumentation 2** May be repeated for credit. Course Prerequisite: MUS 351 or concurrent enrollment. Scoring for various instrumental combinations.
- 458 Advanced Jazz Improvisation 2** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: MUS 258. Advanced concepts in jazz improvisation.
- 465 Seminar in Major Performance Literature 2** May be repeated for credit; cumulative maximum 6 hours. Survey/performance of solo and chamber literature for voice, keyboard, strings, winds, brass, percussion.
- 482 Instrumental Conducting 1 (0-3)** Techniques and patterns in conducting as applied to orchestra and band literature; score preparation and rehearsal techniques for instrumental ensembles.
- 483 Choral Conducting 1 (0-3)** Techniques and patterns in conducting as applied to choral literature; score preparation and rehearsal techniques for choral ensembles.
- 487 String Techniques 2 (0-6)** String techniques, materials and methods for music education majors.
- 493 Wind and Percussion Techniques I 2 (0-6)** Brass, woodwind, and percussion techniques for music education majors.
- 494 Wind and Percussion Techniques II 2 (0-6)** Course Prerequisite: MUS 493. Brass, woodwind and percussion techniques; elementary instrument conducting for music education majors.

- 498 Piano Pedagogy Practicum 2** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: MUS 202, 302, or 402. Piano Pedagogy Practicum 2 Supervised teaching in Piano Preparatory Lab School, including lesson planning and meetings with coordinator for critiques and suggestions.
- 501 Organ V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 502 Piano V 2-4** May be repeated for credit.
- 503 Voice V 2-4** May be repeated for credit.
- 504 French Horn V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 505 Trumpet V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 506 Trombone V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 507 Euphonium V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 508 Tuba V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 509 Percussion V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 510 Violin V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 511 Viola V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 512 Violoncello V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 513 Contrabass V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 514 Flute V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 515 Oboe V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 516 Clarinet V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 517 Bassoon V 2** (0-6) to 4 (0-12) May be repeated for credit.
- 518 Saxophone V 2-4** May be repeated for credit.
- 519 Secondary Performance Study V 1-2** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Instruction on instruments or voice other than major performing medium.
- 520 Commercial Guitar V 2** (0-6) to 4 (0-12) V 2 (0-6) to 4 (0-12) Broad study of American guitar styles, including jazz, rock, finger style, blues, funk, Brazilian, R&B, folk, bluegrass, country, old-time, and even some European art music.
- 522 Graduate Recital 2** May be repeated for credit; cumulative maximum 4 hours. Private screening and public performance as required within each performance emphasis.
- 528 Opera Workshop 1** (0-4) May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Public performance may be required. Credit not granted for both MUS 428 and MUS 528.
- 531 Concert Choir 1** (0-4) May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Auditioned choral ensemble studying and performing global music of varying cultures, language, period, style, and tradition. Credit not granted for both MUS 431 and MUS 531.
- 533 Vocal Ensembles 1** (0-4) May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Study, rehearse, perform, and review original works and transcriptions for symphony orchestra; public performance each semester. Credit not granted for both MUS 433 and MUS 533.
- 534 Symphony Orchestra 1** (0-4) May be repeated for credit. Study, rehearse, perform and review original works and transcriptions for symphony orchestra; public performance each semester.
- 535 Chamber Ensembles 1** May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Public performance may be required. Credit not granted for both MUS 435 and MUS 535.
- 537 Wind Symphony 1** (0-4) May be repeated for credit. Large ensemble; public performances each semester. Credit not granted for both MUS 437 and MUS 537.
- 538 Jazz-Lab Band 1** (0-4) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Jazz big band. Public performances each semester. Credit not granted for both MUS 438 and MUS 538.
- 539 Vocal Jazz Ensemble 1** (0-4) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. The majority of this group is made up of non-music majors. Public performances each semester. Credit not granted for both MUS 439 and MUS 539.
- 540 Jazz Combos 1** (0-4) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Public performances each semester. Credit not granted for both MUS 440 and MUS 540.
- 541 Accompanying 1** (0-4) May be repeated for credit.
- 550 Seminar in Analysis 2** May be repeated for credit; cumulative maximum 4 hours. Applications of analytical techniques to develop a basis for musical understanding and interpretation.
- 553 Seminar in Music Theory 2** May be repeated for credit; cumulative maximum 4 hours.
- 556 Graduate Seminar in Advanced Composition V 2** (1-2) to 3 (1-3) May be repeated for credit; cumulative maximum 10 hours. The creation of works for either traditional acoustic ensembles or electro-acoustic media.
- 559 Seminar in Advanced Jazz Composition V 1** (0-2) to 3 (0-6) May be repeated for credit; cumulative maximum 12 hours. Creation of works for Jazz Ensembles. Credit not granted for both MUS 459 and MUS 559.
- 560 Introduction to Graduate Studies in Music 2** Required of all graduate students in music. Basic bibliographic and research techniques; written presentations related to area of emphasis.

- 561 Seminar in Literature of 20th Century Music 2** Impressionism, expressionism, neoclassicism, neoromanticism, jazz and recent electronic music.
- 562 Seminar in Major Ensemble Literature 2** May be repeated for credit; cumulative maximum 6 hours. Ensemble literature for symphony orchestra, choral or jazz ensembles.
- 566 Seminar in Music History 2** May be repeated for credit; cumulative maximum 6 hours. Various historic periods and composers.
- 575 Advanced Conducting V 2-3** May be repeated for credit. Rehearsing orchestras, bands, and choruses. Public performance may be required.
- 580 Instrumental Music Education 3** Philosophies, administration, organization, materials and methods for instrumental music education K-12. Credit not granted for both MUS 480 and MUS 580.
- 586 Seminar in Piano Pedagogy 2** Course Prerequisite: Mus 502. Materials and methods of teaching experiences.
- 588 Choral Methods and Materials I 2 (0-6)** Preparation in the administration of choral programs from auditions to the selection and rehearsal of choral literature. Credit not granted for both MUS 488 and MUS 588.
- 589 Choral Methods and Materials II 2** Course Prerequisite: Mus 588. Development of skills in choral arranging, curriculum construction, research, and job placement. Credit not granted for both MUS 489 and MUS 589.
- 590 General Music Material/Methods 4 (3-2)** Materials and methods for general music education majors; multiculturalism, collaboration, developmental curriculum and research issues; addressing national standards; observations. Credit not granted for both MUS 490 and MUS 590.
- 591 Voice Pedagogy 2 (1-3)** Anatomy of the singing process; methodology of teaching voices in various learning and teaching styles. Credit not granted for both MUS 491 and MUS 591.
- 596 Topics in Music V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Graduate counterpart of MUS 496; additional requirements.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Music

Degree offered: Master of Arts in Music - Non Thesis

Faculty working with graduate students: 27

Graduate students: 18

Graduate students receiving assistantships or scholarships: 66%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

A graduate recital is required in the performance emphasis, including the conducting emphasis.

Program Description

The School of Music offers the degree Master of Arts in Music, which may be earned through studies in the areas of music education, composition, music history and literature, conducting, and performance studies. Though selection of an emphasis is not required, four emphases are available. The emphasis in music education provides advanced studies for experience and prospective teachers. The emphases in performance and composition are selected by students wishing to teach at the college level or intending to enter such professions as music performance, conducting, composing and arranging. Students electing the jazz emphasis focus on one or more aspects of jazz music - performance, composition, arranging, pedagogy, or history for example - in preparation for careers in jazz. The program offers both thesis and non-thesis options, designed according to the goals of the student. Composition emphasis students must complete the thesis option. The Master of Arts in Music degree offered by the Music Program is flexible and provides students the opportunity to develop a unique program of study to satisfy individual interests and goals. The intention of the Music Program and its Graduate Faculty is to provide the best of instruction to our graduate students, maintaining the highest of standards.

Degree Description

The music program in the School of Music offers the degree of Master of Arts in music, which may be earned through study in areas of music education, composition, music history and literature, conducting, and performance studies. Four emphases are available: -Music education--Provides advanced studies for experienced or prospective teachers. -Performance--selected by students wishing to teach at the college level or enter professions such as music performance and conducting. -Composition--prepares students to enter professions in music such as composition and arranging. -Jazz emphasis--focuses on one or more aspects of jazz music - performance, composition,

arranging, pedagogy, or history for example - in preparation for careers in jazz. The degree may also be completed without an emphasis. The program offers both thesis and non-thesis options, designed according to the goals of the student. Composition emphasis students must complete the thesis option.

Training and Professional Development Opportunities

Graduate students have opportunities to conduct and rehearse ensembles; teach undergraduate courses; perform and make recordings with world acclaimed faculty artists; prepare for major competitions in performance and composition; and tour nationally and internationally with performance ensembles. WSU graduate students have won numerous awards in major competitions for performance and composition. Recent graduates have been featured in Downbeat magazine and been successful in publishing their compositions.

Post-Graduate Career Placements

Graduate students in music have achieved teaching positions at major universities, community colleges and public schools throughout the United States, including the Director of Jazz Studies at West Valley College in Saratoga, CA; teaching position at the Joy of Music Academy in Boston; and teacher position at the American School in Rome, Italy. Other students have continued their postgraduate work at other prestigious schools of music and performed at major music festivals.

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Faculty

Meredith Arksey, Matthew Aubin, Gerald Berthiaume, Ruth Boden, Brian Carter, Sheila Converse, Christopher Dickey, David Hagelganz, Ryan Hare, Donald Hower, David Jarvis, Dean Luethi, Keri McCarthy, Michelle Mielke, William Payne, Danh Pham, Jeffrey Savage, Karen Savage, Jill Schneider, Shannon Scott, Frederick Snider, David Turnbull, Brian Ward, Julie Wieck, Lori Wiest, Ann Yasinitsky and Gregory Yasinitsky.

MUS

- 362 History of Jazz 3** History of jazz in chronological sequence; social and political contexts of the African-American origins of jazz; stylistic developments.
- 363 Women in Music 3** Intersections of gender, class, race, and culture with popular and country music. (Cross-listed course offered as MUS 363, WOMEN ST 363).
- 364 Introduction to Sound Recording Technology 3** Music, audio and recording technology throughout history and its influence on society and culture.
- 371 Diction for Singers I 2** Italian and English; International Phonetic Alphabet; fundamental diction principles, applied to each language and oriented to needs of the singer.
- 372 Diction for Singers II 2** Course Prerequisite: MUS 371. French and German; International Phonetic Alphabet; fundamental diction principles, applied to each language and oriented to needs of the singer.
- 388 Music for the Classroom Teacher 2** Course Prerequisite: Certified major in Elementary Education; MUS 153. Singing, movement, listening and instrumental methods/resources for K-8 grades.
- 432 University Singers 1 (0-4)** May be repeated for credit. Public performance may be required. Non-auditioned choir consisting of 70+ singers. The majority of this group is made up of non-music majors.
- 444 Marching Band/Varsity Band 1 (0-4)** May be repeated for credit.
- 451 Seminar in Counterpoint 2** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: MUS 351 or concurrent enrollment. Contrapuntal techniques of the 16th and 18th century with original stylistic writing.
- 452 Electronic Music 2 (1-3)** Course Prerequisite: MUS 353 or concurrent enrollment. Introduction to computer-controlled digital, analog, and sampling synthesis; topics include sequencing, waveform editing, and creative projects.
- 455 Seminar in Instrumentation 2** May be repeated for credit. Course Prerequisite: MUS 351 or concurrent enrollment. Scoring for various instrumental combinations.
- 458 Advanced Jazz Improvisation 2** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: MUS 258. Advanced concepts in jazz improvisation.
- 465 Seminar in Major Performance Literature 2** May be repeated for credit; cumulative maximum 6 hours. Survey/performance of solo and chamber literature for voice, keyboard, strings, winds, brass, percussion.
- 482 Instrumental Conducting 1 (0-3)** Techniques and patterns in conducting as applied to orchestra and band literature; score preparation and rehearsal techniques for instrumental ensembles.
- 483 Choral Conducting 1 (0-3)** Techniques and patterns in conducting as applied to choral literature; score preparation and rehearsal techniques for choral ensembles.
- 487 String Techniques 2 (0-6)** String techniques, materials and methods for music education majors.
- 493 Wind and Percussion Techniques I 2 (0-6)** Brass, woodwind, and percussion techniques for music education majors.
- 494 Wind and Percussion Techniques II 2 (0-6)** Course Prerequisite: MUS 493. Brass, woodwind and percussion techniques; elementary instrument conducting for music education majors.
- 498 Piano Pedagogy Practicum 2** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: MUS 202, 302, or 402. Piano Pedagogy Practicum 2 Supervised teaching in Piano Preparatory Lab School, including lesson planning and meetings with coordinator for critiques and suggestions.
- 501 Organ V 2 (0-6) to 4 (0-12)** May be repeated for credit.

- 502 **Piano V** 2-4 May be repeated for credit.
- 503 **Voice V** 2-4 May be repeated for credit.
- 504 **French Horn V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 505 **Trumpet V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 506 **Trombone V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 507 **Euphonium V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 508 **Tuba V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 509 **Percussion V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 510 **Violin V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 511 **Viola V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 512 **Violoncello V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 513 **Contrabass V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 514 **Flute V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 515 **Oboe V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 516 **Clarinet V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 517 **Bassoon V** 2 (0-6) to 4 (0-12) May be repeated for credit.
- 518 **Saxophone V** 2-4 May be repeated for credit.
- 519 **Secondary Performance Study V** 1-2 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Instruction on instruments or voice other than major performing medium.
- 520 **Commercial Guitar V** 2 (0-6) to 4 (0-12) V 2 (0-6) to 4 (0-12) Broad study of American guitar styles, including jazz, rock, finger style, blues, funk, Brazilian, R&B, folk, bluegrass, country, old-time, and even some European art music.
- 522 **Graduate Recital** 2 May be repeated for credit; cumulative maximum 4 hours. Private screening and public performance as required within each performance emphasis.
- 528 **Opera Workshop** 1 (0-4) May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Public performance may be required. Credit not granted for both MUS 428 and MUS 528.
- 531 **Concert Choir** 1 (0-4) May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Auditioned choral ensemble studying and performing global music of varying cultures, language, period, style, and tradition. Credit not granted for both MUS 431 and MUS 531.
- 533 **Vocal Ensembles** 1 (0-4) May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Study, rehearse, perform, and review original works and transcriptions for symphony orchestra; public performance each semester. Credit not granted for both MUS 433 and MUS 533.
- 534 **Symphony Orchestra** 1 (0-4) May be repeated for credit. Study, rehearse, perform and review original works and transcriptions for symphony orchestra; public performance each semester.
- 535 **Chamber Ensembles** 1 May be repeated for credit. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Public performance may be required. Credit not granted for both MUS 435 and MUS 535.
- 537 **Wind Symphony** 1 (0-4) May be repeated for credit. Large ensemble; public performances each semester. Credit not granted for both MUS 437 and MUS 537.
- 538 **Jazz-Lab Band** 1 (0-4) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Jazz big band. Public performances each semester. Credit not granted for both MUS 438 and MUS 538.
- 539 **Vocal Jazz Ensemble** 1 (0-4) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. The majority of this group is made up of non-music majors. Public performances each semester. Credit not granted for both MUS 439 and MUS 539.
- 540 **Jazz Combos** 1 (0-4) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By audition only; see <http://libarts.wsu.edu/music/audition/index.htm> for details. Public performances each semester. Credit not granted for both MUS 440 and MUS 540.
- 541 **Accompanying** 1 (0-4) May be repeated for credit.
- 550 **Seminar in Analysis** 2 May be repeated for credit; cumulative maximum 4 hours. Applications of analytical techniques to develop a basis for musical understanding and interpretation.
- 553 **Seminar in Music Theory** 2 May be repeated for credit; cumulative maximum 4 hours.
- 556 **Graduate Seminar in Advanced Composition** V 2 (1-2) to 3 (1-3) May be repeated for credit; cumulative maximum 10 hours. The creation of works for either traditional acoustic ensembles or electro-acoustic media.
- 559 **Seminar in Advanced Jazz Composition** V 1 (0-2) to 3 (0-6) May be repeated for credit; cumulative maximum 12 hours. Creation of works for Jazz Ensembles. Credit not granted for both MUS 459 and MUS 559.
- 560 **Introduction to Graduate Studies in Music** 2 Required of all graduate students in music. Basic bibliographic and research techniques; written presentations related to area of emphasis.
- 561 **Seminar in Literature of 20th Century Music** 2 Impressionism, expressionism, neoclassicism, neoromanticism, jazz and recent electronic music.
- 562 **Seminar in Major Ensemble Literature** 2 May be repeated for credit; cumulative maximum 6 hours. Ensemble literature for symphony orchestra, choral or jazz ensembles.
- 566 **Seminar in Music History** 2 May be repeated for credit; cumulative maximum 6 hours. Various historic periods and composers.

- 575 Advanced Conducting V** 2-3 May be repeated for credit. Rehearsing orchestras, bands, and choruses. Public performance may be required.
- 580 Instrumental Music Education 3** Philosophies, administration, organization, materials and methods for instrumental music education K-12. Credit not granted for both MUS 480 and MUS 580.
- 586 Seminar in Piano Pedagogy 2** Course Prerequisite: Mus 502. Materials and methods of teaching experiences.
- 588 Choral Methods and Materials I 2** (0-6) Preparation in the administration of choral programs from auditions to the selection and rehearsal of choral literature. Credit not granted for both MUS 488 and MUS 588.
- 589 Choral Methods and Materials II 2** Course Prerequisite: Mus 588. Development of skills in choral arranging, curriculum construction, research, and job placement. Credit not granted for both MUS 489 and MUS 589.
- 590 General Music Material/Methods 4** (3-2) Materials and methods for general music education majors; multiculturalism, collaboration, developmental curriculum and research issues; addressing national standards; observations. Credit not granted for both MUS 490 and MUS 590.
- 591 Voice Pedagogy 2** (1-3) Anatomy of the singing process; methodology of teaching voices in various learning and teaching styles. Credit not granted for both MUS 491 and MUS 591.
- 596 Topics in Music V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Graduate counterpart of MUS 496; additional requirements.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Natural Resource Sciences

Degree offered: Master of Science in Natural Resource Sciences

Faculty working with graduate students: 10

Graduate students: 12

Graduate students receiving assistantships or scholarships: 41%

Tests required: GRE (Combined), IELTS, TOEFL

Deadline: Fall: January 10

Spring: July 1

Requirements

Students are required to take NATRS 594 and NATRS 595, NATRS 700 plus one other grad level seminar in any discipline, including NATRS but not limited to.

Degree Description

The Department of Natural Resource Sciences offers programs of graduate study and research leading to a master of science in natural resource sciences and a master of sciences in natural resources. The M.S. in natural resource sciences emphasizes original research by the student. The program in natural resource sciences, and in environmental sciences and regional planning offer a joint Ph.D. degree. This degree provides an atmosphere of scholarship coupled with research opportunities that produces people capable of responding to the complicated issues of use, management, and protection of the environment and its natural resources. The department has laboratory facilities and greenhouses on campus. Field facilities are located at the 12,000 acre Colockum Multiple-Use Research Unit located near Wenatchee, WA. The University of Idaho is eight miles from the Pullman campus and offers cross-listed courses in conjunction with WSU in natural resource management and sciences.

Contact Information

Marlene Guse

Faculty

Keith Blatner, Matthew Carroll, Linda Hardesty, Raymond Jussaume, Barry Moore, Charles Robbins, Rodney Saylor, Lisa Shipley, Mark Swanson and Robert Wielgus.

Natural Resource Sciences

NATRS

- 519 Advanced Topics V** 1-3 May be repeated for credit; cumulative maximum 6 hours.
- 535 Wildlife Ecology 4** (3-3) The ecology of wildlife species and the contributing biological processes. Overnight field trip required.
- 550 Conservation Biology 3** Patterns of biological diversity, factors producing changes in diversity, values of diversity, management principles applied to small populations, protected areas, landscape linkages, biotic integrity, restoration, legal issues and funding sources. Credit not granted for both NATRS 450 and NATRS 550.
- 554 Restoration Ecology 3** (2-3) Ecological principles used to restore biological communities; ecological processes and species on degraded landscapes. Credit not granted for both NATRS 454 and NATRS 554.
- 556 Foraging Ecology of Herbivores 2** Synthesis of foraging behavior concepts including nutritive quality of forages, digestive and metabolic constraints, and diet and habitat selection.

- 560 Watershed Management 3** Principles and practices of management of forest and rangelands for protection, maintenance, and improvement of water resource values. Field trip required. Recommended preparation: NATRS 204 or sufficient background in spreadsheets.
- 564 Landscape Ecology 3 (2-3)** Linkages between spatial patterns and processes in a variety of landscapes and the qualitative tools used in the investigation of these linkages. Credit not granted for both NATRS 464 and NATRS 564.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 595 Seminar in Natural Resource Sciences 1** May be repeated for credit. Literature review; preparation and presentation of reports in natural resource sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Natural Resource Sciences

Degree offered: Master of Science in Natural Resource Sciences – Non Thesis

Tests required: GRE (Combined), IELTS, TOEFL

Deadline: Fall: 1
Spring: July 1

Degree Description

The Department of Natural Resource Sciences offers programs of graduate study and research leading to a master of science in natural resource sciences and a master of sciences in natural resources. The M.S. in natural resource sciences emphasizes original research by the student. The program in natural resource sciences, and in environmental sciences and regional planning offer a joint Ph.D. degree. This degree provides an atmosphere of scholarship coupled with research opportunities that produces people capable of responding to the complicated issues of use, management, and protection of the environment and its natural resources. The department has laboratory facilities and greenhouses on campus. Field facilities are located at the 12,000 acre Colocum Multiple-Use Research Unit located near Wenatchee, WA. The University of Idaho is eight miles from the Pullman campus and offers cross-listed courses in conjunction with WSU in natural resource management and sciences.

Neuroscience

Degree offered: Doctor of Philosophy (Neuroscience)

Faculty working with graduate students: 45

Graduate students: 32

Graduate students receiving assistantships or scholarships: 100%

Program offered: Pullman, Spokane, Vancouver

Tests required: GRE (Combined), TOEFL

Deadline: Fall: December 31

Program Description

Neuroscience, the study of the brain and central nervous system, is a multidisciplinary program leading to the Master of Science and Doctor of Philosophy degree. The neuroscience field plays an important role in both human and animal biomedical science. Innovations by Washington State University neuroscientists advance the world's understanding of how nerves and brain chemicals produce our feelings and behaviors and how poor health results from disturbances in the delicate organization of the brain. Neuroscience seeks to answer questions that touch on nearly every aspect of human life, including feeling, eating, sleeping, remembering, sensing, and maintaining health.

Degree Description

Neuroscience, the study of the brain and central nervous system, is a multidisciplinary program leading to the Master of Science and Doctor of Philosophy degree. The neuroscience field plays an important role in both human and animal biomedical science. Innovations by Washington State University neuroscientists advance the world's understanding of how nerves and brain chemicals produce our feelings and behaviors and how poor health results from disturbances in the delicate organization of the brain. Neuroscience seeks to answer questions that touch on nearly every aspect of human life, including feeling, eating, sleeping, remembering, sensing, and maintaining health.

Training and Professional Development Opportunities

N/A

Post-Graduate Employment Opportunities

Post-Doctoral Fellow at Higher Education Institutions, Industry (e.g. pharmaceutical, biotech)

Post-Graduate Career Placements

Post-Doctoral Fellow at Higher Education Institutions, faculty at Higher Education Institutions, Industry (e.g. pharmaceuticals, biotech)

Contact Information

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Faculty

Bruce Becker, Gregory Belenky, R Brown, Murali Chandra, Allison Coffin, Rebecca Craft, Krzysztof Czaja, Christopher Davis, Alexander Dimitrov, Wenji Dong, Samantha Gizerian, Joseph Harding, Barbara Ingermann, Heiko Jansen, Levente Kapas, Iliia Karatsoreos, James Krueger, David Lin, Peter Meighan, Starla Meighan, Michael Morgan, Jaak Panksepp, James Peters, Christine Portfors, Raymond Quock, Robert Ritter, W Ritter, John Roll, Maureen Schmitter-Edgecombe, Steve Simasko, Bryan Slinker, Leslie Sprunger, Deborah Stenkamp, Eva Szentirmai, Bertrand Tanner, Hans Van Dongen, Michael Varnum, Anita Vasavada, Brendan Walker, Gary Wayman, Suzanne Wayman, Paul Whitney, Jonathan Wisor, John Wright and Jun Xu.

MBIOS

303 Introductory Biochemistry 4 Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

NEURO

404 Neuroanatomy 4 (3-3) Course Prerequisite: NEUROSCI 301 or NEUROSCI 302. Fundamental principles of the organization and plans of circuitry of the nervous system.

430 Principles of Neurophysiology 4 (3-3) Course Prerequisite: BIOLOGY 107; NEUROSCI 301 or NEUROSCI 302; PHYSICS 102, 202 or 206. Advanced exploration of the principles underlying cellular, sensory, motor and integrative functions of the nervous system. Recommended preparation: MBIOS 303.

STAT

412 Statistical Methods in Research I 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.

501 Cell Biology 3 Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.

503 Advanced Molecular Biology I 3 DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.

504 Advanced Molecular Biology II 3 Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.

505 Cell Biology of Disease 3 Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.

507 Critical Analysis of Scientific Literature 2 Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.

508 Quantitative Approaches in Molecular Biosciences 2 Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.

513 General Biochemistry 3 Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.

514 General Biochemistry 3 Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.

528 Molecular and Cellular Reproduction 3 (2-2) State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).

529 Selected Topics in Cell Biology 1 Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.

540 Immunology 3 Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.

541 Research Seminar 1 May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.

542 General Virology 3 The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.

548 Selected Topics in Immunology & Virology 1 May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.

549 Seminar in Immunology 1 May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.

- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 509 Affective Neuroscience 3** Brain mechanisms of human and animal emotions. Credit not granted for both NEUROSCI 409 and NEUROSCI 509.
- 520 Fundamentals of Neuroscience 4 (3-3)** Functional aspects of the brain from cell membrane to higher integrative processes.
- 521 Introduction to Veterinary Neurology 3 (2-3)** Course Prerequisite: VET MED 510. Neuroanatomical and neurophysiological bases of veterinary neurology, emphasizing central and peripheral sensory and motor systems. (Cross-listed course offered as VET MED 521, NEUROSCI 521).
- 526 Domestic and Exotic Animal Behavior 2 (1-3)** Course Prerequisite: Veterinary Medicine student. Advanced study of animal behavior, emphasizing difference between exotic and domestic animal behavior. (Cross-listed course offered as VET MED 526, NEUROSCI 526).
- 529 Integrative Neuroscience 3** Basic biochemical processes in the nervous system and their significance for normal and abnormal function.
- 531 Neuroscience Laboratory Rotation 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Fourteen-week rotation through each of two research laboratories; learning procedures and techniques in neuroscience.
- 540 Special Topics in Integrative Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience involving integrative properties of cell systems.
- 541 Special Topics in Cellular and Molecular Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve nerve cell function and regulation.
- 542 Special Topics in Interdisciplinary Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that revolve around traditional approaches to nervous system study.

- 543 Special Topics in Behavioral/Clinical Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve normal and pathological aspects of behavior.
- 590 Seminar 1** May be repeated for credit; cumulative maximum 7 hours. Presented by advanced graduate students and faculty (both in VCAPP and around WSU) on their research areas.
- 592 Research Writing and Seminar 3** May be repeated for credit; cumulative maximum 6 hours. Written and oral communication of scientific information; formal instruction while preparing research proposals and departmental seminar.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Advanced Logic 3** First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.
- 504 Special Topics in Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of a special topic not otherwise covered in depth in the curriculum.
- 507 Seminar in Philosophy of Religion 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topic-driven seminar. Critical analysis of traditional and contemporary religions and religious phenomena. Credit not granted for both PHIL 407 and PHIL 507.
- 510 Seminar in the History of Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Systematic exploration of the central works of an individual philosopher or philosophical movement.
- 520 Seminar in Ethical Theory 3** The major issues, views, and figures of ethical theory from ancient Greece to the present.
- 522 Seminar in Metaphysics 3** The nature of reality, through study of key concepts such as God, personhood, free will, causation, space, time, and identity.
- 524 Seminar in Epistemology 3** Classical problems, questions, and theories involving the concept of knowledge.
- 530 Bioethics 2** Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.
- 532 Seminar in Business Ethics 3** The major issues in business ethics, both domestic and international, from general principles to specific cases.
- 535 Advanced Biomedical Ethics 3** Current ethical issues in medical practice, medical research and public policy relating to health issues.
- 540 Ethics and Social Science Research 3** Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 Philosophy of Language 3** Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 Philosophy of Law 3** Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph. D student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.

- 511 Analysis of Variance and Experimental Design 3** Course
Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course
Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3**
May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course
Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course
Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.

- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Pre-requisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Pre-requisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Pre-requisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.

- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 580 Leadership Development V 1-3** Course Prerequisite: By permission only. Meetings and workshops designed to develop professional and leadership skills for doctoral students.
- 590 Preparation for College Teaching 2** Cross-discipline instructional development for graduate teaching assistants; course development teaching techniques, university policies and procedures.
- 591 Interdisciplinary Studies 1** May be repeated for credit. Contemporary issues in interdisciplinary education and research. Open to all interested students.
- 597 Preparing the Future Professoriate 2** Course Prerequisite: By permission only. Understanding and contextual knowledge of the professoriate and issues facing higher education.
- 598 Interdisciplinary Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Seminar on theory and practice of advanced interdisciplinary doctoral study.
- 698 Continuous Enrollment Status 0** This course (no credit earned) satisfies continuous enrollment status for graduate students who are not otherwise enrolled.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 899 Continuing Doctoral Status 0** May be repeated for credit; cumulative maximum 0 hours. Continuing Doctoral Status
- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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Neuroscience

Degree offered: Master of Science in Neuroscience

Faculty working with graduate students: 47

Graduate students: 2

Graduate students receiving assistantships or scholarships: 100%

Program offered: Pullman, Spokane, Vancouver

Tests required: GRE (Combined), TOEFL

Deadline: Fall: December 31

Program Description

Neuroscience, the study of the brain and central nervous system, is a multidisciplinary program leading to the Master of Science and Doctor of Philosophy degree. The neuroscience field plays an important role in both human and animal biomedical science. Innovations by Washington State University neuroscientists advance the world's understanding of how nerves and brain chemicals produce our feelings and behaviors and how poor health results from disturbances in the delicate organization of the brain. Neuroscience seeks to answer questions that touch on nearly every aspect of human life, including feeling, eating, sleeping, remembering, sensing, and maintaining health.

Degree Description

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Training and Professional Development Opportunities

n/a

Post-Graduate Employment Opportunities

Continue to PhD degree, Industry (e.g. pharmaceutical, biotech)

Post-Graduate Career Placements

Continue to PhD degree, Industry (e.g. pharmaceutical, biotech)

Contact Information

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Manager

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Faculty

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MBIOS

303 Introductory Biochemistry 4 Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

STAT

412 Statistical Methods in Research I 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.

501 Cell Biology 3 Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.

503 Advanced Molecular Biology I 3 DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.

504 Advanced Molecular Biology II 3 Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.

505 Cell Biology of Disease 3 Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.

507 Critical Analysis of Scientific Literature 2 Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.

508 Quantitative Approaches in Molecular Biosciences 2 Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.

513 General Biochemistry 3 Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.

514 General Biochemistry 3 Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.

528 Molecular and Cellular Reproduction 3 (2-2) State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).

- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 509 Affective Neuroscience 3** Brain mechanisms of human and animal emotions. Credit not granted for both NEUROSCI 409 and NEUROSCI 509.
- 520 Fundamentals of Neuroscience 4 (3-3)** Functional aspects of the brain from cell membrane to higher integrative processes.

- 521 Introduction to Veterinary Neurology 3 (2-3) Course** Prerequisite: VET MED 510. Neuroanatomical and neurophysiological bases of veterinary neurology, emphasizing central and peripheral sensory and motor systems. (Cross-listed course offered as VET MED 521, NEUROSCI 521).
- 526 Domestic and Exotic Animal Behavior 2 (1-3) Course** Prerequisite: Veterinary Medicine student. Advanced study of animal behavior, emphasizing difference between exotic and domestic animal behavior. (Cross-listed course offered as VET MED 526, NEUROSCI 526).
- 529 Integrative Neuroscience 3** Basic biochemical processes in the nervous system and their significance for normal and abnormal function.
- 531 Neuroscience Laboratory Rotation 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Fourteen-week rotation through each of two research laboratories; learning procedures and techniques in neuroscience.
- 540 Special Topics in Integrative Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience involving integrative properties of cell systems.
- 541 Special Topics in Cellular and Molecular Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve nerve cell function and regulation.
- 542 Special Topics in Interdisciplinary Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that revolve around traditional approaches to nervous system study.
- 543 Special Topics in Behavioral/Clinical Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve normal and pathological aspects of behavior.
- 590 Seminar 1** May be repeated for credit; cumulative maximum 7 hours. Presented by advanced graduate students and faculty (both in VCAPP and around WSU) on their research areas.
- 592 Research Writing and Seminar 3** May be repeated for credit; cumulative maximum 6 hours. Written and oral communication of scientific information; formal instruction while preparing research proposals and departmental seminar.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 501 Advanced Logic 3** First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.
- 504 Special Topics in Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of a special topic not otherwise covered in depth in the curriculum.
- 507 Seminar in Philosophy of Religion 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topic-driven seminar. Critical analysis of traditional and contemporary religions and religious phenomena. Credit not granted for both PHIL 407 and PHIL 507.
- 510 Seminar in the History of Philosophy 3** May be repeated for credit; cumulative maximum 6 hours. Systematic exploration of the central works of an individual philosopher or philosophical movement.
- 520 Seminar in Ethical Theory 3** The major issues, views, and figures of ethical theory from ancient Greece to the present.
- 522 Seminar in Metaphysics 3** The nature of reality, through study of key concepts such as God, personhood, free will, causation, space, time, and identity.
- 524 Seminar in Epistemology 3** Classical problems, questions, and theories involving the concept of knowledge.
- 530 Bioethics 2** Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.
- 532 Seminar in Business Ethics 3** The major issues in business ethics, both domestic and international, from general principles to specific cases.
- 535 Advanced Biomedical Ethics 3** Current ethical issues in medical practice, medical research and public policy relating to health issues.
- 540 Ethics and Social Science Research 3** Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 Philosophy of Language 3** Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 Philosophy of Law 3** Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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- 515 Multilevel and Synthesized Data** 3 Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software** 3 Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy** 3 Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues** 3 Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology** 3 Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology** 3 Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis** 3 Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment** 3 Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum** 3 May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment** 3 Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology** 3 Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy** 3 Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions** 3 Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum** 3 (0-9) May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V** 1-3 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.

- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 580 Leadership Development V 1-3** Course Prerequisite: By permission only. Meetings and workshops designed to develop professional and leadership skills for doctoral students.
- 590 Preparation for College Teaching 2** Cross-discipline instructional development for graduate teaching assistants; course development teaching techniques, university policies and procedures.
- 591 Interdisciplinary Studies 1** May be repeated for credit. Contemporary issues in interdisciplinary education and research. Open to all interested students.
- 597 Preparing the Future Professoriate 2** Course Prerequisite: By permission only. Understanding and contextual knowledge of the professoriate and issues facing higher education.
- 598 Interdisciplinary Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Seminar on theory and practice of advanced interdisciplinary doctoral study.
- 698 Continuous Enrollment Status 0** This course (no credit earned) satisfies continuous enrollment status for graduate students who are not otherwise enrolled.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 899 Continuing Doctoral Status 0** May be repeated for credit; cumulative maximum 0 hours. Continuing Doctoral Status
- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.

- 555 General and Cellular Physiology 4** (3-3) Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nuclear Engineering – Cert in Nuclear Eng

Degree offered: Graduate Certificate in Nuclear Engineering

Faculty working with graduate students: 30

Graduate students: 5

Program offered: Pullman, Tri-Cities

Deadline: Fall: January 10
Spring: July 1

Requirements

Students must complete a minimum of 9 credits (of which 6 credits must be at the 500-level) from the following list of 3-credit courses: ME 461 Intro to Nuclear Engineering, ME 483 Topics in ME: Nuclear Safeguards and Security, ME 565 Nuclear Reactor Engineering, ME 579 Advanced Topics in ME: Nuclear Reactor Engineering, Chem 550 Special Topics: Nuclear Processes and Radioactive Waste Management. Note: courses in which a grade of B- or below is obtained may not count towards completion of the requirements.

Program Description

Our nation is in the early stages of a nuclear energy renaissance. Nuclear energy shows promise as a carbon free energy source to address growing energy demands. This certificate program will benefit students who wish to pursue employment opportunities in the nuclear industry. The program provides formal academic coursework to engineers whose training is in a non-nuclear discipline or graduate students who wish to have an emphasis in this area. Studies show that only a small portion of engineers employed in the nuclear industry (approximately five percent) have a nuclear engineering degree. Thus, this approach supplies the

needs and expectations of the current and future industry.

Degree Description

This certificate program provides formal academic coursework to engineers whose training is in a non-nuclear discipline or graduate students who wish to have an emphasis in this area. Students must complete a minimum of nine credits (of which six credits must be at the 500-level) from a specific list of courses found at <http://www.mme.wsu.edu/grad/certificate.html>.

Training and Professional Development Opportunities

None.

Post-Graduate Employment Opportunities

This certificate program will benefit students who wish to pursue employment opportunities in the nuclear industry.

Contact Information

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Mechanical Engineering

M E

- 461 Introduction to Nuclear Engineering 3** Course Prerequisite: Certified major in engineering or physical sciences; senior standing; MATH 315. Applied nuclear physics; application to the nuclear fuel cycle and nuclear reactor core design; nuclear reactor systems and safety. (Cross-listed course offered as ME 461, CHE 461).
- 483 Topics in Mechanical Engineering V** 1 (0-4) to 4 (0-16) May be repeated for credit; cumulative maximum 7 hours. Contemporary topics in materials engineering.
- 501 Advanced Inorganic Chemistry I** 3 Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry V** 1-3 May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory** 3 Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.

- 510 Introduction to Proteomics 2** Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis 2** Methods for the measurement of biological compounds.
- 514 Mass Spectrometry 2** Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography 2** Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry 2** Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry 3** Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers 2** Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory 1 (0-3)** Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry 2** Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry V 1-3** May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I 3** Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II 3** Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics 3** Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry 3** Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V 1-3** May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V 1-3** May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V** 1-3 May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nurse Educator – Cert in Nurse Educator

Degree offered: Graduate Certificate in Nurse Educator

Faculty working with graduate students: 20

Graduate students: 10

Program offered: Spokane, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: February 1

Spring: October 1

Requirements

- a bachelor's degree - admitted in the MN degree program- a minimum 3.00 grade point average in undergraduate work (exceptions may be made based on substantial evidence of extra-scholastic qualifications) - successful completion of a basic statistics course - favorable recommendations regarding practice and potential for graduate work in nursing - RN license to practice nursing in Washington - written goal statement congruent with program's philosophy and focus - complete a written interview

Program Description

The Master's program in nursing at the College of Nursing is accredited by the Commission on Collegiate Nursing Education. The program builds upon an undergraduate degree in nursing and provides a basis for further study at the doctoral level. The purpose is to prepare students for leadership positions in

advanced nursing practice.

Degree Description

The nurse educator certificate program, a track within the Advanced Practice for Population Health (APH) graduate nursing program, includes the completion of four theory courses that focus on teaching and learning, with an emphasis on distance friendly educational pedagogy. The program also is open to post-Master's students wishing to focus on nursing education. Each course is designed to be primarily web based with some videoconferencing class sessions. Additional practicum experiences can be arranged; the NURS 556 capstone practicum (a requirement for all APH students) also offers opportunities for an educational focus. A certificate will be awarded upon completion of all requirements for the MN degree/education track.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

Nurse educator

Post-Graduate Career Placements

Teaching positions in colleges of nursing

Contact Information

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Faculty

Carol Allen, Mary Bayne, Sandra Benavides-Vaello, Ruth Bindler, Debra Brinker, Patricia Butterfield, Joan Caley, Cynthia Corbett, Dawn Doutrich, Alice Dupler, Linda Eddy, Phyllis Eide, Renee Hoeksel, Janet Katz, Janet Lohan, Julie Postma, Denise Smart, Janet Spuck, Catherine Van Son and Roxanne Vandermause.

NURS

503 Scientific Inquiry in Nursing 2 Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.

- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V 1** (0-3) to 4 (0-12) Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V 1** (0-3) to 4 (0-12) Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V 3** (0-9) to 5 (0-15) Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.
- 521 Teaching, Learning and Evaluation in Nursing V 3-6** Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
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- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.
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- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4** (3-3) Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4** (3-3) Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.

- 546 Practicum in Psychiatric/Mental Health Nursing V** 4 (1-9) to 5 (1-12) Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
- 548 Psychiatric Nurse Practitioner Internship V** 1-9 May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V** 2-4 Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology: principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V** 2-6 Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3** (2-3) Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V** 2-3 Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4** (1-9) Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4** (1-9) Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
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- 570 Clinical Decision Making 1** (0-3) Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
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- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V** 2-3 Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.

- 578 Plateau Tribes: Culture and Health 3** (2-3) Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1** (0-3) to 5 (0-15) Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
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- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
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- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nursing – Advanced Population Health

Degree offered: Doctor of Nursing Practice

Faculty working with graduate students: 55

Program offered: Spokane, Vancouver

Tests required: IELTS, TOEFL

Deadline: :
Summer/Fall: Default

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

The Doctor of Nursing Practice Advanced Population Health (DNP APH) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Training and Professional Development Opportunities

The DNP is a new program offered through Washington State University. Presently in the Master's in nursing program, 15-20 teaching assistantships per semester are available. HRSA scholarships to qualified disadvantaged full-time students, HRSA Advanced Nursing Education Traineeships, HRSA Nurse Faculty Loan Funds and College of Nursing scholarships are available for application.

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NURS

- 503 Scientific Inquiry in Nursing 2** Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.
- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.

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- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
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- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

799 Dissertation Seminar 1 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nursing – Advanced Population Health

Degree offered: Master of Nursing

Faculty working with graduate students: 55

Graduate students: 56

Graduate students receiving assistantships or scholarships: 12%

Program offered: Spokane, Tri-Cities, Vancouver

Tests required: IELTS, TOEFL

Deadline: Fall: January 10

Spring: July 1

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

The Master of Nursing Advanced Population Health (MN APH) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Post-Graduate Employment Opportunities

Community nurse educators and administrators.

Contact Information

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NURS

- 503 Scientific Inquiry in Nursing 2** Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.
- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V 3 (0-9) to 5 (0-15)** Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.
- 521 Teaching, Learning and Evaluation in Nursing V 3-6** Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.
- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
- 535 Philosophy of Nursing Science 2** Course prerequisite: Graduate standing in Nursing; NURS 534 or concurrent enrollment. Structure and organization of fields of knowledge in science including historical and philosophical tenets of inquiry.

- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4 (3-3)** Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V 4 (1-9) to 5 (1-12)** Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
- 548 Psychiatric Nurse Practitioner Internship V 1-9** May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V 2-4** Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology; principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V 2-6** Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3 (2-3)** Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
- 569 Primary Care of Families: Family 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1 (0-3)** Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.

- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3 (2-3)** Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V 2-3** Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3 (2-3)** Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

799 Dissertation Seminar 1 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nursing – Community–Based/Population Focused Care

Degree offered: Master of Nursing (Advanced Population Health)

Faculty working with graduate students: 57

Graduate students: 56

Graduate students receiving assistantships or scholarships: 12%

Program offered: Spokane, Tri–Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

This graduate program is designed to meet the needs of nurses who practice, teach or administer programs in community-based settings. The curriculum offers the following options to meet the needs of nurses providing leadership in a variety of settings: Administration, Education, and Individualized Study.

Post–Graduate Employment Opportunities

Community nurse educators and administrators.

Contact Information

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Carol Allen, Merry Armstrong, Jacquelyn Banasik, Celestina Barbosa-Leiker, Mary Bayne, Sandra Benavides-Vaello, Ruth Bindler, Debra Brinker, Patricia Butterfield, Joan Caley, Jennifer Cameron, Sandy Carollo, Cynthia Corbett, Neva Crogan, Kenn Daratha, Julie Dewitt-Kamada, Joann Dotson, Dawn Doutrich, Alice Dupler, Linda Eddy, Phyllis Eide, Cynthia Fitzgerald, Susan Fleming, Virginia Guido, Melvin Haberman, Laura Hahn, Valerie Hennessy, Renee Hoeksel, Donelle Howell, Shigeko Izumi, Margaret Jones, Suzan Kardong-Edgren, Janet Katz, Sarah Kooienga, Janet Lohan, Naomi Lungstrom, Anne Mason, Sterling McPherson, Randi Obrien, Tamara Odom-Maryon, Julie Postma, Janet Purath, Melody Rasmor, Barbara Richardson, John Roll, Dawn Rondeau, Allan Sanders, Lorna Schumann, Billie Severtsen, Michele Shaw, Kawkab Shishani, Robert Short, Denise Smart, Janet Spuck, Ryan Townsend, Catherine Van Son and Roxanne Vandermause.

NURS

503 Scientific Inquiry in Nursing 2 Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.

504 Evidence-Based Practice 3 Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.

505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12) Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.

506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12) Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.

507 Health Care Policy Analysis V 2-3 Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.

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512 Rural and Cultural Competencies for Population Health Practicum V 1-2 Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.

517 Quality Improvement and Program Evaluation 3 Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.

518 Translating Evidence into Practice 3 Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.

- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
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- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
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- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
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- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
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- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
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- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V 4 (1-9) to 5 (1-12)** Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
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- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V 2-4** Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology: principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.

- 556 Advanced Population Health V 2-6** Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3 (2-3)** Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
- 569 Primary Care of Families: Family 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1 (0-3)** Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3 (2-3)** Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V 2-3** Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3 (2-3)** Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.

- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

799 Dissertation Seminar 1 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nursing – Family Nurse Practitioner

Degree offered: Doctor of Nursing Practice

Faculty working with graduate students: 56

Program offered: Spokane, Vancouver

Tests required: IELTS, TOEFL

Deadline: Summer/Fall: Default

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

The Doctor of Nursing Practice Family Nurse Practitioner (DNP FNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Training and Professional Development Opportunities

The DNP is a new program offered through Washington State University. Presently in the Master's in nursing program, 15-20 teaching assistantships per semester are available. HRSA scholarships to qualified disadvantaged full-time students, HRSA Advanced Nursing Education Traineeships, HRSA Nurse Faculty Loan Funds and College of Nursing scholarships are available for application.

Contact Information

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PO Box 1495
Spokane, WA 99210-1495
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E-mail: kelleyt@wsu.edu

Faculty

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NURS

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- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
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Nursing – Family Nurse Practitioner

Degree offered: Master of Nursing (Family Nurse Practitioner)

Faculty working with graduate students: 63

Graduate students: 153

Graduate students receiving assistantships or scholarships: 32%

Program offered: Spokane, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: February 1
Spring: October 1

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

The MN degree program prepares advanced-practice nurses with leadership skills to plan, implement, coordinate and evaluate health care, as well as formulate policy for a diverse and multi-cultural society. It also prepares advanced-practice nurses to work with health care providers and those in other occupations to plan and provide high quality care. A post-Master's program is also available for nurse practitioner students.

Post-Graduate Employment Opportunities

Family Nurse Practitioner positions

Post-Graduate Career Placements

FNP positions such as clinics, offices, hospitals, in rural and urban areas.

Contact Information

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Faculty

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Nursing

Degree offered: Doctor of Philosophy (Nursing)

Faculty working with graduate students: 64

Graduate students: 28

Graduate students receiving assistantships or scholarships: 28%

Program offered: Spokane, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

The Doctor of Philosophy in Nursing (PhD) prepares you to advance the discipline of nursing science through a research-focused program emphasizing innovative approaches and leveraged resources to improve health care for all. Graduates of the program are equipped to become leaders in nursing education and research, critical roles in today's health care environment.

Post-Graduate Employment Opportunities

tenured faculty, researchers, and health care administration

Post-Graduate Career Placements

Colleges and schools of Nursing, Education and Research departments of hospitals and other health care environments, state and local government departments related to health care

Contact Information

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Faculty

Carol Allen, Merry Armstrong, Jacquelyn Banasik, Celestina Barbosa-Leiker, Mary Bayne, Sandra Benavides-Vaello, Ruth Bindler, Debra Brinker, Margaret Bruya, Patricia Butterfield, Joan Caley, Jennifer Cameron, Rebecca Cardell, Sandy Carollo, Cynthia Corbett, Neva Crogan, Kenn Daratha, Lorrie Dawson, Julie Dewitt-Kamada, Joann Dotson, Dawn Doutrich, Alice Dupler, Linda Eddy, Phyllis Eide, Roberta Emerson, Cynthia Fitzgerald, Susan Fleming, Virginia Guido, Melvin Haberman, Laura Hahn, Valerie Hennessy, Anne Hirsch, Stephen Hirsch, Renee Hoeksel, Donelle Howell, Shigeko Izumi, Margaret Jones, Suzan Kardong-Edgren, Janet Katz, Sarah Kooienga, Janet Lohan, Naomi Lungstrom, Anne Mason, Sterling McPherson, Randi Obrien, Tamara Odom-Maryon, Julie Postma, Janet Purath, Melody Rasmor, Barbara Richardson, John Roll, Dawn Rondeau, Allan Sanders, Lorna Schumann, Billie Severtsen, Michele Shaw, Kawkab Shishani, Robert Short, Denise Smart, Mary Sobralske, Janet Spuck, Ryan Townsend, Catherine Van Son and Roxanne Vandermause.

NURS

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- 505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
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- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
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- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4 (3-3)** Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
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- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V 2-4** Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
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- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
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- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
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- 569 Primary Care of Families: Family 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1 (0-3)** Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
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- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V 2-3** Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3 (2-3)** Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
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- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
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- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
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- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.

- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
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- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Tests required: IELTS, TOEFL

Deadline: Summer/Fall: Default

Program Description

The Doctor of Nursing Practice (DNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Degree Description

The Doctor of Nursing Practice Psychiatric/Mental Health Nurse Practitioner (DNP PMHNP) is a practice-focused degree that is designed to educate advanced practice nurses to provide direct care to individual patients; manage care for individuals, families, groups and populations; serve as administrators in health care organizations; engage as faculty in nursing programs; develop and implement health policy; and translate research into expert practice.

Training and Professional Development Opportunities

The DNP is a new program offered through Washington State University. Presently in the Master's in nursing program, 15-20 teaching assistantships per semester are available. HRSA scholarships to qualified disadvantaged full-time students, HRSA Advanced Nursing Education Traineeships, HRSA Nurse Faculty Loan Funds and College of Nursing scholarships are available for application.

Contact Information

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Cindy Fitzgerald
Director, DNP Program
E-mail: cefitzerald@wsu.edu

Mel Haberman
Director, MN and Certificate Programs
E-mail: mel.haberman@wsu.edu

Nursing – Psychiatric/Mental Health Nurse Practitioner

Degree offered: Doctor of Nursing Practice

Faculty working with graduate students: 41

Program offered: Spokane, Vancouver

Faculty

Carol Allen, Merry Armstrong, Jacquelyn Banasik, Celestina Barbosa-Leiker, Sandra Benavides-Vaello, Ruth Bindler, Patricia Butterfield, Cynthia Corbett, Neva Crogan, Kenn Daratha, Julie Dewitt-Kamada, Joann Dotson, Dawn Doutrich, Alice Dupler, Linda Eddy, Phyllis Eide, Cynthia Fitzgerald, Susan Fleming, Virginia Guido, Melvin Haberman, Renee Hoeksel, Donelle Howell, Shigeo Izumi, Suzan Kardong-Edgren, Janet Katz, Sarah Kooienga, Janet Lohan, Sterling McPherson, Tamara Odom-Maryon, Julie Postma, Janet Purath, John Roll, Dawn Rondeau, Lorna Schumann, Billie Severtsen, Michele Shaw, Kawkab Shishani, Robert Short, Denise Smart, Catherine Van Son and Roxanne Vandermause.

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- 595 Internship** V 1-10 May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar** 1 May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Nursing Leadership – Cert in Nursing Leadership

Degree offered: Graduate Certificate in Nursing Leadership

Faculty working with graduate students: 1

Graduate students: 5

Program offered: Spokane, Tri-Cities, Vancouver

Tests required: TOEFL, TOEFLI

Deadline: Fall: Default
Spring: Default

Program Description

The Master's program in nursing at the College of Nursing is accredited by the Commission on Collegiate Nursing Education. The program builds upon an undergraduate degree in nursing and provides a basis for further study at the doctoral level. The purpose is to prepare students for leadership positions in advanced nursing practice.

Degree Description

This certificate program has been designed for nurse administrators who are seeking advanced education in organizational leadership, quality management/care management, professional practice environments, organizational systems management and communications/collaboration. For certificate program completion, each student must successfully complete the following three credit hour theory courses: NURS 532, Resource Stewardship; NURS 565, Information Management for Clinical Practice; NURS 576, Organizational Leadership, and NURS 591, Quality Improvement/Outcomes and Program Evaluation. These courses explore key concepts relevant to today's healthcare marketplace and are presented from the perspective of multiple clinical practice settings, including acute care institutions, clinic and outpatient settings, public health environments, and community health settings. Students who complete these 12 hours of graduate level educational courses may be eligible to sit for the American Nurses Credentialing Center's Nurse Executive, Advanced certification, pending attainment of all eligibility criteria. Courses are taught in a hybrid mix of face-to-face and web-based delivery. Through web-based technology, educational software, streaming video, communication tools and electronic email, this program is accessible to potential and current nurse executives and other interested nurses in their home communities.

Training and Professional Development Opportunities

None

Post-Graduate Employment Opportunities

Leadership positions in agencies, hospitals, and clinics.

Contact Information

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Faculty

Carol Allen.

NURS

503 Scientific Inquiry in Nursing 2 Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.

504 Evidence-Based Practice 3 Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.

505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12) Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.

506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12) Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.

507 Health Care Policy Analysis V 2-3 Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.

511 Rural and Cultural Competencies for Population Health 2 Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.

512 Rural and Cultural Competencies for Population Health Practicum V 1-2 Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.

- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V 3 (0-9) to 5 (0-15)** Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.
- 521 Teaching, Learning and Evaluation in Nursing V 3-6** Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.
- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
- 535 Philosophy of Nursing Science 2** Course prerequisite: Graduate standing in Nursing; NURS 534 or concurrent enrollment. Structure and organization of fields of knowledge in science including historical and philosophical tenets of inquiry.
- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4 (3-3)** Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V 4 (1-9) to 5 (1-12)** Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
- 548 Psychiatric Nurse Practitioner Internship V 1-9** May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V 2-4** Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.

- 554 Epidemiology and Biostatistics for Health Professions 3**
Introduction to epidemiology: principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V 2-6** Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3 (2-3)** Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3**
Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
- 569 Primary Care of Families: Family 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1 (0-3)** Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3 (2-3)** Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V 2-3** Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3 (2-3)** Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.

- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Pharmaceutical Sciences

Degree offered: Doctor of Philosophy (Pharmaceutical Sciences)

Faculty working with graduate students: 32

Graduate students: 22

Graduate students receiving assistantships or scholarships: 100%

Program offered: Pullman, Spokane

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 7

Program Description

The College of Pharmacy Graduate Program prepares students to be successful professionals in academia, industry, health care, and private institutions dedicated to the promotion of human health and wellness.

Degree Description

The College of Pharmacy offers a Doctor of Philosophy in Pharmaceutical Sciences. This research-oriented program, which uses both human and animal models, prepares students for careers in independent research and teaching in pharmacology, pharmacotherapeutics, toxicology, and related fields.

Post-Graduate Employment Opportunities

The wide array of disciplines within the College of Pharmacy Graduate Programs provides an extensive range of career opportunities in pharmaceutical industry, biotechnology companies, specialty laboratories, government agencies, and academia.

Contact Information

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Physics

Degree offered: Doctor of Philosophy (Physics)

Faculty working with graduate students: 30

Graduate students: 69

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI, IELTS

Deadline: Fall: April 1

Spring: October 1

Requirements

Transfer credit is limited to no more than half of the total graded course credits required by the department for the master's degree. None of these credits may be applied toward another advanced degree at WSU. Students wanting to transfer course work should talk to the chair of the Graduate Studies Committee immediately upon enrolling at Washington State University. All transfer work under consideration must have a grade of "A-" or better and be no more than 10 years old at time of submission on the program of study. Additional restrictions may apply.

Program Description

The Department of Physics and Astronomy at Washington State University offers three graduate degrees: the doctorate, the thesis master's, and the non-thesis master's. They are designed to give every student a thorough background in the major areas of current research. We seek to provide an atmosphere that fosters intellectual growth and quantitative reasoning. We offer educational programs in physics and astronomy that engage students in teaching and research activities that provide the skills, knowledge, and ability for critical thinking that will enable them to be productive members of society. In the process, we will lay the foundations for technological advances that improve our quality of life. The department emphasizes a friendly, informal atmosphere, where students can tailor their programs to specific needs, interests and scholarship.

Degree Description

The Department of Physics and Astronomy doctoral program at Washington State University is designed to produce leaders in industry, in academia, and at national laboratories. The department's progressive environment seeks to provide an atmosphere that fosters intellectual growth and quantitative reasoning. The program engages students in teaching and research activities that provide the skills, knowledge, and ability for critical thinking that will enable them to be productive members of society. In the process, our goal is to lay the foundations for technological advances that improve our quality of life.

Post-Graduate Employment Opportunities

While the Department of Physics and Astronomy conducts research in the traditional areas of physics, it has enhanced its program by focusing on three areas of research excellence: Astrophysics, Extreme Matter, and Materials and Optics. Astrophysics seeks to answer some of the most basic questions about the universe and space-time and is in high demand from the students. Materials and Optics, and Extreme Matter are at the forefront of important technological advances. These research areas are supported by two WSU research units, the Center for Materials Research (CMR) and Institute for Shock Physics (ISP) as well as unique regional facilities such as the Pacific Northwest National Laboratory (PNNL) and the Laser Interferometer Gravitational Observatory (LIGO). Students gain international exposure through conferences, collaborations, and a cooperative agreement between WSU and the Katholieke University of Leuven (KUL), Belgium that allows students to pursue a joint degree between the two institutions. Our department has applied for another US government grant, Graduate Students in Areas of National Need (GAANN). Funding decisions for this grant will be made in late summer.

Post-Graduate Career Placements

Postdoctoral positions; Physics research - industrial and applied physics at national labs such as Sandia, Los Alamos, Lawrence Livermore, etc.; engineering physics jobs; university teaching/research positions.

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Electrical Engineering

E E

- 496 Semiconductor Devices 3** Course Prerequisite: Certified major in Electrical Engineering, Computer Science, or Computer Engineering. Equilibrium statistics of electrons and holes; carrier dynamics; p-n junctions, metal-semiconductor junctions, BJTs, Mosfets, solar cells, and LEDs.
- 581 Advanced Topics 3** May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 501 Advanced Inorganic Chemistry I 3** Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry V 1-3** May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory 3** Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics 2** Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis 2** Methods for the measurement of biological compounds.
- 514 Mass Spectrometry 2** Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography 2** Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry 2** Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry 3** Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers 2** Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory 1 (0-3)** Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry 2** Natural water chemistry, AGRI processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry V 1-3** May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I 3** Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II 3** Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics 3** Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry 3** Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V 1-3** May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V 1-3** May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.

- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** Faculty research interests, departmental computer systems, computer science research, report preparation.
- 516 Algorithmics 3** Discrete structures, automata, formal languages, recursive functions, algorithms, and computability.
- 527 Computer Security 3** Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CPT S 427 and CPT S 527.
- 530 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 531 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 534 Neural Network Design and Application 3** Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534.
- 538 Scientific Visualization 3** Data taxonomy; sampling; plotting; using and extending a visualization package; designing visualizations; domain-specific techniques.
- 540 Artificial Intelligence 3** An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540.
- 542 Computer Graphics 3** Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542.
- 543 Human-Computer Interaction 3** Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543.
- 548 Advanced Computer Graphics 3** Solid modeling, visual realism, light and color models, advanced surface generation techniques.
- 550 Parallel Computation 3** Parallel machine models, principles for the design of parallel algorithms, interconnection networks, systolic arrays, computational aspects to VLSI. Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 557 Advanced Computer Networks 3** ATM networks, optical WDM networks, and wireless/mobile networks; access, transport, and routing protocols.
- 560 Operating Systems 3** Structure of multiprogramming and multiprocessing; efficient allocation of systems resources; design implementation and performance measurement.
- 561 Computer Architecture 3** Parallel and distributed processors; multiprocessors; interconnection topologies; language-directed architecture; special-purpose architecture.

- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 564 Distributed Systems Concepts and Programming 3** Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564.
- 566 Embedded Systems 3 (2-3)** The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566.
- 570 Machine Learning 3** Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 571 Computational Genomics 3** Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571.
- 572 Numerical Methods in Computational Biology 3** Computational methods for solving scientific problems related to information processing in biological systems at the molecular and cellular levels.
- 573 Bioinformatics Software Development 3** Provides programming skills needed to address current computational problems in bioinformatics; emphasis on mathematical development and software design.
- 580 Advanced Topics in Computer Science 3** May be repeated for credit.
- 595 Directed Study in Computer Science V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 6 hours. Current topics in computer science.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Linear System Theory 3** Dynamic systems from the state variable approach; observability, controllability, stability, and sensitivity of differential and nondifferential systems.
- 502 Linear Multivariable Control 3** Course Prerequisite: E E 501. Optimal linear feedback control, optimal stochastic observers, LQG/LTR design methodology, modern Wiener-Hopf design, robust controllers.
- 503 Structure, Dynamics and Control of Large-scale Networks 3** Course Prerequisite: E E 501; E E 507. Introduction and development of computational and analytical methods required to characterize large-scale networks.
- 504 Modern Optics 3** Diffraction theory, Fourier transforming and imaging properties of lenses, spatial filtering, holography, temporal and spatial coherence, imaging through random media.
- 505 Nonlinear System Theory 3** Course Prerequisite: E E 501. Overview of nonlinear phenomena, Lyapunov stability, input-output stability, periodic orbits, singular perturbation, differential geometric methods, bifurcations and complex behaviors.
- 507 Random Processes in Engineering 3** Functions of random variables; random sequences; stochastic processes; mean-square stochastic calculus; ergodicity; spectral density; linear transformations, filtering, dynamic systems.
- 508 Estimation Theory for Signal Processing, Communications, and Control 3** Course Prerequisite: E E 501; E E 507. Principles of statistical estimation; LLSE; Kalman filtering; smoothing; prediction; maximum-likelihood and Bayesian estimation.
- 509 Adaptive Control 3** Course Prerequisite: E E 501. Model reference adaptive systems (MRAS), adaptive observers, adaptive control, on-line identification, robustness issues, self-tuning regulators.
- 511 Protection of Power Systems II 3** Protection of electrical equipment as related to electric power systems with emphasis on digital algorithms.
- 518 Advanced Electromagnetic Theory I 3** Electromagnetic waves, electromagnetic theorems and concepts, solutions to the wave equation in rectangular, cylindrical and spherical coordinates.
- 520 Plasma Engineering 3** Electromagnetics, kinetic theory, and fluid mechanics of plasmas in space, arcs, plasma processing, coronas, and fusion reactors.
- 521 Analysis of Power Systems 3** Concepts and practices of modern power engineering, including steady-state and dynamic analysis, economics and control design.
- 523 Power Systems Stability and Control 3** Dynamic analysis of interconnected electric power system; modeling of synchronous generators, loads and transmission network; small-signal stability and transient stability analysis; dynamic stability controls.

- 524 Advanced Computer Architecture 3** Instruction set architectures, pipelining and super pipelining, instruction level parallelism, superscalar and VLIW processors, cache memory, thread-level parallelism and VLSI.
- 525 Power System Applications of Power Electronics 3** Course Prerequisite: E E 521. Power electronic converters in modern power systems, FACTS devices, HVDC, compensation; microgrids and integration renewable energy resources; modeling and control.
- 527 Antenna Theory and Design 3** Antenna fundamentals, analytical techniques, characteristics and design procedures for selected types of wire, broadband, and aperture antennas.
- 528 Advanced Topics in Electromagnetics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topics of current interest in wave propagation (electromagnetics, acoustics, or optics).
- 530 Digital Signal Processing II 3** Course Prerequisite: E E 507. Frequency selective digital filtering, least-squares filtering, adaptive filtering, multirate signal processing.
- 535 Numerical Solutions to EM Problems 3** Theory and use of finite-difference time-domain; numeric dispersion; absorbing boundary conditions; scattering; radiation; time-domain vs. frequency-domain.
- 536 Power Systems Economics and Electricity Markets 3** Economic dispatch and optimal power flow; electricity market; short-term load forecasting; electricity price forecasting; price-based unit commitment; arbitrage in electricity markets; market power analysis.
- 545 Data Compression 3** Course Prerequisite: E E 507. Source coding with a fidelity criterion; quantization theory; predictive, transform and subband coding; noiseless source codes.
- 548 Information Theory and Channel Coding 3** Course Prerequisite: E E 507. Information theory; entropy, mutual information, source and channel coding theorems, channel capacity, Gaussian channels; channel coding: block and convolutional codes.
- 551 Data Communication Systems 3** Course Prerequisite: E E 507. Digital communications; multi-amplitude/phase signal constellations; probability of error performance; cutoff rate; Viterbi algorithm; trellis coded modulation.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 571 Advanced Wireless Integrated Circuits and Systems 3** Analysis and design methodologies of state-of-the-art wireless integrated circuits and systems.
- 576 Analog Integrated Circuits 3** Analysis and design of analog integrated circuits in CMOS and BiCMOS technologies; current mirrors, gain stages, operational amplifiers, frequency response, and compensation.
- 581 Advanced Topics in Power Systems V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E E 521. Power system operations including AGC, economic dispatch and security; power system dynamics; intelligent systems applications.
- 582 Advanced Topics V 1-3** May be repeated for credit.
- 586 VLSI Systems Design 3** VLSI models, layout algorithms, design methodologies, simulation and layout tools, algorithm design for VLSI implementation.
- 587 System on Chip (SoC) Design and Test 3** System on Chip (SoC) and sub-micron integrated circuit design and testing.
- 595 Directed Study in Electrical Engineering V 1 (0-3) to 3 (0-9)** May be repeated for credit. Current topics in electrical engineering.
- 596 Advanced Analog Integrated Circuits 3** MOS and BiCMOS technologies; MOS and BiCMOS operational amplifiers; A/D, D/A converters; switched-capacitor filters; continuous-time filters.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.

- 509 MEMS Engineering 3** (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elasto-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V** 1-3 May be repeated for credit. Recent advances and current research at the forefront of materials science.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V** 1-3 May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.
- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.

- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I 3** The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.

- 571 Mathematical Foundations of Continuum Mechanics II 3**
Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization 3** May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering 3** Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management 3** Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V 1-3** May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V 1-3** May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science 3** Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar 1** May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18**
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities 3** Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.

- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elasto-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 501 Graduate Seminar 1** Introduction to graduate and interdisciplinary research.
- 514 Optoelectronics Lab I 1 (0-3)** May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I 3** Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II 3** Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.
- 533 Thermal and Statistical Physics I 3** Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II 3** Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
- 541 Electromagnetic Theory 3** Special relativity and the classical electromagnetic field; emission, propagation, and absorption of electromagnetic waves.
- 542 Electrodynamics 3** Interaction of matter and electromagnetic radiation; classical and quantum electrodynamics.
- 545 Nonlinear Optics 3** Nonlinear wave propagation theory applied to several nonlinear-optical phenomena; experimental techniques that probe a material's nonlinearity.
- 546 Quantum Electronics 3** The physics of lasers and of coherent optical radiation generation and propagation.

- 550 Quantum Theory I** 3 Introduction to quantum theory; physical and mathematical foundations; application to atomic systems.
- 551 Quantum Theory II** 3 Symmetry and invariance; angular momentum theory; approximation methods.
- 552 Quantum Theory III** 3 Scattering theory; relativistic wave mechanics; quantum field theory.
- 561 Atomic and Molecular Physics** 3 Physics of atoms and molecules using quantum theory.
- 563 Physics of the Solid State** 3 Lattice vibrations and defects; ionic and electronic conductivities; band theory; magnetic properties; luminescence.
- 566 Biological Physics** 3 Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics** 3 Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.
- 575 Advanced Solid State Physics** 3 Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics** 3 May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar** 1 May be repeated for credit.
- 592 Wave Propagation Seminar** 2 May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories** 1 May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Graduate Seminar** 1 Introduction to graduate and interdisciplinary research.
- 514 Optoelectronics Lab I** 1 (0-3) May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II** V 1 (0-3) to 3 (0-9) May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I** 3 Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II** 3 Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.
- 533 Thermal and Statistical Physics I** 3 Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II** 3 Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
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- 551 Quantum Theory II** 3 Symmetry and invariance; angular momentum theory; approximation methods.
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- 566 Biological Physics 3** Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics 3** Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.
- 575 Advanced Solid State Physics 3** Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics 3** May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar 1** May be repeated for credit.
- 592 Wave Propagation Seminar 2** May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories 1** May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.

- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Physics

Degree offered: Master of Science in Physics

Faculty working with graduate students: 31

Graduate students: 2

Tests required: TOEFL, TOEFLI, IELTS

Deadline: Fall: April 1

Spring: October 1

Requirements

M.S. Thesis: The program must consist of a minimum of 30 semester hours of approved graduate credit, including 21 hours of graded 500-level course work (18 of which must be in the physics core curriculum); additional course work may include 3 or more credits of physics electives or, approved courses taught outside of the department; a minimum of 4 total hours of 700-Master's Research; 4 hours of seminar credit; and includes a substantial thesis project. Time required for completion is about three years. A bound copy of the thesis is required by the department. Transfer credit is limited to no more than half of the total graded course credits required by the department for the master's degree. None of these credits may be applied toward another advanced degree at WSU. Students wanting to transfer course work should talk to the chair of the Graduate Studies Committee immediately upon enrolling at Washington State University. All transfer work under consideration must have a grade of "A-" or better and be no more than 10 years old at time of submission on the program of study. Additional restrictions may apply.

Program Description

The Department of Physics and Astronomy at Washington State University offers three graduate degrees: the doctorate, the thesis master's, and the non-thesis master's. They are designed to give every student a thorough background in the major areas of current research. We seek to provide an atmosphere that fosters intellectual growth and quantitative reasoning. We offer educational programs in physics and astronomy that engage students in teaching and research activities that provide the skills, knowledge, and ability for critical thinking that will enable them to be productive members of society. In the process, we will lay the foundations for technological advances that improve our quality of life. The department emphasizes a friendly, informal atmosphere, where students can tailor their programs to specific needs, interests and scholarship.

Degree Description

The Department of Physics and Astronomy master's program at Washington State University is designed to produce leaders in industry, in academia, and at national laboratories. The department's progressive environment seeks to provide an atmosphere that fosters intellectual growth and quantitative reasoning. The program engages students in teaching and research activities that provide the skills, knowledge, and ability for critical thinking that will enable them to be productive members of society. In the process, our goal is to lay the foundations for technological advances that improve our quality of life.

Training and Professional Development Opportunities

While the Department of Physics and Astronomy conducts

research in the traditional areas of physics, it has enhanced its program by focusing on three areas of research excellence: Astrophysics, Extreme Matter, and Materials and Optics. Astrophysics seeks to answer some of the most basic questions about the universe and space-time and is in high demand from the students. Materials and Optics, and Extreme Matter are at the forefront of important technological advances. These research areas are supported by two WSU research units, the Center for Materials Research (CMR) and Institute for Shock Physics (ISP) as well as unique regional facilities such as the Pacific Northwest National Laboratory (PNNL) and the Laser Interferometer Gravitational Observatory (LIGO).

Post-Graduate Employment Opportunities

Engineering positions at Boeing and Lockheed Corporations; NASA; Lawrence Livermore National Laboratory; Los Alamos National Laboratory; Schweitzer Engineering, NASA Jet Propulsion Laboratory

Post-Graduate Career Placements

Senior computer scientist; science historian; staff scientist in applied research; meteorology; space industry; fiber optics; oceanic exploration

Contact Information

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Faculty

Michael Allen, James Asay, John Blakeslee, Doerte Blume, Sukanta Bose, Nicholas Cerruti, Santanu Chaudhuri, Koen Clays, Gary Collins, Susan Dexheimer, J Dickinson, Matthew Duez, Hergen Eilers, Peter Engels, Frederick Gittes, Yi Gu, Yogendra Gupta, Mark Kuzyk, Kelvin Lynn, Richard Lytel, Philip Marston, Matthew McCluskey, Gregory Mendell, Michael Miller, Frederick Raab, David Rector, Farida Selim, Steven Tomsovic, Guy Worthey, Choong-Shik Yoo and Matthew Zacate.

Electrical Engineering

E E

- 496 Semiconductor Devices** 3 Course Prerequisite: Certified major in Electrical Engineering, Computer Science, or Computer Engineering. Equilibrium statistics of electrons and holes; carrier dynamics; p-n junctions, metal-semiconductor junctions, BJTs, Mosfets, solar cells, and LEDs.
- 581 Advanced Topics** 3 May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 501 Advanced Inorganic Chemistry I** 3 Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.

- 503 Advanced Topics in Inorganic Chemistry V** 1-3 May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory** 3 Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics** 2 Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis** 2 Methods for the measurement of biological compounds.
- 514 Mass Spectrometry** 2 Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography** 2 Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry** 2 Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry** 3 Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers** 2 Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory** 1 (0-3) Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry** 2 Natural water chemistry, AGR1 processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry V** 1-3 May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I** 3 Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II** 3 Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics** 3 Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.
- 536 Quantum Chemistry** 3 Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V** 1-3 May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.

- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V 1-3** May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** Faculty research interests, departmental computer systems, computer science research, report preparation.
- 516 Algorithmics 3** Discrete structures, automata, formal languages, recursive functions, algorithms, and computability.
- 527 Computer Security 3** Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CPT S 427 and CPT S 527.
- 530 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 531 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 534 Neural Network Design and Application 3** Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534.
- 538 Scientific Visualization 3** Data taxonomy; sampling; plotting; using and extending a visualization package; designing visualizations; domain-specific techniques.

- 540 Artificial Intelligence 3** An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540.
- 542 Computer Graphics 3** Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542.
- 543 Human-Computer Interaction 3** Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543.
- 548 Advanced Computer Graphics 3** Solid modeling, visual realism, light and color models, advanced surface generation techniques.
- 550 Parallel Computation 3** Parallel machine models, principles for the design of parallel algorithms, interconnection networks, systolic arrays, computational aspects to VLSI. Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 557 Advanced Computer Networks 3** ATM networks, optical WDM networks, and wireless/mobile networks; access, transport, and routing protocols.
- 560 Operating Systems 3** Structure of multiprogramming and multiprocessing; efficient allocation of systems resources; design implementation and performance measurement.
- 561 Computer Architecture 3** Parallel and distributed processors; multiprocessors; interconnection topologies; language-directed architecture; special-purpose architecture.
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 564 Distributed Systems Concepts and Programming 3** Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564.
- 566 Embedded Systems 3 (2-3)** The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566.
- 570 Machine Learning 3** Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 571 Computational Genomics 3** Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571.
- 572 Numerical Methods in Computational Biology 3** Computational methods for solving scientific problems related to information processing in biological systems at the molecular and cellular levels.
- 573 Bioinformatics Software Development 3** Provides programming skills needed to address current computational problems in bioinformatics; emphasis on mathematical development and software design.
- 580 Advanced Topics in Computer Science 3** May be repeated for credit.
- 595 Directed Study in Computer Science V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 6 hours. Current topics in computer science.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 501 Linear System Theory 3** Dynamic systems from the state variable approach; observability, controllability, stability, and sensitivity of differential and nondifferential systems.
- 502 Linear Multivariable Control 3** Course Prerequisite: E E 501. Optimal linear feedback control, optimal stochastic observers, LQG/LTR design methodology, modern Wiener-Hopf design, robust controllers.
- 503 Structure, Dynamics and Control of Large-scale Networks 3** Course Prerequisite: E E 501; E E 507. Introduction and development of computational and analytical methods required to characterize large-scale networks.
- 504 Modern Optics 3** Diffraction theory, Fourier transforming and imaging properties of lenses, spatial filtering, holography, temporal and spatial coherence, imaging through random media.

- 505 Nonlinear System Theory 3** Course Prerequisite: E E 501. Overview of nonlinear phenomena, Lyapunov stability, input-output stability, periodic orbits, singular perturbation, differential geometric methods, bifurcations and complex behaviors.
- 507 Random Processes in Engineering 3** Functions of random variables; random sequences; stochastic processes; mean-square stochastic calculus; ergodicity; spectral density; linear transformations, filtering, dynamic systems.
- 508 Estimation Theory for Signal Processing, Communications, and Control 3** Course Prerequisite: E E 501; E E 507. Principles of statistical estimation; LLSE; Kalman filtering; smoothing; prediction; maximum-likelihood and Bayesian estimation.
- 509 Adaptive Control 3** Course Prerequisite: E E 501. Model reference adaptive systems (MRAS), adaptive observers, adaptive control, on-line identification, robustness issues, self-tuning regulators.
- 511 Protection of Power Systems II 3** Protection of electrical equipment as related to electric power systems with emphasis on digital algorithms.
- 518 Advanced Electromagnetic Theory I 3** Electromagnetic waves, electromagnetic theorems and concepts, solutions to the wave equation in rectangular, cylindrical and spherical coordinates.
- 520 Plasma Engineering 3** Electromagnetics, kinetic theory, and fluid mechanics of plasmas in space, arcs, plasma processing, coronas, and fusion reactors.
- 521 Analysis of Power Systems 3** Concepts and practices of modern power engineering, including steady-state and dynamic analysis, economics and control design.
- 523 Power Systems Stability and Control 3** Dynamic analysis of interconnected electric power system; modeling of synchronous generators, loads and transmission network; small-signal stability and transient stability analysis; dynamic stability controls.
- 524 Advanced Computer Architecture 3** Instruction set architectures, pipelining and super pipelining, instruction level parallelism, superscalar and VLIW processors, cache memory, thread-level parallelism and VLSI.
- 525 Power System Applications of Power Electronics 3** Course Prerequisite: E E 521. Power electronic converters in modern power systems, FACTS devices, HVDC, compensation; microgrids and integration renewable energy resources; modeling and control.
- 527 Antenna Theory and Design 3** Antenna fundamentals, analytical techniques, characteristics and design procedures for selected types of wire, broadband, and aperture antennas.
- 528 Advanced Topics in Electromagnetics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topics of current interest in wave propagation (electromagnetics, acoustics, or optics).
- 530 Digital Signal Processing II 3** Course Prerequisite: E E 507. Frequency selective digital filtering, least-squares filtering, adaptive filtering, multirate signal processing.
- 535 Numerical Solutions to EM Problems 3** Theory and use of finite-difference time-domain; numeric dispersion; absorbing boundary conditions; scattering; radiation; time-domain vs. frequency-domain.
- 536 Power Systems Economics and Electricity Markets 3** Economic dispatch and optimal power flow; electricity market; short-term load forecasting; electricity price forecasting; price-based unit commitment; arbitrage in electricity markets; market power analysis.
- 545 Data Compression 3** Course Prerequisite: E E 507. Source coding with a fidelity criterion; quantization theory; predictive, transform and subband coding; noiseless source codes.
- 548 Information Theory and Channel Coding 3** Course Prerequisite: E E 507. Information theory; entropy, mutual information, source and channel coding theorems, channel capacity, Gaussian channels; channel coding: block and convolutional codes.
- 551 Data Communication Systems 3** Course Prerequisite: E E 507. Digital communications; multi-amplitude/phase signal constellations; probability of error performance; cutoff rate; Viterbi algorithm; trellis coded modulation.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 571 Advanced Wireless Integrated Circuits and Systems 3** Analysis and design methodologies of state-of-the-art wireless integrated circuits and systems.
- 576 Analog Integrated Circuits 3** Analysis and design of analog integrated circuits in CMOS and BiCMOS technologies; current mirrors, gain stages, operational amplifiers, frequency response, and compensation.
- 581 Advanced Topics in Power Systems V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E E 521. Power system operations including AGC, economic dispatch and security; power system dynamics; intelligent systems applications.
- 582 Advanced Topics V 1-3** May be repeated for credit.
- 586 VLSI Systems Design 3** VLSI models, layout algorithms, design methodologies, simulation and layout tools, algorithm design for VLSI implementation.
- 587 System on Chip (SoC) Design and Test 3** System on Chip (SoC) and sub-micron integrated circuit design and testing.
- 595 Directed Study in Electrical Engineering V 1 (0-3) to 3 (0-9)** May be repeated for credit. Current topics in electrical engineering.
- 596 Advanced Analog Integrated Circuits 3** MOS and BiCMOS technologies; MOS and BiCMOS operational amplifiers; A/D, D/A converters; switched-capacitor filters; continuous-time filters.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 505 Geophysics 4** (3-3) Theory and application of geophysical methods for hydrology, environmental, engineering, exploration, and structural geology; review of techniques. (Cross-listed course offered as GEOLOGY 405).
- 520 Advanced Topics in Sedimentology 3** (2-3) May be repeated for credit; cumulative maximum 6 hours. Modern aspects of sedimentary rocks. Field trip required.
- 521 Clastic Depositional Systems 3** (2-3) Clastic sedimentary environments; architectural elements and facies analysis. Field trip required.
- 523 Advanced Topics in Stratigraphy 3** May be repeated for credit.
- 525 Carbonate Depositional Systems 3** (2-3) Modern carbonate environments and processes; ancient carbonate rock sequences; carbonate platform-to-basin transition; diagenesis of carbonate rocks. Field trip required.
- 538 Orogenic Systems I 3** Field-base course examines tectonic processes active in the northern Cordillera. Field trip required and final research paper.
- 540 Tectonics 3** Nature and origin of the Earth's major tectonic features.
- 541 Structural Analysis 3** (2-3) Structural analysis of complexly deformed rocks in orogenic belts. Field trip required.
- 545 Astrobiology 3** Origin, evolution, distribution and future of life in the universe; fundamental concepts of life and habitable environments on Earth and other planetary bodies within and outside of the solar system. Credit not granted for both GEOLOGY 445 and GEOLOGY 545.
- 550 Advanced Mineralogy 3** Elements of crystal chemistry and crystal physics.
- 552 Analytical Methods in Earth Sciences 3** (2-3) Theory and practical experience in EMPA, XRD, XRF, and ICPMS analysis.
- 560 Advanced Igneous Petrology 3** (2-3) Origin, evolution, and tectonic significance of igneous rocks. Field trip required.
- 562 Watershed Biogeochemistry 3** Sources, transformations, fates and impacts of biogeochemically important compounds as they move downstream through watersheds to the coastal zone.
- 567 Volcanology 3** (2-3) Volcanic process, eruption mechanisms, volcanic deposits, hazard assessment. Field trip required. Credit not granted for both GEOLOGY 467 and GEOLOGY 567.
- 578 Groundwater Geobiology 3** (2-3) Interaction of groundwater geology and the environment including microbial populations with emphasis on microbial transport in the sub-surface and bioremediation approaches.
- 579 Groundwater Geochemistry V** 2-4 May be repeated for credit; cumulative maximum 4 hours. Organic and inorganic aqueous geochemistry; controls on groundwater contaminant fate.
- 583 Radiogenic Isotopes and Geochronology 3** Radiogenic isotopes and their uses as chronometers (radiometric dating) and as tracers of earth evolution and differentiation.
- 584 Stable Isotope Geochemistry 3** Principles and applications of isotope geochemistry in the geological sciences.
- 588 Methods in Radiogenic Isotope Geochemistry 3** (1-6) Course Prerequisite: GEOLOGY 583. Laboratory-based course in modern analytical methods in radiogenic isotope geochemistry.
- 595 Advanced Topics in Geology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 596 Advanced Topics in Geology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 597 Advanced Topics in Geology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Topics of current interest in geology.
- 598 Seminar 1** May be repeated for credit; cumulative maximum 3 hours. Research papers presented by students, faculty, and visiting scientists on geological research. Credit not granted for both GEOLOGY 498 and GEOLOGY 598.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.
- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V** 1-3 May be repeated for credit. Recent advances and current research at the forefront of materials science.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V** 1-3 May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.
- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.

- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 564 Nonlinear Optimization I 3** Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II 3** Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks 3** Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization 3** Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.

- 568 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I** 3 The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II** 3 Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization** 3 May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering** 3 Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management** 3 Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences** 3 Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics** V 1-3 May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics** V 1-3 May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science** 3 Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar** 1 May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering** V 1-3 May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science** 3 Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials** 3 Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities** 3 Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.
- 509 MEMS Engineering** 3 (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity** 3 Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids** 3 Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials** 3 Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations** 3 Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).

- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastoplastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 501 Graduate Seminar 1** Introduction to graduate and interdisciplinary research.
- 514 Optoelectronics Lab I 1 (0-3)** May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I 3** Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II 3** Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.

- 533 Thermal and Statistical Physics I** 3 Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II** 3 Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
- 541 Electromagnetic Theory** 3 Special relativity and the classical electromagnetic field; emission, propagation, and absorption of electromagnetic waves.
- 542 Electrodynamics** 3 Interaction of matter and electromagnetic radiation; classical and quantum electrodynamics.
- 545 Nonlinear Optics** 3 Nonlinear wave propagation theory applied to several nonlinear-optical phenomena; experimental techniques that probe a material's nonlinearity.
- 546 Quantum Electronics** 3 The physics of lasers and of coherent optical radiation generation and propagation.
- 550 Quantum Theory I** 3 Introduction to quantum theory; physical and mathematical foundations; application to atomic systems.
- 551 Quantum Theory II** 3 Symmetry and invariance; angular momentum theory; approximation methods.
- 552 Quantum Theory III** 3 Scattering theory; relativistic wave mechanics; quantum field theory.
- 561 Atomic and Molecular Physics** 3 Physics of atoms and molecules using quantum theory.
- 563 Physics of the Solid State** 3 Lattice vibrations and defects; ionic and electronic conductivities; band theory; magnetic properties; luminescence.
- 566 Biological Physics** 3 Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics** 3 Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.
- 575 Advanced Solid State Physics** 3 Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics** 3 May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar** 1 May be repeated for credit.
- 592 Wave Propagation Seminar** 2 May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories** 1 May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T₂ and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data** 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Physics

Degree offered: Master of Science in Physics – Non Thesis

Faculty working with graduate students: 30

Graduate students: 2

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI, IELTS

Deadline: Fall: April 1

Spring: October 1

Requirements

The Master of Science in Physics Non-Thesis program must include a minimum of 30 semester hours of approved graded 500-level course work in physics; 18 credits must be in the Ph.D. core curriculum; plus 4 hours of seminar credit and a minimum of 4 credits of Phys 702. Time required for completion is about two years. Transfer credit is limited to no more than half of the total graded course credits required by the department for the master's degree. None of these credits may be applied toward another advanced degree at WSU. Students wanting to transfer course work should talk to the chair of the Graduate Studies Committee immediately upon enrolling at Washington State University. All transfer work under consideration must have a grade of "A-" or better and be no more than 10 years old at time of submission on the program of study. Additional restrictions may apply. Final Examination: A final oral examination is required of all master's candidates. This examination is intended to test

the candidate's ability to integrate and interpret material in the major and supporting fields with emphasis on the work presented in the thesis or special problem.

Program Description

The Department of Physics and Astronomy at Washington State University offers three graduate degrees: the doctorate, the thesis master's, and the non-thesis master's. They are designed to give every student a thorough background in the major areas of current research. We seek to provide an atmosphere that fosters intellectual growth and quantitative reasoning. We offer educational programs in physics and astronomy that engage students in teaching and research activities that provide the skills, knowledge, and ability for critical thinking that will enable them to be productive members of society. In the process, we will lay the foundations for technological advances that improve our quality of life. The department emphasizes a friendly, informal atmosphere, where students can tailor their programs to specific needs, interests and scholarship.

Degree Description

The Department of Physics and Astronomy master's program at Washington State University is designed to produce leaders in industry, in academia, and at national laboratories. The department's progressive environment seeks to provide an atmosphere that fosters intellectual growth and quantitative reasoning. The program engages students in teaching and research activities that provide the skills, knowledge, and ability for critical thinking that will enable them to be productive members of society. In the process, our goal is to lay the foundations for technological advances that improve our quality of life.

Post-Graduate Employment Opportunities

Physics and biology faculty; engineering in aerospace industries; senior computer analysts; science historians; staff scientists in applied research; meteorology; appointments in the Department of Energy, Office of Basic Energy Sciences, and NASA Jet Propulsion; fiber optics

Faculty

Michael Allen, James Asay, John Blakeslee, Doerte Blume, Sukanta Bose, Nicholas Cerruti, Santanu Chaudhuri, Koen Clays, Gary Collins, Susan Dexheimer, J Dickinson, Matthew Duez, Peter Engels, Frederick Gittes, Yi Gu, Yogendra Gupta, Mark Kuzyk, Kelvin Lynn, Richard Lytel, Philip Marston, Matthew McCluskey, Michael Miller, Frederick Raab, David Rector, Farida Selim, Steven Tomsovic, Guy Worthey, Choong-Shik Yoo, Matthew Zacate and Chuanwei Zhang.

Electrical Engineering

E E

496 Semiconductor Devices 3 Course Prerequisite: Certified major in Electrical Engineering, Computer Science, or Computer Engineering. Equilibrium statistics of electrons and holes; carrier dynamics; p-n junctions, metal-semiconductor junctions, BJTs, Mosfets, solar cells, and LEDs.

- 581 Advanced Topics 3** May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 501 Advanced Inorganic Chemistry I 3** Periodic table survey, typical compounds and their reactivity; models and reactivity, acid-base, oxidation-reduction, and electronic structure contributions.
- 503 Advanced Topics in Inorganic Chemistry V 1-3** May be repeated for credit. Recent significant developments.
- 509 Chemical Group Theory 3** Mathematical definitions of groups and representations, applications to chemical structure and spectra, ligand field theory, chemical reactions and selection rules.
- 510 Introduction to Proteomics 2** Techniques and applications for the analysis of the proteome. Recommended preparation: MBIOS 303 or equivalent.
- 512 Bioanalysis 2** Methods for the measurement of biological compounds.
- 514 Mass Spectrometry 2** Current methods, techniques and interpretation of mass spectrometric analysis. Recommended preparation: CHEM 425 or equivalent.
- 517 Chromatography 2** Recommended preparation: CHEM 425 or equivalent.
- 518 Electrochemistry 2** Recommended preparation: CHEM 425 or equivalent.
- 520 Advanced Analytical Chemistry 3** Statistics in chemical analysis; sampling; control of contamination and losses in analysis; electrochemical methods; separation in analysis; spectroscopic techniques. Recommended preparation: CHEM 425 or equivalent.
- 521 Radiochemistry and Radiotracers 2** Graduate-level counterpart of CHEM 421; additional requirements. Recommended preparation: CHEM 425 or equivalent.
- 522 Radiochemistry Laboratory 1 (0-3)** Graduate-level counterpart of CHEM 422; additional requirements. Required preparation must include CHEM 222, CHEM 331, and PHYSICS 202 or equivalent.
- 527 Environmental Chemistry 2** Natural water chemistry, AGR processes, kinetics, thermodynamics, modeling in lake, river, and sea water.
- 529 Selected Topics in Analytical Chemistry V 1-3** May be repeated for credit. Selected current developments.
- 531 Advanced Physical Chemistry I 3** Classical physical chemistry including basic thermodynamics and kinetics; an introductory discussion of surface chemistry and electrochemistry. Recommended preparation: CHEM 331 or equivalent.
- 532 Advanced Physical Chemistry II 3** Introduction to quantum mechanics; postulates of quantum mechanics; exact solutions and approximation methods. Recommended preparation: CHEM 332 or equivalent.
- 534 Chemical Statistical Mechanics 3** Statistical theory of thermodynamic variables and chemical equilibrium; calculation of equilibrium properties from spectral data; fluctuations about equilibrium; quantum statistics.

- 536 Quantum Chemistry 3** Course Prerequisite: CHEM 532. Quantum mechanics applied to chemical problems: states of atoms and molecules, transitions and spectra, ladder operators and many electron methods.
- 537 Advanced Topics in Physical Chemistry V 1-3** May be repeated for credit. Selected subjects; irreversible thermodynamics; chemical bonding; NMR; ligand field theory; x-ray diffraction; neutron diffraction.
- 540 Physical Organic Chemistry 3** Course Prerequisite: CHEM 542. The major classes of organic reaction mechanisms and their significance; kinetics and introductory theory.
- 542 Advanced Organic Chemistry 3** Synthesis of organic compounds; recent developments from current literature.
- 543 Bioorganic Chemistry 3** Course Prerequisite: CHEM 542. Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.
- 544 Advanced Topics in Organic Chemistry V 1-3** May be repeated for credit. Current research in organic chemistry.
- 545 Synthetic Organic Chemistry 3** Course Prerequisite: CHEM 542. Modern synthetic methods and strategies; detailed reaction mechanisms, reaction scope and issues in catalysis will be discussed.
- 546 Spectroscopic Identification of Organic Compounds 3** Structural interpretation of mass spectrometry and IR, UV-VIS and NMR spectrometry of small molecule organic compounds.
- 550 Special Topics in Nuclear Processes and Radioactive Waste Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By instructor permission. Fundamental chemistry of the nuclear industry, chemical processing and waste management.
- 555 Teaching Chemistry 1** Teaching chemistry; workshops for new graduate teaching assistants in chemistry focusing on tutorials and labs.
- 564 Molecular Phenomena 3** Phenomena which yield information on structures, energy levels, and interactions of molecules in solid, liquid, and gaseous phases.
- 572 Enzyme Reaction Mechanisms 3** Course Prerequisite: CHEM 542. Methods used to explore enzyme mechanisms; how enzymes catalyze reactions; overview of enzyme co-factors and exploration of differing classes of enzyme catalyzed reactions.
- 581 Environmental Chemistry I 3** Chemistry of natural and pollutant species and their reactions in the atmospheric environment.
- 590 Introduction to Research Topics 1** Presentation and description of research areas and projects of current interest to faculty.
- 592 Seminar in Analytical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in analytical chemistry taken from research in progress or current literature.
- 593 Seminar in Physical Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in physical chemistry taken from research in progress or current literature.
- 594 Seminar in Organic Chemistry 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in organic chemistry taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** Faculty research interests, departmental computer systems, computer science research, report preparation.
- 516 Algorithmics 3** Discrete structures, automata, formal languages, recursive functions, algorithms, and computability.
- 527 Computer Security 3** Computer security concepts, models and mechanism; encryption technology, formal models, policy and ethical implications. Credit not granted for both CPT S 427 and CPT S 527.
- 530 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 531 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 534 Neural Network Design and Application 3** Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534.

- 538 Scientific Visualization** 3 Data taxonomy; sampling; plotting; using and extending a visualization package; designing visualizations; domain-specific techniques.
- 540 Artificial Intelligence** 3 An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540.
- 542 Computer Graphics** 3 Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542.
- 543 Human-Computer Interaction** 3 Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543.
- 548 Advanced Computer Graphics** 3 Solid modeling, visual realism, light and color models, advanced surface generation techniques.
- 550 Parallel Computation** 3 Parallel machine models, principles for the design of parallel algorithms, interconnection networks, systolic arrays, computational aspects to VLSI. Required preparation must include differential equations and a programming course.
- 553 Graph Theory** 3 Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Computer Communication Networks** 3 Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 557 Advanced Computer Networks** 3 ATM networks, optical WDM networks, and wireless/mobile networks; access, transport, and routing protocols.
- 560 Operating Systems** 3 Structure of multiprogramming and multiprocessing; efficient allocation of systems resources; design implementation and performance measurement.
- 561 Computer Architecture** 3 Parallel and distributed processors; multiprocessors; interconnection topologies; language-directed architecture; special-purpose architecture.
- 562 Fault Tolerant Computer Systems** 3 Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 564 Distributed Systems Concepts and Programming** 3 Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564.
- 566 Embedded Systems** 3 (2-3) The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566.
- 570 Machine Learning** 3 Introduction to building computer systems that learn from their experience; classification and regression problems; unsupervised and reinforcement learning.
- 571 Computational Genomics** 3 Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571.
- 572 Numerical Methods in Computational Biology** 3 Computational methods for solving scientific problems related to information processing in biological systems at the molecular and cellular levels.
- 573 Bioinformatics Software Development** 3 Provides programming skills needed to address current computational problems in bioinformatics; emphasis on mathematical development and software design.
- 580 Advanced Topics in Computer Science** 3 May be repeated for credit.
- 595 Directed Study in Computer Science** V 1 (0-3) to 3 (0-9) May be repeated for credit; cumulative maximum 6 hours. Current topics in computer science.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Linear System Theory** 3 Dynamic systems from the state variable approach; observability, controllability, stability, and sensitivity of differential and nondifferential systems.
- 502 Linear Multivariable Control** 3 Course Prerequisite: E E 501. Optimal linear feedback control, optimal stochastic observers, LQG/LTR design methodology, modern Wiener-Hopf design, robust controllers.
- 503 Structure, Dynamics and Control of Large-scale Networks** 3 Course Prerequisite: E E 501; E E 507. Introduction and development of computational and analytical methods required to characterize large-scale networks.

- 504 Modern Optics 3** Diffraction theory, Fourier transforming and imaging properties of lenses, spatial filtering, holography, temporal and spatial coherence, imaging through random media.
- 505 Nonlinear System Theory 3** Course Prerequisite: E E 501. Overview of nonlinear phenomena, Lyapunov stability, input-output stability, periodic orbits, singular perturbation, differential geometric methods, bifurcations and complex behaviors.
- 507 Random Processes in Engineering 3** Functions of random variables; random sequences; stochastic processes; mean-square stochastic calculus; ergodicity; spectral density; linear transformations, filtering, dynamic systems.
- 508 Estimation Theory for Signal Processing, Communications, and Control 3** Course Prerequisite: E E 501; E E 507. Principles of statistical estimation; LLSE; Kalman filtering; smoothing; prediction; maximum-likelihood and Bayesian estimation.
- 509 Adaptive Control 3** Course Prerequisite: E E 501. Model reference adaptive systems (MRAS), adaptive observers, adaptive control, on-line identification, robustness issues, self-tuning regulators.
- 511 Protection of Power Systems II 3** Protection of electrical equipment as related to electric power systems with emphasis on digital algorithms.
- 518 Advanced Electromagnetic Theory I 3** Electromagnetic waves, electromagnetic theorems and concepts, solutions to the wave equation in rectangular, cylindrical and spherical coordinates.
- 520 Plasma Engineering 3** Electromagnetics, kinetic theory, and fluid mechanics of plasmas in space, arcs, plasma processing, coronas, and fusion reactors.
- 521 Analysis of Power Systems 3** Concepts and practices of modern power engineering, including steady-state and dynamic analysis, economics and control design.
- 523 Power Systems Stability and Control 3** Dynamic analysis of interconnected electric power system; modeling of synchronous generators, loads and transmission network; small-signal stability and transient stability analysis; dynamic stability controls.
- 524 Advanced Computer Architecture 3** Instruction set architectures, pipelining and super pipelining, instruction level parallelism, superscalar and VLIW processors, cache memory, thread-level parallelism and VLSI.
- 525 Power System Applications of Power Electronics 3** Course Prerequisite: E E 521. Power electronic converters in modern power systems, FACTS devices, HVDC, compensation; microgrids and integration renewable energy resources; modeling and control.
- 527 Antenna Theory and Design 3** Antenna fundamentals, analytical techniques, characteristics and design procedures for selected types of wire, broadband, and aperture antennas.
- 528 Advanced Topics in Electromagnetics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced topics of current interest in wave propagation (electromagnetics, acoustics, or optics).
- 530 Digital Signal Processing II 3** Course Prerequisite: E E 507. Frequency selective digital filtering, least-squares filtering, adaptive filtering, multirate signal processing.
- 535 Numerical Solutions to EM Problems 3** Theory and use of finite-difference time-domain; numeric dispersion; absorbing boundary conditions; scattering; radiation; time-domain vs. frequency-domain.
- 536 Power Systems Economics and Electricity Markets 3** Economic dispatch and optimal power flow; electricity market; short-term load forecasting; electricity price forecasting; price-based unit commitment; arbitrage in electricity markets; market power analysis.
- 545 Data Compression 3** Course Prerequisite: E E 507. Source coding with a fidelity criterion; quantization theory; predictive, transform and subband coding; noiseless source codes.
- 548 Information Theory and Channel Coding 3** Course Prerequisite: E E 507. Information theory; entropy, mutual information, source and channel coding theorems, channel capacity, Gaussian channels; channel coding: block and convolutional codes.
- 551 Data Communication Systems 3** Course Prerequisite: E E 507. Digital communications; multi-amplitude/phase signal constellations; probability of error performance; cutoff rate; Viterbi algorithm; trellis coded modulation.
- 555 Computer Communication Networks 3** Packet switching networks; multi-access and local-area networks; delay models in data networks; routing and flow control. (Cross-listed course offered as E E 555, CPT S 555).
- 562 Fault Tolerant Computer Systems 3** Fault tolerance aspects involved in design and evaluation of systems; methods of detection and recovery; multicast, middleware, and re-configuration. (Cross-listed course offered as CPT S 562, E E 562).
- 571 Advanced Wireless Integrated Circuits and Systems 3** Analysis and design methodologies of state-of-the-art wireless integrated circuits and systems.
- 576 Analog Integrated Circuits 3** Analysis and design of analog integrated circuits in CMOS and BiCMOS technologies; current mirrors, gain stages, operational amplifiers, frequency response, and compensation.
- 581 Advanced Topics in Power Systems V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E E 521. Power system operations including AGC, economic dispatch and security; power system dynamics; intelligent systems applications.
- 582 Advanced Topics V 1-3** May be repeated for credit.
- 586 VLSI Systems Design 3** VLSI models, layout algorithms, design methodologies, simulation and layout tools, algorithm design for VLSI implementation.
- 587 System on Chip (SoC) Design and Test 3** System on Chip (SoC) and sub-micron integrated circuit design and testing.
- 595 Directed Study in Electrical Engineering V 1 (0-3) to 3 (0-9)** May be repeated for credit. Current topics in electrical engineering.

- 596 Advanced Analog Integrated Circuits 3** MOS and BiCMOS technologies; MOS and BiCMOS operational amplifiers; A/D, D/A converters; switched-capacitor filters; continuous-time filters.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Continuum Mechanics 3** Unified presentation of principles common to all branches of solid and fluid mechanics; viscous fluids, elasticity, viscoelasticity, and plasticity.
- 502 Sustainability Assessment for Engineering Design 3** Sustainability assessment, including environmental, societal, and economic assessment, in design and planning for entire product life cycle.
- 503 Systems Design Approaches for Sustainability 3** Sustainability in systems design methodologies; systems modeling and decision-making for sustainability; multidisciplinary design optimization; research topics.
- 509 MEMS Engineering 3 (2-3)** Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Advanced Heat Transfer 3** Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection.
- 516 Conduction and Radiation Heat Transfer 3** Principles of conduction and radiation heat transfer with focus on solving conduction and radiation problems of engineering interest.
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Fundamentals of Fluids I 3** Governing equations of fluid mechanics accompanied by applications of Navier-Stokes equation to simple flow situations, boundary layer analysis.
- 526 Statistical Thermodynamics 3** Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.
- 527 Macroscopic Thermodynamics 3** Advanced thermodynamics from macroscopic viewpoint; basic postulates, equilibrium, stability, property relations; application to thermal-fluid and solid mechanics; irreversible thermodynamics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elastic-to-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 532 Finite Elements 3** Theory of finite elements; applications to general engineering systems considered as assemblages of discrete elements. (Cross-listed course offered as CE 532, ME 532).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 540 Advanced Dynamics of Physical Systems 3** Newtonian dynamics, rotating coordinate systems; Lagrangian and Hamiltonian mechanics; gyroscopic mechanics, other applications.

- 556 Numerical Modeling in Fluid Mechanics 3** Fundamental concepts in development of numerical models for fluid flow with applications to steady and unsteady flows.
- 565 Nuclear Reactor Engineering 3** Reactor power distribution; thermal and exposure limits; critical heat flux and pressure design; neutronic/thermal hydraulic relationships; transient/accident analysis.
- 574 Foundations of CAD 3** Topics fundamental to the creation of CAD, engineering visualization, and virtual reality based engineering software.
- 575 Geometric Modeling 3** Study of the mathematics behind the creation of complex shapes for CAD using curves, surfaces, and solids.
- 579 Advanced Topics in Mechanical Engineering V 1-3** May be repeated for credit.
- 581 Control Systems 3** Analysis and design of feedback control systems.
- 598 Seminar 1** May be repeated for credit. Current research interests.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Current Topics in Materials Science V 1-3** May be repeated for credit. Recent advances and current research at the forefront of materials science.
- 505 Advanced Materials Science 3** Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials 3** Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 538 Special Topics V 1-3** May be repeated for credit. Selected topics of current interest in advanced materials science.
- 571 Microscopic Analysis of Solid Surfaces 3** Modern spectroscopic methods for microscopic analysis of solid surfaces; emphasizes electron, ion, laser, and x-ray techniques.
- 593 Seminar in Materials Science 1** May be repeated for credit; cumulative maximum 6 hours. Presentation and discussion of topics in materials science taken from research in progress or current literature.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.

- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.
- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.

- 564 Nonlinear Optimization I** 3 Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II** 3 Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks** 3 Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization** 3 Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I** 3 The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II** 3 Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization** 3 May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering** 3 Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management** 3 Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences** 3 Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V** 1-3 May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V** 1-3 May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science** 3 Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar** 1 May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Materials Engineering V** 1-3 May be repeated for credit; cumulative maximum 6 hours.
- 505 Advanced Materials Science** 3 Broad baseline in materials science including relationships between structure and properties. (Cross-listed course offered as MSE 505, MATSE 505).
- 506 Biomaterials** 3 Overview of the different types of materials used in biomedical applications such as implants and medical devices. Credit not granted for both MSE 406 and MSE 506. (Cross-listed course offered as MSE 506 and MATSE 506.)
- 508 Polymer Nanocomposites and Functionalities** 3 Structures, properties, fabrication and applications of nano-scale material and their polymer nanocomposites; functionalities including flame retardant, electrically, thermal and damping properties.

- 509 MEMS Engineering 3** (2-3) Introduction to the design, fabrication and application of microelectromechanical systems. (Cross-listed course offered as ME 509, MSE 509).
- 513 Crystal Plasticity 3** Dislocation theory; slip; climb; mechanical properties of polycrystalline materials and application to important deformation processes. (Cross-listed course offered as MSE 513, ME 513, MATSE 513).
- 514 Thermodynamics of Solids 3** Thermodynamic properties of solid solutions; models for substitutional and interstitial solutions; configurational and non-configurational contributions; calculation of phase diagrams. (Cross-listed course offered as MSE 514, ME 514).
- 515 Electronic Properties of Materials 3** Electron energy bands in solids, electrical conduction in metals and semiconductors, applications to semi-conduction devices based on silicon and III-V compounds.
- 516 Phase Transformations 3** Thermodynamics, nucleation, interface motion, mechanisms and kinetics of chemical reactions between solid metals and their environment. (Cross-listed course offered as MSE 516, MATSE 516).
- 517 Thin Films 3** Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior. (Cross-listed course offered as MSE 517, ME 517).
- 520 Multiscale Modeling in Thermomechanics of Materials 3** Multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity and atomistic methods. (Cross-listed course offered as ME 520, MSE 520).
- 521 Statistics of Microstructures 3** Stereology, orientation and spatial distributions, percolation, measurement techniques and application to modeling of microstructures. (Cross-listed course offered as MSE 521, MATSE 521). Recommended preparation: MATH 540.
- 523 Ceramics Processing 3** Fundamentals of ceramic processing science for thin films and bulk ceramics.
- 530 Elasticity 3** Theory of kinematics of solid deformable bodies; conservation laws applied to an elastic continuum; generalized linear stress-strain behavior with applications. (Cross-listed course offered as ME 530, MSE 530).
- 531 Theory of Plasticity 3** The fundamentals of the theory of plasticity; the classical theory of plasticity; the classical theory and modern continuum theories of large elasto-plastic deformations. (Cross-listed course offered as ME 531, MSE 531).
- 534 Mechanics of Composite Materials 3** Analysis of micro-mechanical and macromechanical behavior of composite materials with emphasis on fiber-reinforced composite; prediction of properties; stiffness and strength theories; laminated beams and plates; dynamic behavior; environmental effects. (Cross-listed course offered as ME 534, MSE 534).
- 537 Fracture Mechanics and Mechanisms 3** Fracture mechanics and mechanisms and the microstructural origins of toughness in metals, polymers and composites. (Cross-listed course offered as MSE 537, ME 537).
- 543 Polymer Materials and Engineering 3** Preparation and structure-property relationship of polymer materials with emphasis on fracture mechanics and toughening. (Cross-listed course offered as CE 593, MSE 543). Required preparation must include MSE 402. Required preparation must include MSE 402.
- 544 Natural Fibers 3** Structural aspects and properties of natural fibers including anatomy, ultrastructure, and chemistry. (Cross-listed course offered as CE 594, MSE 544).
- 545 Polymer and Composite Processing 3** Polymer and composite processing from fundamental principles to practical applications. (Cross-listed course offered as CE 595, MSE 545).
- 546 Engineered Wood Composites 3** Theory and practice of wood composite materials, manufacture and development. (Cross-listed course offered as CE 596, MSE 546).
- 547 Polymers and Surfaces for Adhesion 3** Physical chemistry of polymers and surfaces needed to understand interface morphology, adhesion mechanisms and bond performance. (Cross-listed course offered as CE 597, MSE 547). Required preparation must include MSE 402, or 404. Required preparation must include MSE 402 or 404.
- 548 Natural Fiber Polymer Composites 3** Fundamentals, development and application of composite materials produced from polymers reinforced with natural fibers and wood as major components. (Cross-listed course offered as CE 598, MSE 548).
- 549 Nondestructive Testing of Structural Materials 3** Principles of nondestructive testing applied to wood-based materials, steel, concrete, and masonry. (Cross-listed course offered as CE 536, MSE 549).
- 592 Transmission Electron Microscopy 3** Development of the principles and applications of electron optics in microscopy.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 501 Graduate Seminar 1** Introduction to graduate and interdisciplinary research.

- 514 Optoelectronics Lab I** 1 (0-3) May be repeated for credit; cumulative maximum 3 hours. Experiments with optical systems: Imaging, interference, coherence, information storage/processing, gas and solid state lasers, optical fibers, and communications systems.
- 515 Optoelectronics Lab II** V 1 (0-3) to 3 (0-9) May be repeated for credit; cumulative maximum 3 hours. Experiments in optical physics, physical properties of light, laser physics, waveguides, quantum confined semiconductor structures and ultrafast dynamics and nonlinear optics.
- 521 Classical Mechanics I** 3 Laws of motion as developed by Newton, d'Alembert, Lagrange, and Hamilton; dynamics of particles and rigid bodies.
- 522 Classical Mechanics II** 3 Continuation of PHYSICS 521. Classical mechanics of liquids and deformable solids; stress, deformation and strain, flow, oscillations and waves.
- 533 Thermal and Statistical Physics I** 3 Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients; introduction to statistical mechanics, ensembles, partition functions.
- 534 Thermal and Statistical Physics II** 3 Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions.
- 541 Electromagnetic Theory** 3 Special relativity and the classical electromagnetic field; emission, propagation, and absorption of electromagnetic waves.
- 542 Electrodynamics** 3 Interaction of matter and electromagnetic radiation; classical and quantum electrodynamics.
- 545 Nonlinear Optics** 3 Nonlinear wave propagation theory applied to several nonlinear-optical phenomena; experimental techniques that probe a material's nonlinearity.
- 546 Quantum Electronics** 3 The physics of lasers and of coherent optical radiation generation and propagation.
- 550 Quantum Theory I** 3 Introduction to quantum theory; physical and mathematical foundations; application to atomic systems.
- 551 Quantum Theory II** 3 Symmetry and invariance; angular momentum theory; approximation methods.
- 552 Quantum Theory III** 3 Scattering theory; relativistic wave mechanics; quantum field theory.
- 561 Atomic and Molecular Physics** 3 Physics of atoms and molecules using quantum theory.
- 563 Physics of the Solid State** 3 Lattice vibrations and defects; ionic and electronic conductivities; band theory; magnetic properties; luminescence.
- 566 Biological Physics** 3 Fundamental physics and thermodynamics of the cell; mechanics of biomolecular machines. Credit not granted for both PHYSICS 466 and PHYSICS 566.
- 571 Methods of Theoretical Physics** 3 Mathematical methods for theoretical physics; linear algebra, tensor analysis, complex variables, differential equations, integral equations, variational calculus, and group theory.
- 575 Advanced Solid State Physics** 3 Quantum theory of solids; Green's functions, correlation functions and other field-theoretic methods; magnetism, superconductivity and transport properties.
- 581 Advanced Topics** 3 May be repeated for credit; cumulative maximum 12 hours. Topics of current interest in advanced physics. (Cross-listed course offered as PHYSICS 581, ASTRONOM 581).
- 590 Seminar** 1 May be repeated for credit.
- 592 Wave Propagation Seminar** 2 May be repeated for credit; cumulative maximum 4 hours. Waves in the continuum; elastic, plastic, and hydrodynamic waves; shock waves.
- 598 Teaching Undergraduate Physics Laboratories** 1 May be repeated for credit; cumulative maximum 4 hours. Principles and practices of teaching, planning and management of undergraduate physics laboratories; choice and care of equipment.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Plant Pathology

Degree offered: Doctor of Philosophy (Plant Pathology)

Faculty working with graduate students: 30

Graduate students: 33

Graduate students receiving assistantships or scholarships: 100%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

Plant Pathology is the study of plant diseases caused by pathogens and environmental factors; it involves study in mycology, bacteriology, nematology, virology, disease physiology and biochemistry, molecular biology of host-parasite relationships, etiology, ecology and epidemiology of plant diseases, disease resistance, and integrated disease management by developing and deploying cultural, chemical, biological, and biotechnological approaches. Because of its broad mission, the Department of Plant Pathology has strong interrelationships with all other plant- and biology-oriented departments and commodity groups within the state and nationally and internationally. The mission of the department reflects the strategic goals of Washington State University by advancing knowledge of plant pathology through creative research and scholarship, by extending that knowledge worldwide through the training of graduate students, and by applying the knowledge to protect the quality and quantity of the local and global food supply. The courses offered in this department are designed both to train students expecting to make plant pathology their professional field of specialization and to provide supplementary training for students in other biological and agricultural fields, particularly botany, crop science, genetics, horticulture, forestry, and entomology. Students who expect to become professional plant pathologists are advised to include in their undergraduate studies fundamental courses in botany, chemistry, genetics, microbiology, physics, and zoology. As preparation for work toward an advanced degree, a student should have completed a bachelor's degree; at least one semester each of general inorganic chemistry, botany, zoology, physics; one semester each of systematic botany, plant physiology, general plant pathology, entomology, microbiology, pre-calculus, organic chemistry, genetics, and report writing or advanced composition.

Degree Description

Doctorate in Plant Pathology requires graded course work and completion of dissertation research. The degree involves study in mycology, bacteriology, nematology, virology, disease physiology and biochemistry, molecular biology of host-parasite relationships, etiology, ecology and epidemiology of plant diseases, disease resistance, and integrated disease management by developing and deploying cultural, chemical, biological, and biotechnological approaches.

Contact Information

Debra Marsh
Sr Academic Coordinator
Johnson Hall Graduate center
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Pullman, WA 99164-6420
Telephone: 509-335-2615
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Faculty

Lori Carris, Gary Chastagner, Weidong Chen, Xianming Chen, Frank Dugan, Lindsey Dutoit, Kenneth Eastwell, Axel Elling, Dean Glawe, Gary Grove, Lee Hadwiger, Scot Hulbert, Debra Inglis, Dennis Johnson, Ned Klopfenstein, Richard Larsen, Mark Mazzola, Timothy Murray, Duroy Navarre, Patricia Okubara, Hanu Pappu, Tim Paulitz, Tobin Peever, Naidu Rayapati, Brenda Schroeder, Deven See, Linda Thomashow, George Vandemark, David Weller and Chang-Lin Xiao.

PL P

- 501 Biology and Control of Plant Diseases 3 (2-3)** Introduction to the biology and control of plant diseases covering disorders caused by fungi, viruses, bacteria, and nematodes.
- 503 Advanced Cropping Systems 3** Understanding the management of constraints to crop production and quality; biological, physical, and chemical approaches to crop health management. Field trips required. (Cross-listed course offered as CROP SCI 403, PL P 403). Recommended preparation: CROP SCI 305; PL P 429.
- 511 Viruses and Virus Diseases of Plants 4 (3-3)** Course Prerequisite: MBIOS 503 or 504. Nature of plant viruses, vector-virus relationships and virus diseases of plants.
- 513 Plant Nematology 4 (3-3)** Anatomy and morphology of plant-parasitic nematodes, molecular plant-nematode interactions, genomics, symptoms, identification, techniques and control.
- 514 Phytobacteriology 4 (3-3)** Isolation and characterization of bacteria having a saprophytic, symbiotic or pathogenic association with plants, molecular structure, function, and genetics.
- 515 Seminar 1** May be repeated for credit.
- 521 General Mycology 4 (2-6)** The structure, life histories, classification, and economic importance of the fungi.
- 525 Field Plant Pathology and Mycology V 1 (0-3) to 2 (0-6)** May be repeated for credit; cumulative maximum 4 hours. Field trips, forays, and demonstrations dealing with various aspects of plant pathology and mycology.
- 526 Advanced Fungal Biology 4 (2-6)** Course Prerequisite: PL P 521. Advanced topics in fungal biology, ecology, systematics, evolution and coevolution via discussions of literature and special laboratory projects.
- 535 Molecular Genetics of Plant and Pathogen Interactions 3** Genetic and molecular biological aspects of host-pathogen interactions.
- 551 Epidemiology and Management of Plant Diseases 3** Principles of plant disease epidemiology, control and ecology of pathogens. Recommended preparation: PL P 429.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18

May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Plant Pathology

Degree offered: Master of Science in Plant Pathology

Faculty working with graduate students: 30

Graduate students: 11

Graduate students receiving assistantships or scholarships: 100%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

Plant Pathology is the study of plant diseases caused by pathogens and environmental factors; it involves study in mycology, bacteriology, nematology, virology, disease physiology and biochemistry, molecular biology of host-parasite relationships, etiology, ecology and epidemiology of plant diseases, disease resistance, and integrated disease management by developing and deploying cultural, chemical, biological, and biotechnological approaches. Because of its broad mission, the Department of Plant Pathology has strong interrelationships with all other plant- and biology-oriented departments and commodity groups within the state and nationally and internationally. The mission of the department reflects the strategic goals of Washington State University by advancing knowledge of plant pathology through creative research and scholarship, by extending that knowledge worldwide through the training of graduate students, and by applying the knowledge to protect the quality and quantity of the local and global food supply. The courses offered in this department are designed both to train students expecting to make plant pathology their professional field of specialization and to provide supplementary training for students in other biological and agricultural fields, particularly botany, crop science, genetics, horticulture, forestry, and entomology. Students who expect to become professional plant pathologists are advised to include in their undergraduate studies fundamental courses in botany, chemistry, genetics, microbiology, physics, and zoology. As preparation for work toward an advanced degree, a student should have completed a bachelor's degree; at least one semester each of general inorganic chemistry, botany, zoology, physics; one semester each of systematic botany, plant physiology, general plant pathology, entomology, microbiology, pre-calculus, organic chemistry, genetics, and report writing or advanced composition.

Degree Description

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etiology, ecology and epidemiology of plant diseases, disease resistance, and integrated disease management using cultural, chemical, biological and biotechnological approaches. Because of its broad mission, the Department of Plant Pathology has strong interrelationships with all other plant- and biology-oriented departments and commodity groups within the state and nationally and internationally. The mission of the department reflects the strategic goals of Washington State University by advancing knowledge of plant pathology through creative research and scholarship, by extending that knowledge worldwide through the training of graduate students, and by applying the knowledge to protect the quality and quantity of the local and global food supply. 4000 Character Limit.

Training and Professional Development Opportunities

Students will gain analytical and practical skills in carrying out field-, laboratory- and greenhouse-based research that prepare them to be competitive for employment in academic, government and industry laboratories. Students will be provided other professional development opportunities such as resume writing, interview skills, written and oral communication skills, public speaking and attendance at professional conferences.

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Political Science

Degree offered: Doctor of Philosophy (Political Science)

Faculty working with graduate students: 21

Graduate students: 29

Graduate students receiving assistantships or scholarships: 75%

Program offered: DDP, Pullman, Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10

Program Description

Fifteen faculty members teach and conduct research in the major subfields of the discipline: American, comparative, international relations, public policy and administration, political theory, and political methodology, with sub-specializations in public law, American political behavior, political psychology, French and European politics, American foreign policy, gender and politics, the presidency, the Congress, environmental policy, state and

local politics, and qualitative methodology.

Degree Description

Fifteen faculty members teach and conduct research in the major subfields of the discipline: American, comparative, international relations, public policy and administration, political theory, and political methodology, with sub-specializations in public law, American political behavior, political psychology, French and European politics, American foreign policy, gender and politics, the presidency, the Congress, environmental policy, state and local politics, and qualitative methodology.

Training and Professional Development Opportunities

None at WSU

Post-Graduate Employment Opportunities

Academic career at research university or teaching college, research thinktanks, non-profit organizations, corporations, and governmental careers.

Post-Graduate Career Placements

Academic jobs at various Research I universities, as well as ones at smaller liberal arts colleges. Government analytic and policy making jobs (defense and intelligence community). Work for profit and non-profit organizations.

Contact Information

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Faculty

Dana Baker, William Budd, Aaron Bunch, Joseph Campbell, Cornell Clayton, Martha Cottam, Christopher Faricy, William Kabasenche, Carolyn Long, Nicholas Lovrich, Amy Mazur, Michael Myers, David Nice, John Preston, Travis Ridout, David Shier, Steven Stehr, Mark Stephan, Matt Stichter, Paul Thiers and Matthew Weidenfeld.

POL S

- 501 The Scope of Political Science 3** Historical development and present status of the discipline; contemporary issues and future trends.

- 502 Seminar in Normative Theory 3** Elements of normative theory developments; examination of bases of controversies and approaches in the modern literature using historical sources.
- 503 Research Methods in Political Science 3** Social science research design topics, measurement, sampling, data sources, experimental and quasi-experimental designs, field and historical designs, content analytic designs.
- 504 Quantitative Methods in Political Science 3** Applied statistical skills, enabling understanding of substantive political and social questions.
- 505 Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 Seminar on American Institutions and Processes 3** Seminar required of all graduate students using this field as a major or a minor; it is a prerequisite of all other graduate seminars in the field.
- 511 Seminar in American Political Thought 3** May be repeated for credit; cumulative maximum 6 hours. The genesis and development of political thought in the United States.
- 512 Seminar in American Institutions 3** May be repeated for credit; cumulative maximum 6 hours. Origin, development, and contemporary issues in political organization and structure in the United States.
- 513 Seminar in American Political Behavior 3** May be repeated for credit; cumulative maximum 6 hours. Theoretical approaches to, and empirical analysis of, mass political behavior in the US.
- 514 Seminar in Public Policy 3** Examination of central questions in public policy including the nature of public policy, policy analysis, and government intervention in society.
- 516 Seminar on Law, Courts, and Judicial Politics 3** Seminar on law, courts, and judicial politics.
- 530 American Foreign Policy: Theories and Applications 3** Theories of international politics applied to American foreign policy.
- 531 Seminar in International Security 3** International security and arms control politics, negotiations, agreements.
- 532 Seminar in International Political Economy 3** Institutions, politics, and decision-making processes in managing international economic relations.
- 533 Topics in Political Psychology 3** May be repeated for credit; cumulative maximum 6 hours. Psychological influences on political decision making, bargaining, conflict and conflict resolution options.
- 534 Seminar in Comparative Politics 3**
- 536 Special Topics in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced issues seminar in international and comparative politics.
- 537 Concepts and Methods in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Selected concepts (state, political participation), and methods (cross-national analysis, case study approaches) in comparative politics.
- 538 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 539 The Political Science Profession 1** Methods, problems, and purposes of teaching, research, and vocation in political science.
- 540 Proseminar in Public Administration 3** Proseminar over viewing basic theories of administrative organization, relationships, and behavior.
- 541 Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 542 Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Analytical perspectives and theoretical issues.
- 543 Topics in Public Administration and Policy 3** May be repeated for credit; cumulative maximum 6 hours. Examination of the literature on the politics of the American public policy process.
- 544 The Politics of Policy Process 3** American political process; policy making under the constraints of a democratic system; relationship to the (non) achievement of the public interest.
- 590 Policy Studio Course I 2** Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 591 Policy Studio Course II 2** Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 592 Policy Studio Course III 2** Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 597 Graduate Internship V 2-12** May be repeated for credit; cumulative maximum 12 hours. On/off campus internship in federal, state, or local government institutions; nonprofit or public organizations; written assignments and readings required.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Political Science

Degree offered: Master of Arts in Political Science

Faculty working with graduate students: 21

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Program Description

Fifteen faculty members teach and conduct research in the major subfields of the discipline: American, comparative, international relations, public policy and administration, political theory, and political methodology, with sub-specializations in public law, American political behavior, political psychology, French and European politics, American foreign policy, gender and politics, the presidency, the Congress, environmental policy, state and local politics, and qualitative methodology.

Degree Description

Master of Arts in Political Science Non Thesis in conjunction with certificate program is a terminal degree program designed to provide students with a specialized qualification better suited for the pursuit of professional careers in federal, state, or local government. The GJSS program targets students intending to pursue largely non-academic, governmental careers as practitioners, whether it be in the field of homeland security, law enforcement, or as analysts within the U.S. intelligence or defense communities.

Training and Professional Development Opportunities

none

Post-Graduate Employment Opportunities

none

Post-Graduate Career Placements

none

Contact Information

Martha Cottam
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Bonnie Kemper
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Johnson Tower 801
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Fax: 509-335-7990
E-mail: bkemper@wsu.edu

Faculty

Dana Baker, William Budd, Aaron Bunch, Joseph Campbell, Cornell Clayton, Martha Cottam, Christopher Faricy, William Kabasenche, Carolyn Long, Nicholas Lovrich, Amy Mazur, Michael Myers, David Nice, John Preston, Travis Ridout, David Shier, Steven Stehr, Mark Stephan, Matt Stichter, Paul Thiers and Matthew Weidenfeld.

Political Science

Degree offered: Master of Arts in Political Science - Non Thesis

Faculty working with graduate students: 7

Graduate students: 6

Deadline: Fall: January 10

Program Description

Fifteen faculty members teach and conduct research in the major subfields of the discipline: American, comparative, international relations, public policy and administration, political theory, and political methodology, with sub-specializations in public law, American political behavior, political psychology, French and European politics, American foreign policy, gender and politics, the presidency, the Congress, environmental policy, state and local politics, and qualitative methodology.

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Training and Professional Development Opportunities

None at WSU

Post-Graduate Employment Opportunities

The GJSS program targets students intending to pursue largely non-academic, governmental careers as practitioners, whether it be in the field of homeland security, law enforcement, military service, or as analysts within the U.S. foreign, intelligence, or defense communities.

Post-Graduate Career Placements

Many have gone on to careers in US government agencies, the military, or decided to pursue doctoral studies.

Contact Information

Thomas Preston
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Political Science
810 Johnson Tower
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Telephone: 509-335-5225
Fax: 509-335-7990
E-mail: tpreston@wsu.edu

Faculty

David Brody, Martha Cottam, Faith Lutze, Otwin Marenin, John Preston, Steven Stehr and Bryan Vila.

POL S

- 400 Political Science Issues 3** May be repeated for credit; cumulative maximum 6 hours. Current issues in political science.
- 424 US National Security Policy 3** Substantive and theoretical research on issues relevant to formulation and requirements of post-Cold War, US national security and defense policy.
- 427 United States Foreign Relations 3** Ends and means in foreign policy; organization, management, control, and current policy issues. (Cross-listed course offered as POL S 427, HISTORY 486).
- 428 Issues in Political Psychology 3** Course Prerequisite: POL S 101 or PSYCH 105; junior standing. Introduction to the ways in which psychological factors influence political phenomena.
- 429 Special Topics in American Foreign and Defense Policy 3** May be repeated for credit; cumulative maximum 6 hours. Current issues in foreign policy.
- 505 Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 Leadership in Criminal Justice 3** Study of leadership models and theories as they apply to criminal justice institutions.
- 511 Criminal Justice Management 3** Examines the theoretical framework for understanding criminal justice organizations through examining management theory, organizational dynamics, and administration research.
- 512 Juvenile Justice 3** Examination of the major theories and contemporary issues related to juvenile delinquency, the juvenile justice system, gangs, and juvenile corrections.
- 513 Multicultural Issues in Criminal Justice 3** Critical examination of race, gender, and other diversity and cultural issues within the U.S. criminal justice system.
- 514 Professional Development in Criminal Justice and Criminology 1** Professional aspects of research, teaching, and service activities in criminal justice and criminology.
- 520 Criminal Justice Research Methods 3** The design and execution of criminal justice research; critical examination of current research methods in criminal justice.
- 521 Advanced Topics in Criminal Justice Research Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 520. Exploration of specialized topics in research methodology; topics may include qualitative methods, GIS, ethnography, and survey design.
- 522 Foundations of Quantitative Methods 3** Application of foundational quantitative methods utilized in the field of Criminal Justice and Criminology.
- 523 Intermediate Quantitative Methods 3** Course Prerequisite: CRM J 522. Intermediate-level quantitative methods including logistic regression, factor analysis, propensity scoring and model building.
- 524 Advanced Topics in Quantitative Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 523. Advanced quantitative methods used in criminal justice, including time series, HLM, multi-level modeling, spatial analysis, and repeated measures analysis.
- 530 Criminal Justice: Process and Institutions 3** Processes of criminal justice in the context of the social, political, and economic environments.
- 531 Drugs, Alcohol, and Crime 3** Examination of the research and theory surrounding the relationship between alcohol, drugs, crime, and the criminal justice system.
- 540 Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 541 Seminar in Corrections 3** Current issues related to the control, management, and sanctioning of criminal offenders.
- 542 Community Corrections 3** Examines correctional processes in a community setting, including probation, parole, and innovative community-based strategies for dealing with the offender.
- 555 Seminar in Criminological Theory 3** Individual, situational and ecological correlates of criminal behavior; data sources and empirical research.
- 560 Prosecution and Adjudication 3** The function of courts and the behavior of prosecutors, defense attorneys and judges within the criminal justice system.
- 570 The Police and Society 3** Community and selected social institutional factors as related to their influence on police systems.
- 572 Seminar in Comparative Policing 3** Study of the history, organization, and policies of policing systems in selected countries and of transnational policing.
- 580 Gender and Justice 3** Criminal justice system's treatment of women offenders, victims, and professionals.

- 590 **PRACTICUM V 1-6** May be repeated for credit; cumulative maximum 6 hours. S,F Grading.
- 591 **Seminar in the Administration of Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Current issues, problems, and critical concerns within the field of administration of criminal justice.
- 592 **Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Same as POL S 542.
- 593 **Special Topics in Criminological Theory 3** May be repeated for credit; cumulative maximum 6 hours. Intense examination of a contemporary criminological theory, school, or paradigm.
- 594 **Special Topics in Comparative Criminology and Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of specific topics in comparative criminal justice or criminology.
- 595 **Advanced Topics in Criminal Justice Institutions and Processes 3** May be repeated for credit; cumulative maximum 6 hours. In-depth study of issues associated with criminal justice institutions and processes.
- 596 **Special Topics: Criminal Justice and Public Health 3** May be repeated for credit; cumulative maximum 6 hours. Examination of public health ramifications of criminal justice policy and practice; public health approaches to violence and substance abuse prevention.
- 600 **Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 538 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 539 The Political Science Profession 1** Methods, problems, and purposes of teaching, research, and vocation in political science.
- 540 Proseminar in Public Administration 3** Proseminar over viewing basic theories of administrative organization, relationships, and behavior.
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Prevention Science

Degree offered: Doctor of Philosophy in Prevention Science

Faculty working with graduate students: 31

Graduate students: 15

Graduate students receiving assistantships or scholarships: 73%

Program offered: Pullman, Spokane, Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10th

Program Description

The Prevention Science Graduate Program at Washington State University provides training opportunities at the doctoral level for students interested in developing expertise in the study of individuals and families and in the development and evaluation of prevention programs. The Ph.D. program in Prevention Science at Washington State University is an interdisciplinary program; participating faculty are from Human Development, Communication, Educational Psychology, Psychology, and Nursing. The program emphasizes training in both the generation of research-based knowledge and its translation into effective programs and policies that positively impact the well-being of children, youth, adults, families, and their communities.

Degree Description

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science: 1) Human Development in Context; 2) Research Methods; and 3) Program Development and Evaluation. Students are required to take core courses in at least three of the following disciplines: Communication, Educational Psychology, Human Development, and/or Nursing. All students will complete a Master's thesis as part of their Ph.D. program, as well as a Ph.D. dissertation. Students are required to have faculty members from at least two (preferably three) disciplines on their thesis and dissertation committees. Besides the required courses, students have the opportunity to take additional electives from three elective specialty areas: 1) Advanced Developmental Science, 2) Quantitative Methods, and 3) Social Policy.

Training and Professional Development Opportunities

Students have opportunities to engage in prevention research and outreach activities on the WSU Pullman campus and throughout the state of Washington through partnerships with Health and Wellness Services and with WSU Extension.

Post-Graduate Employment Opportunities

Graduates of the program will be qualified for positions as: program evaluators, research analysts, and administrators in government, private research institutes, social service agencies, and consulting firms; foundation program officers and grant evaluators; tenure-track faculty members in departments of child development, communication, developmental psychology, educational psychology, family studies, human development, public health nursing, rural sociology, and social work; and other university positions such as extension faculty, research associates, or program coordinators for grant-funded projects.

Post-Graduate Career Placements

New program

Contact Information

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Faculty

Erica Austin, Cory Bolkan, Matthew Bumpus, Brittany Cooper, Robert Cooper, Mary Deen, Marcelo Diversi, Susan Finley, Brian French, Deborah Handy, Laura Hill, Douglas Hindman, Elizabeth Hindman, Stacey Hust, Jane Lanigan, Janet Lohan, Laurie McCubbin, Jenifer McGuire, Louise Parker, Patricia Pendry, Karen Peterson, Bruce Pinkleton, Thomas Power, Kathleen Rodgers, Yoshie Sano, Jill Shultz, Suzanne Smith, Michael Trevisan, Sarah Ullrich-French, Bruce Wright and Changmin Yan.

COM

500 Communication Colloquium 1 May be repeated for credit; cumulative maximum 8 hours. Written and oral presentation of research topics in Communication; college colloquium.

- 501 Theory Building in Communication** 3 Relationship of research to theory development; evaluation of current theory and research; planning and executing research within specified theoretical frameworks.
- 502 Consumer Analysis and Brand Development** 3 Consumer analysis and brand development; skills to make strategic communication campaigns successful.
- 504 Instructional Practicum** 1 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: By interview only.
- 506 Persuasion and Social Influence** 3 Theories, concepts strategies and processes of persuasion and social influence.
- 507 Communication Ethics Seminar** 3 Topics in communication ethics.
- 509 Quantitative Research** 3 Introduction to quantitative research in communication; hypothesis development, testing; basic statistics, interpretation; field surveys, laboratory and field experiments, content analysis.
- 514 Health Communication Theories and Campaigns** 3 Health communication theories with a focus on campaign construction and evaluation.
- 516 Health Communication and Society** 3 3 Reviews, critiques and applications of research regarding the impact of social and cultural environments on health communication.
- 517 Health Communication and Social Development** 3 Explores and tests role of mediated communication in the causes of and solutions for health problems, particularly among young people.
- 521 Foundational Perspectives in Intercultural Communication** 3 Overview of three current foundational research perspectives in intercultural communication; functionalist (post-positivist), interpretive and critical.
- 522 Theoretical Perspectives on Intercultural Communication** 3 Advanced readings in intercultural communication theory and methods; paradigms in current theorizing.
- 524 Intercultural/International Communication and Social Change** 3 Application of communication theory, research and technologies aimed at fostering social change in intercultural and international contexts.
- 526 Current Topics in Intercultural Communication** 3 Topics in current intercultural communication research.
- 535 Organizational Communication Theory** 3 May be repeated for credit; cumulative maximum 6 hours. Traditional and emerging theories in organizational communication.
- 537 Organization and Society** 3 Historical foundations, theoretical developments, contemporary issues and practical implications of communicative processes of organizations within society.
- 540 Risk Communication** 3 Research and practice in risk communication.
- 550 Media Processes and Effects: Theory and Practice** 3 Physiological, psychological and social effects of media messages and technologies upon individuals and societies.
- 552 Current Issues in Media Processes and Effects** 3 Current issues in media processes and effects.

- 561 Multimedia Content Creation 3** Exploration and application of strategies to communicate ideas clearly, concisely, and effectively through multimedia content.
- 562 Crisis Communication in Global Contexts 3** Prepare, plan, and execute crisis communication and management to protect the continuity of an organization's image and mission.
- 563 Ethics for Professionals 3** The understanding, discussion, and application of key theories of individual and institutional ethics; the articulation and defense of ethical reasoning.
- 564 Research Methods for Professionals 3** Understanding the role of research in media and related organizations and its application to organizational decision making through quantitative and qualitative research methods including research design, questionnaire construction, sampling, data collection techniques, and variable measurement.
- 570 Communication Theory 3** Relevant theories and research from mass and interpersonal communication.
- 571 Theoretical Perspectives on Media and Society 3** Theories explaining the social and cultural environments of communication processes emphasizing in mass communication.
- 572 Mass Media, Social Control, and Social Change 3** Study of the forces that influence the media's role as an agent of social control or social change.
- 573 Media and Public Discourse 3** Historical and contemporary concepts, questions and dynamics constituting the role of media and discourse among various publics.
- 580 Topics in Communication 3** May be repeated for credit; cumulative maximum 12 hours. Contemporary, specialized, or technical topics in communication.
- 591 Qualitative Research Methods 3** Historical, textual, and legal methodologies for theory-based evaluative and discourse studies in communication.
- 599 Seminar in Communication 3** May be repeated for credit; cumulative maximum 6 hours. Special topics in rhetoric, communication, and public address.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: By interview only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
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- Human Development**
- H D**
- 511 Theory and Substance of Human Development I 3** Human development theories; application to life span development, cultural variations, resources, problem solving, interaction of families and individuals with other systems.
- 513 Research Methods in Human Development I 3** Introduction to process of research and methods in human development; techniques of research, data collection, and data analysis procedures.
- 514 Research Methods in Human Development II 3** Course Prerequisite: H D 513. Integration of formal decision making into the social science research process; procedures appropriate for experimental, quasi-experimental and field research.
- 520 Adolescence 3** In-depth examination of theories and research, developmental issues and prevention and intervention programs for school-aged children and adolescents.
- 535 Program Development in Child and Family Studies 3** Analysis and development of program delivery systems, curricula and evaluation models.
- 540 Effective Intervention Programs 3** Course Prerequisite: H D 535. Innovative effective prevention and intervention programs from theoretical, applied, and outcome evaluation perspectives.
- 550 Seminar on Family Relationships 3** Survey of family studies topics and issues examined from a research point of view.
- 558 Parent-Child Relationships 3** The reciprocal interactions among family members will be examined; theoretical perspectives and empirical findings will be explored in terms of implications for education and practice.
- 560 Seminar in Child Development 3** Survey of literature on selected areas in child development; discussion of research and application related to current issues and trends.
- 561 Advanced Curriculum for Early Childhood Programs 3** Opportunity to explore curriculum practices in early childhood education; discussion, evaluation and adaptation of curricula based on current research.
- 562 Administration and Leadership in Programs 3** Examining early childhood administrator role; analysis and application of research to administration, developing concrete skills necessary for successful administration.
- 580 Families, Community and Public Policy 3** Course Prerequisite: H D 560. Analysis of family policy research; role of family policy research in public policy and knowledge building processes.
- 586 Special Topics in Human Development V 1-3** May be repeated for credit; cumulative maximum 6 hours. Assessment and evaluation of families and children.

- 598 Professional Internship 3** Supervised individual experiences with related organizations, businesses, or government agencies; opportunities for interaction with professionals in related fields.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- Human Development**
- NURS**
- 503 Scientific Inquiry in Nursing 2** Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.
- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.
- 506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V 3 (0-9) to 5 (0-15)** Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.
- 521 Teaching, Learning and Evaluation in Nursing V 3-6** Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.
- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
- 535 Philosophy of Nursing Science 2** Course prerequisite: Graduate standing in Nursing; NURS 534 or concurrent enrollment. Structure and organization of fields of knowledge in science including historical and philosophical tenets of inquiry.

- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4 (3-3)** Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V 4 (1-9) to 5 (1-12)** Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.
- 548 Psychiatric Nurse Practitioner Internship V 1-9** May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V 2-4** Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology; principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V 2-6** Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3 (2-3)** Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V 2-3** Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
- 569 Primary Care of Families: Family 4 (1-9)** Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1 (0-3)** Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.

- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3 (2-3)** Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V 2-3** Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3 (2-3)** Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.
- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Human Development

SP ED

- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).
- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.

- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Project Management – Cert in Project Management

Degree offered: Graduate Certificate in Project Management

Graduate students: 15

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)
 Spring: November 15 (July 1 international)
 Summer: April 1 (Default international)

Requirements

Students will apply for graduation with this certificate according to posted Graduate School Deadlines.

Program Description

The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs. Rather than completing all the course requirements for an ETM master's degree, students may take four courses (12-credit hours) in specialized areas. A certificate is awarded upon completion of these courses. Course credits earned for a certificate may also apply to a master's degree in the ETM Program or other graduate degree programs. A student may earn more than one certificate and may work on the certificate and master's program

concurrently. Eight certificates are available in the Master of Engineering and Technology Management degree program.

Degree Description

It is necessary for project managers to update their skills in modern project management techniques, to effectively contribute to the continuing growth of the industry. The increasing complexity of project management requires the one in charge to understand the many facets in order to become/remain proficient in the field. The PM certificate provides the recipients with the skills to manage any type of project. It is a fact that all technology managers will have to also manage projects. It is necessary that these projects be managed professionally. Many professionals have reported that this certificate has allowed them advance in their Careers as a Project Manager and as a Technology Manager.

Contact Information

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Engineering Management

E M

- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.
- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.

- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Protein Biotechnology – Cert in Protein Biotechnology

Degree offered: Graduate Certificate in Protein Biotechnology

Requirements

Please see the program/department for more information.

Contact Information

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Psychology – Psychology–Clinical

Degree offered: Doctor of Philosophy (Psychology)

Faculty working with graduate students: 31

Graduate students: 26

Graduate students receiving assistantships or scholarships: 96%

Tests required: GRE (Combined)

Deadline: Fall: December 15

Spring: No spring applications

Program Description

The Department of Psychology offers Ph.D. programs in Clinical Psychology and Experimental Psychology.

Degree Description

The Clinical Psychology Program at Washington State University is based on the scientist-practitioner model of training. The Program is designed to integrate theory, research, and clinical practice in the training of students. Students are thus involved in research activities each semester in the Program and clinical practice beginning in the third semester until the start of the 12-month internship. The goal of the program is to train highly competent clinical psychologists who will obtain high quality APA-approved internships and, with graduation, make positive contributions to the field of clinical psychology. Given that our graduates can potentially make contributions to clinical psychology in academic, research, medical, clinical, or community settings dependent on their interests and goals, the Program provides broad, general clinical training during the four years that students are at the University. Areas of interest within the Clinical Psychology Program include: Health Psychology, Neuropsychology, Adult Psychopathology, and Clinical Child, Adolescent and Family Psychology. The Program is fully accredited by the American Psychological Association [750 First Street, NE, Washington, DC 20002; (202) 336-5979].

Training and Professional Development Opportunities

RESEARCH TRAINING The Clinical Program operates on the proposition that research training is an integral part of the education of clinical psychologists. Although the program admits only persons who expect to receive a Ph.D., each student who enters at the bachelor's degree level is expected to complete an empirical master's project while in progress toward the doctoral dissertation. Students may conduct research under the supervision of either clinical or experimental faculty. In addition to the master's project and dissertation, clinical students are expected to be involved in research activity under the direction of a faculty member during each semester in residence.

CLINICAL TRAINING Exposure to professional clinical activities begins in the fall semester of the second year of graduate training and continues through the completion of the clinical internship. To provide broad clinical training for students, the Department of Psychology offers a variety of different clinical experiences. The Psychology Clinic in the Department of Psychology is staffed by faculty and clinical graduate students and provides assessment, diagnostic, and psychotherapy services for a fee to the University and surrounding communities. The University Counseling Services is staffed by clinical and counseling psychology graduate students and faculty psychologists, and provides ongoing counseling and

emergency services to students. The University Health and Wellness Services provide assistance to students through the Behavior Medicine Service, which is staffed by clinical graduate students, physicians, and a psychiatrist. The University of Idaho Child and Adolescent Study Center provides assessment and therapy to children and adolescents.

Post-Graduate Employment Opportunities

Post-Graduate Employment Opportunities 1. Post-doctoral (one to two year) positions in universities and medical schools 2. Staff psychologist positions in VA Health Care Centers 3. Faculty positions as clinical psychologists at Universities 4. Staff psychologist positions in hospitals and clinics 5. Staff psychologist positions in medical schools 6. Clinical psychologist in private practice

Post-Graduate Career Placements

2011 Graduates1. Onondaga Case Management Services Syracuse, NY2. Northern California Health Care System Sacramento, CA3. Department of Pediatric Psychology University of Arkansas for Medical Sciences Little Rock, AR4. Private Practice Littleton, CO2010 Graduates1. Health and Wellness Washington State University Pullman, WA2. Mayo Clinic, Rochester, MN3. The Help Group Sherman Oaks, CA 914014. Department of Psychology Washington State University Pullman, WA5. Brooke Army Medical Center Warrior Resiliency Program Department of Behavioral Medicine 3851 Roger Brooke Drive Fort Sam Houston, TX 6. University of Alaska-Anchorage Center for Behavioral Health Studies Anchorage, AK 7. Department of Neurology University of California-Davis Sacramento, CA 958178. Veterans Affairs Medical Center Salem, Virginia 241539. VA Palo Alto Health Care System Palo Alto, CA 943042009 Graduates1. Trillium Health Center Mississauga, Ontario2. Department of Psychiatry and Division of Neurology University of British Columbia Vancouver, BC 3. James A. Haley Veterans Hospital Tampa, Florida4. Department of Physical Medicine and Rehabilitation Johns Hopkins University School of Medicine Baltimore, Maryland2008 Graduates1. Department of Psychology Northern Illinois University DeKalb, IL2. Evergreen Behavioral Health Vancouver, WA3. Puget Sound Psychology and Consulting Seattle, WA4. St. Peter Regional Treatment Center St. Peter, MN5. Platteville Family Resource Center Platteville, WI2007 Graduates1. Alcohol Drug Abuse and Treatment Program Cannon Air Force Base New Mexico2. Merit Care Health System Detroit Lakes, MN3. VA Loma Linda Healthcare System, Loma Linda, California4. Department of Psychiatry University of Washington School of Medicine Seattle, WA 5. Private Practice in Forensic Psychology Seattle, WA6. Zablocki VA Medical Center Milwaukee, WI2006 Graduates1. Department of Veterans Affairs St. Augustine, FL2. Foothills Medical Center-Sleep Center Alberta Health Services Alberta, Canada3. Portland VA Medical Center Portland, OR4. Fargo VA Medical Center Fargo, ND5. Department of Rehabilitative Medicine St. Mary's Hospital Tucson, Arizona6. Assistant Dean of Students for Chemical Health and Outreach Programing Counseling Services St. Cloud State University St. Cloud, Wisconsin7. Easton Center for Alzheimer's Disease Research UCLA David Geffen School of Medicine Los Angeles, CA8. Department of Psychiatry/Psychology Division David Geffen School of Medicine UCLA Los Angeles, CA

Contact Information

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Human Development

H D

- 511 Theory and Substance of Human Development I** 3 Human development theories; application to life span development, cultural variations, resources, problem solving, interaction of families and individuals with other systems.
- 513 Research Methods in Human Development I** 3 Introduction to process of research and methods in human development; techniques of research, data collection, and data analysis procedures.
- 514 Research Methods in Human Development II** 3 Course Prerequisite: H D 513. Integration of formal decision making into the social science research process; procedures appropriate for experimental, quasi-experimental and field research.
- 520 Adolescence** 3 In-depth examination of theories and research, developmental issues and prevention and intervention programs for school-aged children and adolescents.
- 535 Program Development in Child and Family Studies** 3 Analysis and development of program delivery systems, curricula and evaluation models.
- 540 Effective Intervention Programs** 3 Course Prerequisite: H D 535. Innovative effective prevention and intervention programs from theoretical, applied, and outcome evaluation perspectives.
- 550 Seminar on Family Relationships** 3 Survey of family studies topics and issues examined from a research point of view.
- 558 Parent-Child Relationships** 3 The reciprocal interactions among family members will be examined; theoretical perspectives and empirical findings will be explored in terms of implications for education and practice.
- 560 Seminar in Child Development** 3 Survey of literature on selected areas in child development; discussion of research and application related to current issues and trends.

- 561 Advanced Curriculum for Early Childhood Programs** 3 Opportunity to explore curriculum practices in early childhood education; discussion, evaluation and adaptation of curricula based on current research.
- 562 Administration and Leadership in Programs** 3 Examining early childhood administrator role; analysis and application of research to administration, developing concrete skills necessary for successful administration.
- 580 Families, Community and Public Policy** 3 Course Prerequisite: H D 560. Analysis of family policy research; role of family policy research in public policy and knowledge building processes.
- 586 Special Topics in Human Development V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Assessment and evaluation of families and children.
- 598 Professional Internship** 3 Supervised individual experiences with related organizations, businesses, or government agencies; opportunities for interaction with professionals in related fields.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

Human Development

PSYCH

- 502 Research Design V** 1-3 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations** 3 Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V** 1-3 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology** 1 May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V** 1-3 May be repeated for credit.

- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3** May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.

- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Pre-requisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Pre-requisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Psychology – Psychology–Experimental

Degree offered: Doctor of Philosophy (Psychology)

Faculty working with graduate students: 33

Graduate students: 29

Graduate students receiving assistantships or scholarships: 93%

Program offered: Pullman, Vancouver

Tests required: GRE (Combined)

Deadline: Fall: December 15

Requirements

A master's-level research project is also required for those students who enter without a master's.

Program Description

The Department of Psychology offers Ph.D. programs in Clinical Psychology and Experimental Psychology.

Degree Description

The doctoral program in Experimental Psychology at Washington State University is designed to produce highly skilled experimental psychologists. Degree recipients are expected to be highly knowledgeable about their specialty areas, to have a strong background in general psychology, to be able to identify significant research problems, and to be conversant with a wide variety of strategies for generating and testing hypotheses that emerge from these problems. It is expected that each graduate will leave Washington State University well equipped to become a productive member of the scientific community. The program is designed to be completed in no more than 5 years, for students entering without a master's degree.

Training and Professional Development Opportunities

varies by specific research area

Post-Graduate Employment Opportunities

psychology researcher; statistician; college professor; consultant

Post-Graduate Career Placements

College Professorships: MacMurray College, SE Oklahoma State University, Augustana College, University of Great Falls, D'Youville College, Zayed University (Dubai), Western WA University, Idaho State University, North Dakota State University, Ohio University, University of Alaska, Western Illinois University, Indiana University (PA), Santiago Canyon College, Wheaton College, Concordia College; University of Wisconsin-Stout, Singapore Management University; Merced College; Post-Doctoral Research Associateships: Cornell Medical School, Columbia University, American Psychological Association, Vanderbilt University, University of British Columbia; Researcher/Statistician: WSU-Spokane, Federal Aviation Administration, U.S. Air Force, other private companies.

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MGTOP

- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

NEURO

509 Affective Neuroscience 3 Brain mechanisms of human and animal emotions. Credit not granted for both NEUROSCI 409 and NEUROSCI 509.

520 Fundamentals of Neuroscience 4 (3-3) Functional aspects of the brain from cell membrane to higher integrative processes.

521 Introduction to Veterinary Neurology 3 (2-3) Course Prerequisite: VET MED 510. Neuroanatomical and neurophysiological bases of veterinary neurology, emphasizing central and peripheral sensory and motor systems. (Cross-listed course offered as VET MED 521, NEUROSCI 521).

526 Domestic and Exotic Animal Behavior 2 (1-3) Course Prerequisite: Veterinary Medicine student. Advanced study of animal behavior, emphasizing difference between exotic and domestic animal behavior. (Cross-listed course offered as VET MED 526, NEUROSCI 526).

529 Integrative Neuroscience 3 Basic biochemical processes in the nervous system and their significance for normal and abnormal function.

531 Neuroscience Laboratory Rotation 1 (0-3) May be repeated for credit; cumulative maximum 2 hours. Fourteen-week rotation through each of two research laboratories; learning procedures and techniques in neuroscience.

540 Special Topics in Integrative Neuroscience 3 May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience involving integrative properties of cell systems.

541 Special Topics in Cellular and Molecular Neuroscience 3 May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve nerve cell function and regulation.

542 Special Topics in Interdisciplinary Neuroscience 3 May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that revolve around traditional approaches to nervous system study.

543 Special Topics in Behavioral/Clinical Neuroscience 3 May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve normal and pathological aspects of behavior.

590 Seminar 1 May be repeated for credit; cumulative maximum 7 hours. Presented by advanced graduate students and faculty (both in VCAPP and around WSU) on their research areas.

592 Research Writing and Seminar 3 May be repeated for credit; cumulative maximum 6 hours. Written and oral communication of scientific information; formal instruction while preparing research proposals and departmental seminar.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

PHIL

501 Advanced Logic 3 First-order predicate logic plus some metatheory, applications and/or extensions. Credit not granted for both PHIL 401 and PHIL 501. Recommended preparation: PHIL 201.

504 Special Topics in Philosophy 3 May be repeated for credit; cumulative maximum 6 hours. Intensive study of a special topic not otherwise covered in depth in the curriculum.

507 Seminar in Philosophy of Religion 3 May be repeated for credit; cumulative maximum 6 hours. Advanced topic-driven seminar. Critical analysis of traditional and contemporary religions and religious phenomena. Credit not granted for both PHIL 407 and PHIL 507.

510 Seminar in the History of Philosophy 3 May be repeated for credit; cumulative maximum 6 hours. Systematic exploration of the central works of an individual philosopher or philosophical movement.

520 Seminar in Ethical Theory 3 The major issues, views, and figures of ethical theory from ancient Greece to the present.

522 Seminar in Metaphysics 3 The nature of reality, through study of key concepts such as God, personhood, free will, causation, space, time, and identity.

524 Seminar in Epistemology 3 Classical problems, questions, and theories involving the concept of knowledge.

530 Bioethics 2 Professional ethics for scientists; ethical implications of new technologies; obligations to human and non-human research subjects.

- 532 **Seminar in Business Ethics 3** The major issues in business ethics, both domestic and international, from general principles to specific cases.
- 535 **Advanced Biomedical Ethics 3** Current ethical issues in medical practice, medical research and public policy relating to health issues.
- 540 **Ethics and Social Science Research 3** Professional ethics for social science research, ethical conduct of research, obligations to human subjects and ethical implications of methods and technologies.
- 543 **Philosophy of Language 3** Investigation of philosophical issues concerning meaning, reference, truth, the nature of language, and the relation between language and thought. Credit not granted for both PHIL 443 and PHIL 543.
- 570 **Philosophy of Law 3** Selected topics pertaining to moral and philosophical evaluation of law. Credit not granted for both PHIL 470 and PHIL 570.
- 600 **Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 **Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- POL S**
- 501 **The Scope of Political Science 3** Historical development and present status of the discipline; contemporary issues and future trends.
- 502 **Seminar in Normative Theory 3** Elements of normative theory developments; examination of bases of controversies and approaches in the modern literature using historical sources.
- 503 **Research Methods in Political Science 3** Social science research design topics, measurement, sampling, data sources, experimental and quasi-experimental designs, field and historical designs, content analytic designs.
- 504 **Quantitative Methods in Political Science 3** Applied statistical skills, enabling understanding of substantive political and social questions.
- 505 **Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 **Seminar on American Institutions and Processes 3** Seminar required of all graduate students using this field as a major or a minor; it is a prerequisite of all other graduate seminars in the field.
- 511 **Seminar in American Political Thought 3** May be repeated for credit; cumulative maximum 6 hours. The genesis and development of political thought in the United States.
- 512 **Seminar in American Institutions 3** May be repeated for credit; cumulative maximum 6 hours. Origin, development, and contemporary issues in political organization and structure in the United States.
- 513 **Seminar in American Political Behavior 3** May be repeated for credit; cumulative maximum 6 hours. Theoretical approaches to, and empirical analysis of, mass political behavior in the US.
- 514 **Seminar in Public Policy 3** Examination of central questions in public policy including the nature of public policy, policy analysis, and government intervention in society.
- 516 **Seminar on Law, Courts, and Judicial Politics 3** Seminar on law, courts, and judicial politics.
- 530 **American Foreign Policy: Theories and Applications 3** Theories of international politics applied to American foreign policy.
- 531 **Seminar in International Security 3** International security and arms control politics, negotiations, agreements.
- 532 **Seminar in International Political Economy 3** Institutions, politics, and decision-making processes in managing international economic relations.
- 533 **Topics in Political Psychology 3** May be repeated for credit; cumulative maximum 6 hours. Psychological influences on political decision making, bargaining, conflict and conflict resolution options.
- 534 **Seminar in Comparative Politics 3**
- 536 **Special Topics in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced issues seminar in international and comparative politics.
- 537 **Concepts and Methods in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Selected concepts (state, political participation), and methods (cross-national analysis, case study approaches) in comparative politics.
- 538 **International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 539 **The Political Science Profession 1** Methods, problems, and purposes of teaching, research, and vocation in political science.
- 540 **Proseminar in Public Administration 3** Proseminar over viewing basic theories of administrative organization, relationships, and behavior.
- 541 **Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 542 **Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Analytical perspectives and theoretical issues.
- 543 **Topics in Public Administration and Policy 3** May be repeated for credit; cumulative maximum 6 hours. Examination of the literature on the politics of the American public policy process.

- 544 The Politics of Policy Process** 3 American political process; policy making under the constraints of a democratic system; relationship to the (non) achievement of the public interest.
- 590 Policy Studio Course I** 2 Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 591 Policy Studio Course II** 2 Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 592 Policy Studio Course III** 2 Course Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 597 Graduate Internship** V 2-12 May be repeated for credit; cumulative maximum 12 hours. On/off campus internship in federal, state, or local government institutions; nonprofit or public organizations; written assignments and readings required.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- PSYCH**
- 502 Research Design** V 1-3 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations** 3 Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology** V 1-3 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology** 1 May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology** V 1-3 May be repeated for credit.
- 510 Introduction to Online Instruction** 1 Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design** 3 Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design** 3 Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design** 3 May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics** 3 Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data** 3 Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software** 3 Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy** 3 Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues** 3 Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology** 3 Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.

- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
- 544 Medical Psychology: Psychological and Pharmacological Interventions 3** Course Prerequisite: Ph.D. student in Psychology. Psychological factors and their influence upon the causes and/or course of medical illnesses as well as relevant clinical interventions.
- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.
- 592 Cognition and Affective Basis of Behavior 3** Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology V 2-16** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Public Affairs

Degree offered: Master of Public Affairs

Faculty working with graduate students: 13

Graduate students: 39

Graduate students receiving assistantships or scholarships: 7%

Program offered: Vancouver

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal)

Deadline: Fall: January 10

Spring: July 1

Requirements

Transfer credits are not accepted for core courses. Students are expected to submit their program of study in the last semester of coursework. Applicants and students should consult the current MPA Handbook for complete information. Applicants and students should consult the current MPA Handbook for complete information.

Degree Description

The Master's Degree in Public Affairs (MPA), which is housed in the Department of Political Science, draws on a wide variety of academic disciplines, including political science, sociology, business administration, economics, health policy administration, environmental and research science/regional planning and criminal justice. This degree program is designed for the education of individuals interested in administrative and leadership positions in the public sector. The MPA prepares students for a diverse group of positions in government such as public policy, personnel administration and strategic planning, as well as a range of jobs outside of government service, such as not-for-profit organizations. MPA students may already be employed in these areas and are seeking this degree to advance professionally in the field; these students can expect to hone their skills and receive further training. Alternatively, the Master of Public Affairs degree is also appropriate for students who would like to shift their career tracks and obtain a position in the public and non-profit sector. The MPA seeks to develop the skills of present and future public administrators and policy analysts in the region to provide them with the tools to meet the challenges of government. In an age when governmental philosophies are continually being redefined, the MPA program is designed to promote professionalism, leadership, inventiveness, and a commitment to public service for government employees in the area of public administration, applied policy studies and health policy administration. The Master of Public Affairs degree at WSU is designed to accommodate the needs of working students. The degree can be completed entirely in the evenings, and most students often continue to work full

time during the day when completing their degree. Seminars are small, ranging from 5-20 students, and typically meet one or two evenings a week over the course of the semester. Class structure includes lectures, small group discussions, and individual and group presentations. The program takes two or more years to complete; the exact length of time required to complete the degree depends on how many classes a student takes each semester.

Contact Information

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Faculty

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ANTH

405 Medical Anthropology 3 Relationships among disease, curing, culture and environment; non-Western medical systems; political economy of health care. Recommended preparation: Junior standing.

CRM J

400 Issues in the Administration of Criminal Justice 3 May be repeated for credit; cumulative maximum 6 hours. Selected topics in criminal justice.

403 Violence Toward Women 3 Course Prerequisite: Junior standing. Violence toward women and its relationship to broader social issues such as sexism and social control. (Cross-listed course offered as CRM J 403, WOMEN ST 403).

405 Comparative Criminal Justice Systems 3 Comparative study of criminal justice systems in the US and selected foreign countries. (Cross-listed course offered as CRM J 405, POL S 405).

420 Criminal Procedure 3 Principal court decisions concerning standards of conduct and rights in the criminal process.

424 Community Corrections 3 Theory practice and human impact of treating criminal offenders in the community.

426 Victimology and Public Policy 3 Examination of victimization; policy responses to victims; victim's rights.

427 Crime Prevention Strategies 3 Personal, environmental, community-based and government crime prevention strategies and issues.

428 Drug and Alcohol Use and Abuse 3 Drug use, impact on behavior and drug control policies.

- 450 Senior Seminar: Ethical Issues in Criminal Justice 3** Examination of ethical issues in decision making in criminal justice.
- 468 Addictive Behavior Across the Demographic Spectrum 3** Course Prerequisite: Junior standing. Overview of social, cultural and historical perspectives on dealing with addictive behavior. (Cross-listed course offered as SOC 468, CRM J 468, PSYCH 468). Recommended preparation: SOC 101, PSYCH 105, or CRM J 101.
- 490 Criminal Justice Internship V 2-12** May be repeated for credit; cumulative maximum 12 hours. On/off-campus internship in criminal justice institutions (police, FBI, jails, law firms, etc.); written assignments and readings will be required.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.
- Environmental Science & Regional Planning**
- ES/RP**
- 481 Economics of Environmental Issues 3** Same as Econ 481.
- Environmental Science & Regional Planning**
- POL S**
- 400 Political Science Issues 3** May be repeated for credit; cumulative maximum 6 hours. Current issues in political science.
- 402 Civil Liberties 3** Origin and development of civil liberties; responsibility of the branches of government and the people for their maintenance.
- 404 The Judicial Process 3** Relationship of judicial behavior to structure, politics and the behavior of other participants in the judicial process.
- 405 Comparative Criminal Justice Systems 3** Comparative study of criminal justice systems in the US and selected foreign countries. (Cross-listed course offered as CRM J 405, POL S 405).
- 410 History of American Indian Sovereignty and Federal Indian Law 3** The history of sovereignty and Federal Indian Law against the backdrop of treaties and trust responsibility. (Cross-listed course offered as HISTORY 410, ANTH 410, POL S 410).
- 416 Policy Analysis 3** Analysis of public policy formation, evaluation and implementation.
- 417 Voting and Elections 3** Analysis of voting behavior and elections; turnout, influences on voter choice, congressional and presidential elections, campaign finance, and polling.
- 418 Human Issues in International Development 3** Interdisciplinary analysis of complex interaction between tradition and modernity in Third World societies. (Cross-listed course offered as ANTH 418, POL S 418, SOC 418).
- 420 Political Parties and Interest Groups 3** Roles, characteristics, and theories of political parties; organization, behavior, and impact of interest groups.
- 424 US National Security Policy 3** Substantive and theoretical research on issues relevant to formulation and requirements of post-Cold War, US national security and defense policy.
- 427 United States Foreign Relations 3** Ends and means in foreign policy; organization, management, control, and current policy issues. (Cross-listed course offered as POL S 427, HISTORY 486).
- 428 Issues in Political Psychology 3** Course Prerequisite: POL S 101 or PSYCH 105; junior standing. Introduction to the ways in which psychological factors influence political phenomena.
- 429 Special Topics in American Foreign and Defense Policy 3** May be repeated for credit; cumulative maximum 6 hours. Current issues in foreign policy.
- 430 The Politics of Natural Resource and Environmental Policy 3** Course Prerequisite: Junior standing. Issues and problems of natural resource and environmental policy.
- 432 Comparative Public Policy 3** Processes of public policy formation and outcomes in post-industrial democracies, and how to analyze it in a comparative perspective.
- 435 Politics of Developing Nations 3** Issues and problems of political development and modernization common among developing nations.
- 436 Disability, Aging, and Public Policy 3** Application of disability and aging theory to public policy challenges in the 21st century.
- 437 Classical Political Thought 3** The development of political philosophy from the pre-Socratics to Machiavelli.
- 438 Recent Political Thought 3** The development of political thought since Machiavelli. (Cross-listed course offered as POL S 438, HISTORY 489).
- 442 Leadership Skills for the Public Sector 3** Leadership, motivation, team-building, group dynamics, interpersonal and group conflict and job design for the public sector.
- 443 Administrative Jurisprudence 3** Study of the origins, nature, and practice of justice and law in public administration.
- 445 Public Personnel Administration 3** Development of American civil service systems and concepts; problems and techniques involved in selection and management of public employees.
- 446 Public Budgeting 3** The government budget as an instrument of politics, planning and control; organizing for democratic accountability.
- 447 Comparative Public Administration 3** Public administration systems in Europe, Japan, Socialist and developing countries; origins and development.
- 448 Urban Politics and Policy 3** Urban political processes and policies; intergovernmental relationships; impact of urban reform.
- 450 The Legislative Process 3** Role of legislatures in a democratic system; problems of representation; election and tenure of lawmakers; legislative organization and procedures.
- 455 The Presidency 3** Organization and processes of executive institutions at the national level; uses and limits of executive power.

- 472 European Politics 3** Government and politics of postindustrial societies, including West Europe and Japan.
- 474 African Politics 3** Course Prerequisite: Junior standing. Historical, economic, and social factors that shape contemporary African political systems and problems of nation-building.
- 475 Mao to Deng: The People's Republic of China, 1949 - 1999 3** The major political, social, economic and cultural developments during the People's Republic of China. (Cross-listed course offered as HISTORY 475, ASIA 475, POL S 475).
- 476 Revolutionary China, 1800 to Present 3** Continuity and change in the political, social, cultural and economic experience of China since 1800. (Cross-listed course offered as HISTORY 476, ASIA 476, POL S 476).
- 497 Political Science Internship V 1-12** May be repeated for credit; cumulative maximum 12 hours. On/off campus internship in federal, state, or local government institutions; nonprofit or public organizations; written assignments and readings required.
- 498 Cooperative Education Internship V 2-12** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Off-campus cooperative education internship with business, industry, or government unit coordinated through the Professional Experience Program.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.
- 500 Field Methods V 2 (0-6) to 8 (0-24)** Course Prerequisite: By instructor permission. Training in gathering and analyzing field data.
- 501 Verification of Catalog Number 3** Verification of Catalog Number
- 504 Tribal Peoples and Development 3** Global and historic perspectives on the complex issues surrounding the problem of tribal peoples and development.
- 507 Advanced Studies in Culture Theory 3** May be repeated for credit; cumulative maximum 6 hours. Evaluation of major theories and methods and their relationship to problems in cultural-social analysis.
- 510 Fundamentals of Cultural Anthropology 3** Overview of basic concepts and theory in cultural anthropology based on in-depth analysis of selected theoretical and ethnographic materials.
- 513 Lithic Technological Organization 4 (3-3)** Methods and theory of lithic technology.
- 514 Ceramic Analysis 4 (3-3)** Basic concepts, methods, and approaches used in the analysis of archaeological pottery.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 521 Psychological Anthropology 3** Psychological and anthropological aspects of personhood, self, human development, gender, sexuality, emotion and cognition in various cultures.
- 528 Historical Ethnography 3** May be repeated for credit; cumulative maximum 9 hours. Culture history, ethnography, theoretical, and contemporary problems of selected culture areas.
- 529 Seminar in Ethnography 3** Methodological, stylistic and craft issues in the process and product of ethnography.
- 530 Archaeological Method and Theory 3** History of archaeological method and theory; analysis of current literature.
- 535 Cultural Resource Management 3** Role of archaeology in historic preservation and resource conservation; legal and institutional frameworks; research and interpretation in a CRM context.
- 537 Quantitative Methods in Anthropology 4 (3-3)** May be repeated for credit; cumulative maximum 8 hours. Sampling, exploratory data analysis, inferential statistics, and use of SAS in anthropological research with emphasis on archaeology.
- 539 Prehistory of the Southwest 3** Prehistory of the American Southwest; emphasis on Pueblo, Mogollon and Hohokam traditions and relationships to historic native groups.
- 540 Prehistory of the Northwest Coast 3** Prehistoric cultures, chronologies, and interrelationships on the northwest coast of North America.
- 543 Prehistory of the Plateau and Basin 3** Archaeology of the interior Northwest and Great Basin.
- 546 Complexity in Small Scale Societies 3** Seminar focused on classic literature and current issues relevant to complexity in small scale societies, predominately covering hunter-gatherer systems. Recommended preparation: ANTH 530.
- 547 Models and Simulation 3** Models and model-building as an anthropological approach to present and past cultures.
- 548 Hunters and Gatherers: Past and Present 3** Introduction to hunter-gatherer studies in anthropology and archaeology exploring uses of evolutionary approaches to modeling and reconstructing hunter-gatherer behavior in contemporary and prehistoric contexts.
- 549 Settlement and Agro-Pastoralism 3** Development of settled communities and food production through evaluation of their social, economic and spatial configurations. Recommended preparation: ANTH 530.
- 550 Descriptive Linguistics 3** Introduction to analysis and description of natural languages; phonological, syntactic, and semantic analysis of data from a variety of languages. (Cross-listed course offered as ANTH 450, FOR LANG 450).
- 554 Anthropological Field Methods Seminar 3** Elicitation, recording techniques and analysis of sociocultural and linguistic field data. Recommended preparation: ANTH 450 or 550.
- 561 Current Trends in Physical Anthropology 3** May be repeated for credit. Intensive review of major current trends in physical anthropology. Recommended preparation: ANTH 465.

- 562 Evolutionary Method and Theory in Anthropology and Archaeology 3** A graduate-level seminar-based course focusing on the evolutionary analysis of past and present human behavior.
- 563 Anthropology of Life and Death 3** Demography, dynamics of evolution, human ecology, and their relationships to the biology of living, historical, and archaeological populations. Credit not granted for both ANTH 463 and ANTH 563. Recommended preparation: ANTH 260.
- 564 Advances in Evolution and Human Behavior 3** Recent trends in the study of evolution and human behavior.
- 565 Human Evolution 3** Human origins in the light of the fossil record and evolutionary theory. Credit not granted for both ANTH 465 and ANTH 565. Recommended preparation: ANTH 260.
- 567 Primate Behavioral Ecology 3** Seminar-based course focusing on evolutionary analysis of primate behavior, morphology and ecology.
- 569 Evolutionary Cultural Anthropology 3** Evolutionary nature of culture and its interactions with human biology (genes) and ecology.
- 570 Sediments in Geoarchaeology 4 (3-3)** Sediment-forming processes, sedimentological techniques, reconstruction of Quaternary environments, and sedimentology of site-forming processes.
- 573 Zooarchaeology 4 (2-6)** Identification of animal bones from archaeological sites, methodological and theoretical techniques for interpreting faunal remains.
- 576 Palynology 4 (3-3)** Pollen and spore morphology, evolution, production, dispersal, and preservation; index fossils, dating, archaeology, and vegetational history. Field trip required.
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 591 Special Topics in Anthropology 3** May be repeated for credit; cumulative maximum 9 hours. Examination of current areas of anthropological theory and research.
- 593 Publishing and Professional Communication 3** Preparation of original research reports; survey of types of professional communication, and of standards and techniques.
- 596 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 598 Advanced Anthropology Internship V 1-15** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: By instructor permission. Participation as archaeological or cultural anthropological intern in public or private sectors; requires special arrangement with faculty advisor.
- 599 Archaeological Field School V 2-8** Course Prerequisite: By instructor permission. Training in methods of archaeological data recovery and analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 505 Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).
- 510 Leadership in Criminal Justice 3** Study of leadership models and theories as they apply to criminal justice institutions.
- 511 Criminal Justice Management 3** Examines the theoretical framework for understanding criminal justice organizations through examining management theory, organizational dynamics, and administration research.
- 512 Juvenile Justice 3** Examination of the major theories and contemporary issues related to juvenile delinquency, the juvenile justice system, gangs, and juvenile corrections.
- 513 Multicultural Issues in Criminal Justice 3** Critical examination of race, gender, and other diversity and cultural issues within the U.S. criminal justice system.
- 514 Professional Development in Criminal Justice and Criminology 1** Professional aspects of research, teaching, and service activities in criminal justice and criminology.
- 520 Criminal Justice Research Methods 3** The design and execution of criminal justice research; critical examination of current research methods in criminal justice.
- 521 Advanced Topics in Criminal Justice Research Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 520. Exploration of specialized topics in research methodology; topics may include qualitative methods, GIS, ethnography, and survey design.
- 522 Foundations of Quantitative Methods 3** Application of foundational quantitative methods utilized in the field of Criminal Justice and Criminology.
- 523 Intermediate Quantitative Methods 3** Course Prerequisite: CRM J 522. Intermediate-level quantitative methods including logistic regression, factor analysis, propensity scoring and model building.

- 524 Advanced Topics in Quantitative Methods 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: CRM J 523. Advanced quantitative methods used in criminal justice, including time series, HLM, multi-level modeling, spatial analysis, and repeated measures analysis.
- 530 Criminal Justice: Process and Institutions 3** Processes of criminal justice in the context of the social, political, and economic environments.
- 531 Drugs, Alcohol, and Crime 3** Examination of the research and theory surrounding the relationship between alcohol, drugs, crime, and the criminal justice system.
- 540 Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 541 Seminar in Corrections 3** Current issues related to the control, management, and sanctioning of criminal offenders.
- 542 Community Corrections 3** Examines correctional processes in a community setting, including probation, parole, and innovative community-based strategies for dealing with the offender.
- 555 Seminar in Criminological Theory 3** Individual, situational and ecological correlates of criminal behavior; data sources and empirical research.
- 560 Prosecution and Adjudication 3** The function of courts and the behavior of prosecutors, defense attorneys and judges within the criminal justice system.
- 570 The Police and Society 3** Community and selected social institutional factors as related to their influence on police systems.
- 572 Seminar in Comparative Policing 3** Study of the history, organization, and policies of policing systems in selected countries and of transnational policing.
- 580 Gender and Justice 3** Criminal justice system's treatment of women offenders, victims, and professionals.
- 590 PRACTICUM V 1-6** May be repeated for credit; cumulative maximum 6 hours. S,F Grading.
- 591 Seminar in the Administration of Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Current issues, problems, and critical concerns within the field of administration of criminal justice.
- 592 Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Same as POL S 542.
- 593 Special Topics in Criminological Theory 3** May be repeated for credit; cumulative maximum 6 hours. Intense examination of a contemporary criminological theory, school, or paradigm.
- 594 Special Topics in Comparative Criminology and Criminal Justice 3** May be repeated for credit; cumulative maximum 6 hours. Intensive study of specific topics in comparative criminal justice or criminology.
- 595 Advanced Topics in Criminal Justice Institutions and Processes 3** May be repeated for credit; cumulative maximum 6 hours. In-depth study of issues associated with criminal justice institutions and processes.
- 596 Special Topics: Criminal Justice and Public Health 3** May be repeated for credit; cumulative maximum 6 hours. Examination of public health ramifications of criminal justice policy and practice; public health approaches to violence and substance abuse prevention.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Graduate Skills Seminar 1** Seminar designed to introduce first year graduate students to the science graduate program; roles and responsibilities of graduate students, teaching assistants and researchers.
- 504 Ecosystem Management 3** Analysis of ecosystem processes; dual emphasis on ecological principles and development of methods and concepts to evaluate policies for management.
- 531 Fundamentals of Environmental Toxicology 3** Fundamentals of toxicology; environmental fate and biological deposition and effects of natural products, drugs, food chemicals, and pollutants.
- 532 Applied Environmental Toxicology 3** Course Prerequisite: ENVR SCI 531 or PHARMSCI 505. Overview of the field of environmental toxicology; interactions of xenobiotics with natural systems.
- 540 Agroecology 3** Social and ecological aspects of agriculture and human food systems.
- 544 Environmental Assessment 4** Environmental impact statements and their national and state policy frameworks, methods of assessment, and team preparation of an impact statement. Credit not granted for both ENVR SCI 444 and ENVR SCI 544.

- 545 Hazardous Waste Management 3** Environmental, technical, and political aspects of hazardous waste management; evaluative methods, risk assessment, and current management requirements. Credit not granted for both ENVR SCI 445 and ENVR SCI 545.
- 550 System Dynamics Models of Environmental Systems 3** Analysis of environmental system dynamics; development and uses of simulation models using the Stella software on Macintosh.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 585 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 586 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 590 Special Topics 2** May be repeated for credit; cumulative maximum 6 hours.
- 592 Special Topics V 1-4** May be repeated for credit; cumulative maximum 4 hours.
- 593 Seminar in Environmental Science and Regional Planning 1** May be repeated for credit; cumulative maximum 8 hours. May be repeated for credit, cumulative maximum 8 hours.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 511 Theory and Substance of Human Development I 3** Human development theories; application to life span development, cultural variations, resources, problem solving, interaction of families and individuals with other systems.
- 513 Research Methods in Human Development I 3** Introduction to process of research and methods in human development; techniques of research, data collection, and data analysis procedures.
- 514 Research Methods in Human Development II 3** Course Prerequisite: H D 513. Integration of formal decision making into the social science research process; procedures appropriate for experimental, quasi-experimental and field research.
- 520 Adolescence 3** In-depth examination of theories and research, developmental issues and prevention and intervention programs for school-aged children and adolescents.
- 535 Program Development in Child and Family Studies 3** Analysis and development of program delivery systems, curricula and evaluation models.
- 540 Effective Intervention Programs 3** Course Prerequisite: H D 535. Innovative effective prevention and intervention programs from theoretical, applied, and outcome evaluation perspectives.
- 550 Seminar on Family Relationships 3** Survey of family studies topics and issues examined from a research point of view.
- 558 Parent-Child Relationships 3** The reciprocal interactions among family members will be examined; theoretical perspectives and empirical findings will be explored in terms of implications for education and practice.
- 560 Seminar in Child Development 3** Survey of literature on selected areas in child development; discussion of research and application related to current issues and trends.
- 561 Advanced Curriculum for Early Childhood Programs 3** Opportunity to explore curriculum practices in early childhood education; discussion, evaluation and adaptation of curricula based on current research.
- 562 Administration and Leadership in Programs 3** Examining early childhood administrator role; analysis and application of research to administration, developing concrete skills necessary for successful administration.
- 580 Families, Community and Public Policy 3** Course Prerequisite: H D 560. Analysis of family policy research; role of family policy research in public policy and knowledge building processes.

- 586 Special Topics in Human Development V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Assessment and evaluation of families and children.
- 598 Professional Internship 3** Supervised individual experiences with related organizations, businesses, or government agencies; opportunities for interaction with professionals in related fields.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 500 Introduction to the Health Care System 3** Orientation to history and organization of the health care system.
- 501 Health Care Policy and Politics 3** History, methods, results and evaluation of health-care-related policy and politics.
- 502 Law and Ethics of Health Management 3** Private health law and ethics, including professional liability, relationship of physician and patient, malpractice reform, health institutions, and health access.
- 503 Government Regulation of Health Services 3** Public law regulation; health care quality, personhood and individual autonomy, life/death decisions, antitrust, health care financing and cost control.
- 509 Health Care Economics 3** The economics of allocating, financing and delivering health care services.
- 510 Health Care Cost Accounting 3** Basic cost-accounting concepts, principles, and applications in the health care setting.
- 511 Health Care Finance 3** Aspects of health care financial management fundamentals and managerial accounting for strategic financial management.
- 512 Health Management Decision Science 3** Application of decision science technology to risk-analysis problems in healthcare for both investor-owned and non-profit entities.
- 515 Health Care Management 3** Introduction to the knowledge, skills, and values associated with the practice of health management.
- 516 Health Quality Management 3** Overview of the total field of health quality, including strategic quality management programs, quality assurance, quality control, and design.
- 517 Health Care and Human Resources Management 3** Managing human resources and health professionals in diverse health care environments such as hospitals, clinics, home health care agencies and pharmaceutical firms.
- 519 Biostatistics and Epidemiology for the Health Sciences 3** Application of quantitative methods to problems in the health sciences; statistical analysis software.
- 520 Research and Evaluation Methods 3** Basic research and evaluation methods for health care professionals.
- 530 Health Care Information Systems 3** Key attributes of health care information systems and their evolution in health care environment.
- 570 Marketing for Health Care Organizations 3** Basic marketing concepts, principles, and issues related to marketing public and private health care.
- 572 Health Care Ethics 3** Ethical issues affecting health care institutions, professionals and consumers.
- 573 Comparative International Health Care 3** Analysis of key attributes of health care in selected countries and comparisons with the US health care system.
- 574 Rural Health Care in America 3** The unique characteristics, professional opportunities, problems and reform alternatives in rural health care.
- 579 Mental Health Policy and Law 3** Professions regulation, negligence, consent, privacy; civil commitment, treatment rights, guardianship, trial competency, insanity defense, sex offenders, execution capacity, entitlements, discrimination.
- 580 Disability and Aging Policy 3** Policy aspects of disability, aging and chronic illness; including work disability, health and long term care, rationing, gender and class.
- 590 Strategic Management and Marketing 3** Key components and processes in strategic planning.
- 597 Internship V** 1-5 May be repeated for credit; cumulative maximum 5 hours. Student experience in professional work settings.
- 599 Special Topics in Health Policy and Administration V** 1-3 May be repeated for credit; cumulative maximum 9 hours.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.

- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Scientific Inquiry in Nursing 2** Course prerequisite: Graduate standing in Nursing. Scientific inquiry applied to theoretical and philosophical foundations in nursing.
- 504 Evidence-Based Practice 3** Course prerequisite: NURS 503 or concurrent enrollment, or in graduate Nursing Certificate program. Exploration of evidence-based practice through the conduct of scientific inquiry and application of credible evidence.
- 505 Nursing Practice Inquiry V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 539; NURS 565; NURS 576. Analysis and development of a practice inquiry proposal based on a practice concern of interest to the student.

- 506 Nursing Practice Capstone V 1 (0-3) to 4 (0-12)** Course prerequisite: NURS 505; NURS 539; NURS 565; NURS 576. Translational research project including measurement of outcomes, analysis of results and the dissemination of recommendations for practice.
- 507 Health Care Policy Analysis V 2-3** Analysis of health care system policy; exploration of issues of clinical management and community resource utilization including advocacy techniques.
- 511 Rural and Cultural Competencies for Population Health 2** Course prerequisite: Graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care for local and global populations.
- 512 Rural and Cultural Competencies for Population Health Practicum V 1-2** Course prerequisite: NURS 511; graduate standing in Nursing. Rural, cultural and research competencies necessary for reducing health disparities to increase access to care in the practice setting.
- 517 Quality Improvement and Program Evaluation 3** Principal dimensions of healthcare quality management including quality measurement and continuous quality improvement.
- 518 Translating Evidence into Practice 3** Course prerequisite: Graduate standing in Nursing. Health related evidence and development of skills to apply evidence in advanced practice.
- 519 Teaching in the Information Age 3** Course Prerequisite: By instructor permission. Focus on educational paradigms consistent with distance education; development of a variety of multimedia materials for nursing education. Required preparation: Basic computer skills.
- 520 Nursing Education in a Multicultural Society V 3 (0-9) to 5 (0-15)** Course Prerequisite: By instructor permission. Application of learning theories and strategies useful in teaching diverse populations; taught in a distance degree format.
- 521 Teaching, Learning and Evaluation in Nursing V 3-6** Exploration of concepts related to teaching-learning, assessment of diverse learning needs, instructional strategies and design, evaluation of performance outcomes.
- 523 Educational Issues and Curriculum Analysis V 3-5** Exploration of curriculum history, development, future predictions; program evaluation, instructional resources, leadership, and policy development in academic and service settings.
- 524 Foundations of Methodological Applications for Health Sciences 2** Qualitative and quantitative methods in health care; research, statistics, and interpretation language.
- 525 Psychopharmacology 3** Clinical psychopharmacology across the lifespan including pharmacokinetics, pharmacodynamics, principles of prescribing, client education and outcome monitoring.
- 526 Analytical Foundations for Health Sciences 3** Quantitative methods, research and statistics in current health care literature. Required preparation must include college-level statistics course.
- 527 Association, Group Difference and Regression Techniques for Health Services 3** Course Prerequisite: NURS 526. Application of quantitative techniques to explore relationships and group differences among variables supporting questions in health science research. Required preparation: Graduate-level statistics course.
- 528 Multivariate Statistical Techniques for Health Sciences 3** Course Prerequisite: NURS 527. Application of quantitative techniques to explore multivariate relationships among variables supporting questions in health science research.
- 529 Analytical Seminar for Health Science 3** In-depth research methods used for health science research.
- 531 Culture, Populations, and Family Health Care 3** Diverse health beliefs and practices of clients, families, and members of the interdisciplinary health care team.
- 532 Resource Stewardship in Health Care 3** Theory, research and practice dimensions of resource stewardship to effectively manage human and material resources in the practice setting.
- 534 Research Seminar: Grant Development 1** Seminar focusing on grant writing and advanced skills for critically reviewing grant applications.
- 535 Philosophy of Nursing Science 2** Course prerequisite: Graduate standing in Nursing; NURS 534 or concurrent enrollment. Structure and organization of fields of knowledge in science including historical and philosophical tenets of inquiry.
- 536 Nursing Theory: Foundations for Knowledge Development 2** Course prerequisite: Graduate standing in Nursing. Theory development analysis; theory critique; nursing knowledge examination; impact of theory on nursing science, applied to student's phenomenon of interest.
- 539 Scientific Foundations of the Advanced Practice Nursing Role 2** Course prerequisite: Graduate standing in Nursing. Analysis of the foundations of the Advanced Practice Nursing role emphasizing the integration of practice inquiry and advanced practice.
- 540 Internship: Practicum in Advancing the FNP Primary Care Role V 1-10** May be repeated for credit; cumulative maximum 10 hours. Primary Care Practicum experience requiring the supervised provision of increasingly complex direct patient care.
- 541 Psychiatric/Mental Health Nursing: Individuals 4 (3-3)** Course prerequisite: Graduate standing in Nursing; NURS 562; NURS 581 or concurrent enrollment. Theories of psychopathology and appropriate nursing interventions with individuals across the age continuum.
- 543 Psychiatric Mental Health Nursing 4 (3-3)** Course prerequisite: NURS 541; NURS 581. Introduction to theory and practice of group psychotherapy; Milieu and other selected theories studied and applied to nursing practice.
- 546 Practicum in Psychiatric/Mental Health Nursing V 4 (1-9) to 5 (1-12)** Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 541; NURS 543; NURS 562; NURS 581. Individualized clinical experience/seminar designed to provide advanced competency, accountability, leadership in psychiatric/mental health nursing.

- 548 Psychiatric Nurse Practitioner Internship V** 1-9 May be repeated for credit; cumulative maximum 9 hours. Course prerequisite: Graduate standing in Nursing; NURS 525; NURS 546; by interview only. Application and integration of theory, research findings, and interventions in the primary care of clients with psychiatric disorders.
- 549 Addiction Perspectives 2** Overview of the theories, physiology, course and epidemiology of addictions; assessment, evaluation, prevention and treatment.
- 550 International, Interdisciplinary, and Transcultural Health Care 3** Diverse health beliefs and practices of clients and members of the interdisciplinary health care team.
- 551 Risk and Resilience in Child and Adolescent Health 4** Risk and resilience models in the development of strengths-based health interventions for child and adolescent populations.
- 552 Family Nursing in the Community V** 2-4 Theoretical approaches to the analysis of normal and at-risk families; application of family assessment and intervention models when planning care.
- 553 Seminar in Interprofessional Collaboration 1** Course prerequisite: Graduate standing in Nursing. Leadership and collaboration efforts among professionals with clients and community partners.
- 554 Epidemiology and Biostatistics for Health Professions 3** Introduction to epidemiology: principles and methods of epidemiologic investigation including analysis of key elements of investigation of high risk populations. Required preparation must include college-level statistics course.
- 556 Advanced Population Health V** 2-6 Course Prerequisite: Graduate student in Nursing; instructor permission. Culminating analysis, development, and enactment of advanced practice roles in teaching, practice, or administration of community-based/population-focused nursing.
- 561 Advanced Assessment and Diagnosis for the Psychiatric Mental Health Practitioner 3** Course prerequisite: Graduate standing in Nursing. Assessment and diagnosis of psychiatric illnesses; focus on physical and psychiatric history, mental status exam and strategies of psychometric evaluation.
- 562 Advanced Health Assessment and Differential Diagnoses 3** (2-3) Course prerequisite: Graduate standing in Nursing. Applying health assessment and differential diagnostic skills to individuals, families, and populations in rural, urban, and medically under-served areas.
- 563 Advanced Pharmacological Concepts and Practice 3** Pharmacology for clinical practice including decision making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 564 Health Promotion in Nursing Practice V** 2-3 Interprofessional course analyzing the theoretical bases for developing and evaluating health promotion strategies tailored to variations in health behaviors.
- 565 Information Management for Clinical Practice 3** Application/evaluation of nursing informatics; information systems to support clinical research, practice, administration, and education. Required preparation must include competency in word processing/spreadsheets.
- 566 Community Analysis and Grant Development 2** Application of core public health functions in community analysis, program development and program evaluation.
- 567 Primary Care of Families: Adults and Elders 4** (1-9) Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with adults; developmental changes; opportunities to provide diagnostic, maintenance, and follow-up care.
- 568 Primary Care of Families: Infants, Children and Adolescents 4** (1-9) Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, and therapeutic intervention with infants, children, and adolescents in rural and urban settings.
- 569 Primary Care of Families: Family 4** (1-9) Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581. Assessment, differential diagnosis, therapeutic intervention with individuals in childbearing, childrearing, and multigenerational families.
- 570 Clinical Decision Making 1** (0-3) Course prerequisite: NURS 581; NURS 562; NURS 563; concurrent with first clinical course (NURS 567, 568, or 569). Provides a framework for systematic collection, organization, interpretation, and communication of data for the development of differential diagnosis.
- 572 Nursing Science: Research and Theory of Chronic Conditions 2** Course prerequisite: NURS 536. Concepts, theories and research relevant to preventing and managing chronic conditions across the lifespan.
- 573 Rational Prescribing 2** Course Prerequisite: NURS 563; admission to FNP program. Pharmacology for clinical practice including decision-making, prescribing, drug monitoring, and patient education associated with prescriptive authority.
- 574 Nursing Sciences: Research and Theory of Acute Conditions 2** Course prerequisite: NURS 536. Research methods, procedures and analysis of acute phenomena in nursing with a focus on vulnerable populations.
- 575 Diagnostic Testing and Interpretation 3** (2-3) Course prerequisite: Admission to FNP program. Analysis of diagnostic findings across the age continuum for clinical decision making; selected diagnostic and treatment skills for advanced practice.
- 576 Organizational Systems and Leadership 3** Integration of leadership competencies and resource stewardship for nurse leaders in a constantly changing health care environment.
- 577 Health Care Ethics V** 2-3 Ethical theories including deontology, teleology, virtue ethics and applicability to ethical dilemmas in nursing. Credit not granted for both NURS 477 and NURS 577.
- 578 Plateau Tribes: Culture and Health 3** (2-3) Course Prerequisite: Graduate standing in Nursing, Nutrition and Exercise Physiology, or Pharmacy. History, culture, and health care needs of the Plateau Indian tribes; both classroom and practicum experience. Credit not granted for both NURS 478 and NURS 578.

- 580 Practicum in Advanced Nursing Practice V 1 (0-3) to 5 (0-15)** Course prerequisite: NURS 539; concurrent enrollment in NURS 576. Integration and synthesis of practice inquiry; leadership and advanced practice to demonstrate competency in an area of advanced practice nursing.
- 581 Advanced Pathophysiology 3** Etiology, pathogenesis, manifestations, and outcomes of disruption and dysfunction of human physiology.
- 584 Theory and Policy Development in Systems of Health Care Delivery 2** Course prerequisite: NURS 536. Health care delivery systems in the US and worldwide addressing barriers to care, social justice, vulnerability and access disparity.
- 585 Faculty Role Seminar 1** Course prerequisite: Graduate standing in Nursing. Analysis of current issues related to the faculty role in nursing education.
- 586 Faculty Role Practicum 2** Course prerequisite: Graduate standing in Nursing. Analysis, development, and enactment of selected aspects of the faculty role.
- 587 Research Inquiry: Qualitative Methods I 3** Qualitative methodologies, issues and techniques of data collection, analysis and interpretation; issues of ethics and bias.
- 588 Research Inquiry: Quantitative Methods I 3** Quantitative methodologies, issues and techniques of data collection, analysis and interpretation.
- 589 Psychometrics in Health Care Research 2** Course prerequisite: NURS 526; NURS 527; 588. Application of psychometric theory and techniques for constructing, analyzing and testing instruments to measure nursing and educational interventions and outcomes.
- 590 Research Inquiry: Quantitative Methods II 2** Course prerequisite: NURS 588; NURS 589. Advanced theoretical and practical application of selected quantitative and methodological strategies.
- 591 Mixed Methods for Program Development 2** Program development, implementation, and outcomes evaluation in healthcare will be addressed primarily from a mixed methods and application perspective.
- 592 Research Inquiry: Qualitative Methods II 2** Course prerequisite: NURS 587. Application of qualitative methodologies, techniques of qualitative data analysis, presentation of qualitative findings, rigor, data management and research dissemination.
- 593 Preliminary Examination Seminar 1** Course prerequisite: PhD in Nursing; completion of 30 core credits; by permission only. Methods to synthesize material from coursework to present and analyze scholarly nursing science knowledge.
- 594 Community-Based Care of At-Risk Adults and Marginalized Adult Populations 3** Analysis and evaluation of strategies, interventions and programs to promote health of at-risk adults, older adults and marginalized adult populations.
- 595 Internship V 1-10** May be repeated for credit; cumulative maximum 10 hours. Course prerequisite: Admission to FNP program; NURS 562; NURS 563; NURS 581; one of NURS 567, 568, 569, 571, or 572. Application and integration of theoretical content, research findings, and assessment and intervention strategies into primary care practice.
- 597 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 598 Advanced Topics in Nursing V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Graduate student in Nursing; instructor permission. Specialized topics within the discipline; content will vary each term.
- 599 Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Graduate student in Nursing; instructor permission.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 799 Dissertation Seminar 1** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Best practices for doctoral research and presentation.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course prerequisite: Graduate standing in Nursing. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 The Scope of Political Science 3** Historical development and present status of the discipline; contemporary issues and future trends.
- 502 Seminar in Normative Theory 3** Elements of normative theory developments; examination of bases of controversies and approaches in the modern literature using historical sources.
- 503 Research Methods in Political Science 3** Social science research design topics, measurement, sampling, data sources, experimental and quasi-experimental designs, field and historical designs, content analytic designs.
- 504 Quantitative Methods in Political Science 3** Applied statistical skills, enabling understanding of substantive political and social questions.
- 505 Comparative Criminal Justice 3** Comparative study of crime laws and criminal justice systems in selected foreign countries. (Cross-listed course offered as CRM J 505, POL S 505).

- 510 Seminar on American Institutions and Processes 3** Seminar required of all graduate students using this field as a major or a minor; it is a prerequisite of all other graduate seminars in the field.
- 511 Seminar in American Political Thought 3** May be repeated for credit; cumulative maximum 6 hours. The genesis and development of political thought in the United States.
- 512 Seminar in American Institutions 3** May be repeated for credit; cumulative maximum 6 hours. Origin, development, and contemporary issues in political organization and structure in the United States.
- 513 Seminar in American Political Behavior 3** May be repeated for credit; cumulative maximum 6 hours. Theoretical approaches to, and empirical analysis of, mass political behavior in the US.
- 514 Seminar in Public Policy 3** Examination of central questions in public policy including the nature of public policy, policy analysis, and government intervention in society.
- 516 Seminar on Law, Courts, and Judicial Politics 3** Seminar on law, courts, and judicial politics.
- 530 American Foreign Policy: Theories and Applications 3** Theories of international politics applied to American foreign policy.
- 531 Seminar in International Security 3** International security and arms control politics, negotiations, agreements.
- 532 Seminar in International Political Economy 3** Institutions, politics, and decision-making processes in managing international economic relations.
- 533 Topics in Political Psychology 3** May be repeated for credit; cumulative maximum 6 hours. Psychological influences on political decision making, bargaining, conflict and conflict resolution options.
- 534 Seminar in Comparative Politics 3**
- 536 Special Topics in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Advanced issues seminar in international and comparative politics.
- 537 Concepts and Methods in Comparative Politics 3** May be repeated for credit; cumulative maximum 6 hours. Selected concepts (state, political participation), and methods (cross-national analysis, case study approaches) in comparative politics.
- 538 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 539 The Political Science Profession 1** Methods, problems, and purposes of teaching, research, and vocation in political science.
- 540 Proseminar in Public Administration 3** Proseminar over viewing basic theories of administrative organization, relationships, and behavior.
- 541 Seminar in Evaluation Research 3** Interrelationship of ideology, data, policy development, and policy implementation in public policy analysis. (Cross-listed course offered as CRM J 540, POL S 541).
- 542 Proseminar in Administration, Justice, and Applied Policy Studies 3** May be repeated for credit; cumulative maximum 6 hours. Analytical perspectives and theoretical issues.
- 543 Topics in Public Administration and Policy 3** May be repeated for credit; cumulative maximum 6 hours. Examination of the literature on the politics of the American public policy process.
- 544 The Politics of Policy Process 3** American political process; policy making under the constraints of a democratic system; relationship to the (non) achievement of the public interest.
- 590 Policy Studio Course I 2 Course** Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 591 Policy Studio Course II 2 Course** Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 592 Policy Studio Course III 2 Course** Prerequisite: By instructor permission. Public policy training for graduate students in the science and engineering fields through the NSF-IGERT program.
- 597 Graduate Internship V 2-12** May be repeated for credit; cumulative maximum 12 hours. On/off campus internship in federal, state, or local government institutions; nonprofit or public organizations; written assignments and readings required.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 510 Development of Social Theory 3** Examination of the foundations of social theory.
- 517 Seminar in Contemporary Sociological Theory 3** Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.

- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 520 Research Methods in Sociology 3** Methodology of social research at the professional level.
- 521 Regression Models 3** Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.
- 522 Advanced Sociological Methodology 3** May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.
- 523 Qualitative Methods Practicum 3** Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.
- 525 Practicum in Survey Research 3** Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.
- 526 Experimental Methods 3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.
- 530 Demography 3** Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.
- 531 Human Ecology 3** Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.
- 532 Environmental Sociology 3** Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.
- 535 Technology and Society 3** Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.
- 536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.
- 542 Social Stratification: Class, Race and Gender Inequalities 3** Theoretical and empirical research in both classic stratification literature and recent scholarship on class, race/ethnicity and gender.
- 545 Sociology of Community 3** Community stability and change: interaction processes; decision making; societal linkages; effects on well-being.
- 553 Social Organization and the Family 3** The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.
- 554 Social Psychology of the Family 3** The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.
- 556 Sociology of Aging and the Life Course 3** Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.
- 574 Labor Market Inequality 3** Overview of research on the causes and consequences of inequality in U.S. work organizations.
- 580 Sociology of Race Relations 3** Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.
- 582 Social Movements 3** Theories and methods in social movement studies.
- 590 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 591 The Sociology Profession 1** May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.
- 592 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 593 Special Topics in Sociology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Reproductive Biology – Cert in Reproductive Biology

Degree offered: Graduate Certificate in Reproductive Biology

Requirements

Please see the program/department for more information.

Contact Information

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Six Sigma Quality Management – Cert in Six Sigma Quality Mgmt.

Degree offered: Graduate Certificate in Six Sigma Quality Management

Graduate students: 5

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)
Spring: December 15 (July 1 international)
Summer: April 1 (Default international)

Requirements

Student must apply for the certificate and pay the required fee the first half of the final semester.

Program Description

The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs. Rather than completing all the course requirements for an ETM master's degree, students may take four courses (12-credit hours) in specialized areas. A certificate is awarded upon completion of these courses. Course credits earned for a certificate may also apply to a master's degree in the ETM Program or other graduate degree programs. A student may earn more than one certificate and may work on the certificate and master's program concurrently.

Degree Description

A concentration of quality improvement courses can be taken as a part of the engineering management Master's degree or as a part of the Quality Management Certificate. The certificate provides training in Six Sigma principles relevant to strategic and operational decisions using state-of the art knowledge, tools, and skills in improving quality. This certificate is for engineers and non-engineering professionals in technology management holding a bachelor's degree in engineering, technical, or management areas.

Contact Information

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Faculty

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Engineering Management

E M

- 501 Management of Organizations 3** Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.
- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.

- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Sociology

Degree offered: Doctor of Philosophy (Sociology)

Faculty working with graduate students: 15

Graduate students: 39

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Requirements

No additional requirements.

Program Description

The Department of Sociology at Washington State University offers Master's and Ph.D. degrees in Sociology, although we admit students only into the Ph.D. program (i.e. we do not admit students seeking only a Master's degree). The department makes an effort to fund all qualified students with teaching or research assistantships. Faculty members are productive scholars and dedicated teachers, with research agendas spanning a variety of subfields. Specifically, our program focuses on the discipline's core debates and several fields of study, including crime and deviance, race and ethnicity, environmental sociology, social inequality, political sociology, gender, social institutions, the family, and social psychology. Faculty interests span the discipline, from studies focusing on the international political economy to the hands on study of communities -- with wide array of specialties represented. On a methodological front, students will learn to

employ a wide range of methods. Our program's size and our setting allow students to become acquainted with and to collaborate with members of the faculty. Our department has a rich history in sociology and has produced many well-known and highly respected professional sociologists. If you have any questions, please don't hesitate to contact us. If you're considering graduate school, we'd like to learn more about your interests and have the opportunity to answer your questions.

Degree Description

The Sociology Program at Washington State is designed to integrate research and teaching in the training of students. Students have the opportunity for involvement in collaborative and independent research activities, facilitated by faculty led seminars and research programs. In addition to offering yearly teaching workshops for students who teach their own courses, students participate in a teaching seminar in their second year. The goal of the Program, and focus of graduate curriculum, is to train highly competent sociologists who will make constructive contributions to the field of sociology in academic, research, governmental, and community settings.

Training and Professional Development Opportunities

Opportunities include ability to work on federal grants with faculty members and develop your own courses.

Post-Graduate Employment Opportunities

Academic appointments at colleges and universities, research positions with government agencies or private research organizations.

Post-Graduate Career Placements

Research positions in the following organizations: Battelle Institute, the Bonneville Power Administration, the State of Washington, the State of Oregon, the State of Idaho, the U.S. Ninth District Court, the Bureau of Labor Statistics, and the General Accounting Office. Tenure-track positions in the following institutions: University of Akron American University of Arkansas State University Auburn University Bowling Green State University Brigham Young University of California - Riverside California State University - Fullerton California State University - Sacramento Cleveland State University University of Colorado - Boulder University of Colorado - Denver University of Florida Florida International University George Mason University Harvard University Humboldt State University Idaho State University University of Idaho Iowa State University University of Massachusetts - Boston University of Memphis University of Miami Michigan State University Minnesota State University - Mankato University of Missouri - Columbia University of Nebraska - Lincoln University of Nevada - Las Vegas University of Nevada - Reno University of New Mexico New Mexico State University University of North Carolina - Greensboro North Carolina State University University of North Dakota North Dakota State University Northern Arizona University University of Northern Colorado Ohio University Oklahoma State University University of Oregon Oregon State University Portland State University Purdue University University of South Florida University of Southern California University of Tennessee University of Texas - Austin Texas A&M University Utah State University Virginia Polytechnic Institute & State University University of Wisconsin - Madison

Contact Information

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Faculty

Don Dillman, Scott Frickel, Elizabeth Fussell, Gregory Hooks, Christine Horne, Erik Johnson, Monica Johnson, Julie Kmec, Alair Maclean, Lisa McIntyre, Clayton Mosher, Thomas Rotolo, Jennifer Schwartz, Jennifer Sherman and Amy Wharton.

SOC

- 421 Quantitative Techniques in Sociology II** 3 Probability theory, sampling distributions, random variables, matrix approaches to statistical techniques, calculus for statistics and computer applications.
- 510 Development of Social Theory** 3 Examination of the foundations of social theory.
- 517 Seminar in Contemporary Sociological Theory** 3 Recent developments in sociological theory, analysis, application and appraisal of specific theoretical systems.
- 519 International Development and Human Resources** 3 History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 520 Research Methods in Sociology** 3 Methodology of social research at the professional level.
- 521 Regression Models** 3 Simple and multiple regression, structural equation models, nonlinear applications, applications for discrete dependent variables.
- 522 Advanced Sociological Methodology** 3 May be repeated for credit; cumulative maximum 12 hours. Scaling theory, sampling theory, experimental design, measurement of association, multivariate analysis, current methods and techniques. Recommended preparation: SOC 521.
- 523 Qualitative Methods Practicum** 3 Introduction to qualitative research methods as used in social sciences; epistemological underpinnings and empirical techniques. Recommended preparation: SOC 520.
- 525 Practicum in Survey Research** 3 Practical experience in design and implementation of telephone and mail surveys; participation in all aspects of conducting a survey. Recommended preparation: SOC 520.
- 526 Experimental Methods** 3 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: SOC 521. Experimental methods including design and analysis, settings, manipulations, measures and human subjects considerations.
- 530 Demography** 3 Population studies; causes, effects, and measurement of changes in fertility, mortality, and migration; population estimation and projection.

- 531 Human Ecology 3** Ecosystem context of human life; change viewed ecologically; sociological use and misuse of ecological concepts; issues in theory and research.
- 532 Environmental Sociology 3** Societal-environmental interactions; impacts of human societies on the physical environment; environmental impacts on human behavior and social organization.
- 535 Technology and Society 3** Analysis of sociotechnical systems; effects of technology on society; the social shaping of technologies and their environmental impacts.
- 536 Special Topics in Environmental Sociology V 1 (0-3) to 3 (0-9)** May be repeated for credit; cumulative maximum 9 hours. Special topics in environmental sociology.
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- 553 Social Organization and the Family 3** The family as a social institution; principles of social organization applied to family relationships; macro-level analyses of family structure.
- 554 Social Psychology of the Family 3** The family as an interacting group; social psychological theories and research applied to family relationships; effects of families on individuals.
- 556 Sociology of Aging and the Life Course 3** Theory and research on the changes individuals undergo over the life course; influences of history, social structure, agency and social relations on lives.
- 574 Labor Market Inequality 3** Overview of research on the causes and consequences of inequality in U.S. work organizations.
- 580 Sociology of Race Relations 3** Analysis of race/ethnic relations; historical and current theoretical explanations of race/ethnic relations.
- 582 Social Movements 3** Theories and methods in social movement studies.
- 590 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 591 The Sociology Profession 1** May be repeated for credit; cumulative maximum 2 hours. Requirements, operations, problems, and possibilities of the sociology profession.
- 592 Special Topics in Sociology 3** May be repeated for credit; cumulative maximum 9 hours.
- 593 Special Topics in Sociology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Special topics in sociology.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

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Soil Science

Degree offered: Doctor of Philosophy (Soil Science)

Faculty working with graduate students: 88

Graduate students: 25

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Fifteen hours of 500-level grade coursework are required; not included but required are 2 credits of Soils 501 Seminar and 1 credit of Soils 502 State Tour. Two credits of Soils 511 Research Proposal and Development are also required (S/F grading). No more than half of the graded credit may be transfer credit. Seventy-two credits are required for the degree.

Program Description

The Department of Crop and Soil Sciences at Washington State University department offers M.S. and Ph.D. programs in Soil Science, with the ability to conduct graduate research in a variety of specialized areas within each discipline. The Soil Science program supports two major, overlapping research themes: sustainable agriculture and vadose zone hydrology. Within these broad themes, faculty lead collaborative research on organic, conservation and precision agriculture, biogeochemistry, contaminant transport, storm water management, nutrient cycling, microbial dynamics, climate change mitigation, proximal soil sensing, digital soil mapping, and bioenergy development. Soils faculty work closely with crops and horticulture faculty and with the Center for Environmental Research, Education and Outreach to apply this expertise to sustainable natural and agricultural systems. We have several research projects conducted in

cooperation with the United States Department of Agriculture (USDA) through the USDA Agricultural Research Service (USDA-ARS) and USDA Natural Resources Conservation Service (USDA-NRCS) in addition to research projects being conducted in association with other universities. Research facilities include state of the art laboratories and greenhouse facilities, and research farms located in Pullman, as well as throughout the state at five Research and Extension Centers. Graduate students learn valuable skills and knowledge working side by side with faculty members and research technicians providing them the opportunity to play an integral role in the advancement of their major advisor's research. Students also have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Qualified students typically receive competitive teaching or research assistantships. These assistantships provide non-resident and resident tuition waivers, paid health insurance, and stipends to help cover living expenses.

Degree Description

Training and Professional Development Opportunities

Students have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Extension program delivery, and Graduate School teacher training and grant proposal writing workshop opportunities are also available.

Post-Graduate Employment Opportunities

Soil scientists with advanced degrees may find employment in government agencies, national labs, academia, private business, environmental and agricultural consulting, and organic, international, and sustainable agriculture.

Post-Graduate Career Placements

University faculty positions, National Lab scientists, USDA scientists, Agribusiness owners, Extension agents, Natural Resource Conservation Service scientists, Soil fertility analysts/consultants, University administrators.

Contact Information

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E-mail: marshdj@wsu.edu

Lisa Lujan
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SOILS

- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.

- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Pre-requisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3 (2-3)** Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

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Soil Science

Degree offered: Master of Science in Soil Science

Faculty working with graduate students: 94

Graduate students: 17

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Twenty-one hours of graded credit are required, including seminar and state-wide tour. Twenty-six credits are required overall.

Program Description

The Department of Crop and Soil Sciences at Washington State University department offers M.S. and Ph.D. programs in Soil Science, with the ability to conduct graduate research in a variety of specialized areas within each discipline. The Soil Science program supports two major, overlapping research themes: sustainable agriculture and vadose zone hydrology. Within these broad themes, faculty lead collaborative research on organic, conservation and precision agriculture, biogeochemistry, contaminant transport, storm water management, nutrient cycling, microbial dynamics, climate change mitigation, proximal soil sensing, digital soil mapping, and bioenergy development. Soils faculty work closely with crops and horticulture faculty and with the Center for Environmental Research, Education and Outreach to apply this expertise to sustainable natural and agricultural systems. We have several research projects conducted in cooperation with the United States Department of Agriculture (USDA) through the USDA Agricultural Research Service (USDA-ARS) and USDA Natural Resources Conservation Service (USDA-NRCS) in addition to research projects being conducted in

association with other universities. Research facilities include state of the art laboratories and greenhouse facilities, and research farms located in Pullman, as well as throughout the state at five Research and Extension Centers. Graduate students learn valuable skills and knowledge working side by side with faculty members and research technicians providing them the opportunity to play an integral role in the advancement of their major advisor's research. Students also have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Qualified students typically receive competitive teaching or research assistantships. These assistantships provide non-resident and resident tuition waivers, paid health insurance, and stipends to help cover living expenses.

Degree Description

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Students have the opportunity to gain leadership, communication, and instructional experience through the option of serving as teaching assistants for one or more courses within their discipline. Extension program delivery, and Graduate School teacher training and grant proposal writing workshop opportunities are also available.

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Soil scientists with advanced degrees may find employment in government agencies, national labs, academia, private business, environmental and agricultural consulting, and organic, international, and sustainable agriculture.

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National Lab scientists, USDA scientists, Agribusiness owners, Extension agents, Natural Resource Conservation Service scientists, Soil fertility analysts/consultants.

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- 568 ArcGIS and Geospatial Analysis 4** (2-6) Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
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Soil Science

Degree offered: Master of Science in Soil Science – Non Thesis

Faculty working with graduate students: 92

Graduate students: 17

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10
Spring: July 1

Requirements

Twenty-six hours of graded coursework are required, including seminar and state-wide tour. Thirty hours are required overall.

Program Description

The Department of Crop and Soil Sciences at Washington State University department offers M.S. and Ph.D. programs in Soil Science, with the ability to conduct graduate research in a variety of specialized areas within each discipline. The Soil Science program supports two major, overlapping research themes: sustainable agriculture and vadose zone hydrology. Within these broad themes, faculty lead collaborative research on organic, conservation and precision agriculture, biogeochemistry, contaminant transport, storm water management, nutrient cycling, microbial dynamics, climate change mitigation, proximal soil sensing, digital soil mapping, and bioenergy development. Soils

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- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
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702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

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Speech and Hearing Sciences

Degree offered: Master of Arts in Speech and Hearing Sciences

Faculty working with graduate students: 15

Graduate students: 53

Graduate students receiving assistantships or scholarships: 5%

Program offered: Spokane

Tests required: GRE (Combined)

Deadline: Fall: January 10

Program Description

Academic course work and clinical practicum offerings prepare students to become professional personnel capable of meeting the diagnostic and therapy needs of individuals of all ages evidencing a wide variety of speech, language, learning, and hearing problems. Students are prepared as speech-language pathologists to provide direct and consultative services in educational and medical settings. The course of study emphasizes physiological, behavioral, neurological, and psychological dimensions of normal development, fundamental communication processes, and disorders of communication.

Degree Description

The Department of Speech and Hearing Sciences' master's program in speech-language pathology is based at WSU Spokane. A bachelor's degree in speech-language pathology is not mandatory; however, students entering the graduate program with undergraduate majors in related fields must complete a core of prerequisites including 32 hours of undergraduate courses. All students are required to complete a statistics course. This is considered a prerequisite, and not part of the graduate program, although the course may be taken at graduate level. Academic coursework and clinical practicum offerings prepare students to become professional personnel capable of meeting the diagnostic

and therapy needs of individuals of all ages evidencing a wide variety of speech, language, learning, and hearing problems. The program stresses the application of theory through work in the University's clinics, as well as in clinical placements throughout the state. Thesis and a non-thesis options are available. Students are prepared as speech-language pathologists to provide direct and consultative services in educational and medical settings. The course of study emphasizes physiological, behavioral, neurological, and psychological dimensions of normal development, fundamental communication processes, and disorders of communication. By applying science and research to clinical practice, graduate students develop proficiency in reasoning and problem-solving relative to clinical principles and procedures in diagnosis and treatment. The academic teaching and learning philosophy is student-centered, research-based, and writing intensive. Full-time students typically complete the program in approximately two years (including one summer), carrying on average 12-16 credit hours per semester. The master's degree specialization in speech-language pathology is accredited by ASHA and certified by the State Board of Education. The program provides the basis for certification in speech-language pathology by the American Speech-Language-Hearing Association (ASHA), the certificate of clinical competence or the CCC, and for state licensure. The post-baccalaureate program, a specialized one-year course sequence, allows a student with a bachelor's degree in another field to prepare for entry to the master's degree program in Speech and Hearing Sciences.

Training and Professional Development Opportunities

Visit the following website for contact information and research interests of EWU faculty who teach in the cooperative EWU/WSU undergraduate and graduate programs (UPCD).
<http://www.ewu.edu/cshe/programs/communication-disorders/comd-faculty.xml>

Contact Information

Doug Stephens
 Program Coordinator
 Speech & Hearing Sciences
 P.O. Box 1495
 Spokane, WA 99210-1495
 Telephone: (509) 358-7602
 Fax: (509) 358-7600
 E-mail: stephend@wsu.edu

Faculty

Sandra Bassett, Gail Chermak, Lesli Cleveland, Donald Fuller, Ella Inglebret, Roberta Jackson, Georgina Lynch, Charles Madison, Amy Meredith, Doreen Nicholas, Jane Pimentel, Nancy Potter, Leslie Power, Mark Vandam and Elizabeth Wilson.

Speech And Hearing Sciences

SHS

- 501 Research Methods 3** Philosophy of research, types of literature; experimental and descriptive designs; application of statistics; analysis of statistical results.
- 503 Research Methods II 2** Experimental and descriptive designs, application of statistics, analysis of statistical results. SHS graduate student; all undergraduate prerequisite courses completed.

- 540 Special Topics in Speech and Hearing Sciences V 1-3** May be repeated for credit; cumulative maximum 9 hours. Advanced study of specialized topics in speech and hearing sciences. SHS graduate student; all undergraduate prerequisite courses completed.
- 542 Infant and Toddler Communication and Language 3** Typical development of communication and language in the birth to 5 year-old population; impairments affecting development; disorders; assessment; intervention. SHS graduate student; all undergraduate prerequisite courses completed.
- 543 School Age and Adolescent Language 3** Language development in typically developing and language impaired school age and adolescent students; disorder types; implications for assessment and intervention. SHS graduate student; all undergraduate prerequisite courses completed.
- 545 Autism Spectrum Disorder 3** Course Prerequisite: SHS 542. Overview and discussions of the characteristics, causes, assessments, and interventions for autism spectrum disorder.
- 550 Special Topics in Speech and Hearing Sciences V 1-3** May be repeated for credit; cumulative maximum 9 hours. Study of specialized topics in speech and hearing sciences. SHS graduate student; all undergraduate prerequisite courses completed.
- 555 Bilingual and Cultural Issues 2** Cultural and linguistic variables that may impact speech-language pathology services of culturally and linguistically diverse populations; assessment and treatment considerations.
- 556 Problems in Stuttering 2** Historical and current literature; problem-solving strategies applied to theoretical and clinical problems in stuttering. SHS graduate student; all undergraduate prerequisite courses completed.
- 557 Cleft Palate and Craniofacial Disorders 2** Speech and voice problems associated with clefts of the lip and palate. SHS graduate student; all undergraduate prerequisite courses completed.
- 560 Special Topics in Speech and Hearing Sciences V 1-3** May be repeated for credit; cumulative maximum 9 hours. Advanced study of specialized topics in speech and hearing sciences. SHS graduate student; all undergraduate prerequisite courses completed.
- 562 Motor Speech Disorders 3** Underlying processes of neuromuscular control and feedback; results of damage and disease on neuromotor system. SHS graduate student; all undergraduate prerequisite courses completed.
- 563 Dysphagia 3** Anatomy and physiology of swallowing; evaluation and treatment of swallowing disorders. SHS graduate student; all undergraduate prerequisite courses completed.
- 565 Augmentative Communication 3** Augmentative communication theory; implementation, training strategies, ongoing adjustments, and evaluating effectiveness. SHS graduate student; all undergraduate prerequisite courses completed.
- 566 Off-Campus Practicum Public School Setting V 2 (0-6) to 6 (0-18)** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: SHS 575. Advanced clinical practice in a public school setting; evaluation and treatment of speech, language, and hearing disorders. SHS graduate student; all undergraduate prerequisite courses completed.

- 567 Issues in Public School Service Delivery** 3 Clinical operations, policies, procedures, including legal, ethical, and professional considerations in the schools. SHS graduate student; all undergraduate prerequisite courses completed.
- 568 Off-campus Practicum Clinical Setting** V 2 (0-6) to 6 (0-18) May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: SHS 575. Advanced clinical practice in an off-campus clinical/medical setting; evaluation and treatment of speech, language and hearing disorders.
- 570 Advanced Internship in Speech-Language Pathology** V 1-18 May be repeated for credit. Course Prerequisite: SHS 566 or SHS 568. Advanced practicum in diagnosis of and therapy for communication disorders. SHS graduate student; all undergraduate prerequisite courses completed.
- 574 Neuropathologies of Language** 3 Advanced study of language disorders resulting from brain insult after birth; emphasis on aphasia and related disorders. SHS graduate student; all undergraduate prerequisite courses completed.
- 575 Advanced Clinical Practice** V 2-6 May be repeated for credit; cumulative maximum 15 hours. Advanced clinical practice in evaluation and treatment of speech, language, and hearing disorders. SHS graduate student; all undergraduate prerequisite courses completed.
- 576 Voice Disorders** 2 Functional and organic voice disorders resulting from various etiologies. SHS graduate student; all undergraduate prerequisite courses completed.
- 580 Special Topics in Speech and Hearing Sciences** V 1-3 May be repeated for credit; cumulative maximum 9 hours. Advanced study of specialized topics in speech and hearing sciences. SHS graduate student; all undergraduate prerequisite courses completed.
- 582 Clinical Perspectives** 3 Theory and clinical experience designed to assist students in integrating course work into a clinical perspective. SHS graduate student; all undergraduate prerequisite courses completed.
- 587 Speech-Language Pathology in the Medical Setting** 2 Report writing and charting, collaborating with the medical team, establishing prognosis and assessing efficacy of treatment, and third-party reimbursement. SHS graduate student; all undergraduate prerequisite courses completed.
- 588 Phonological Acquisition and Behavior** 3 Current literature in articulatory development and deviancy; diagnosis and therapy. SHS graduate student; all undergraduate prerequisite courses completed.
- 590 Special Topics in Speech and Hearing Sciences** V 1-3 May be repeated for credit; cumulative maximum 9 hours. Advanced study of specialized topics in speech and hearing sciences. SHS graduate student; all undergraduate prerequisite courses completed.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

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702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Sport Management

Degree offered: Master of Arts in Education – Non Thesis

Faculty working with graduate students: 7

Graduate students: 18

Program offered: DDP, Pullman

Tests required: GRE (Combined)

Deadline: Fall: January 10

Spring: July 1

Program Description

The Sport Management Program at Washington State University offers graduate studies at the master's level at one of the nation's leading land-grant and research institutions and largest residential university campuses. Situated in the pristine, rolling hills of the Palouse in eastern Washington, many opportunities abound at Washington State University for students to pursue their academic program and their professional goals. Program faculty are dedicated to meeting students' needs as current and future leaders in a variety of sport settings within the sport industry. Opportunities include, but are not limited to, public school, college and university athletic departments; community and recreational sport agencies; sport journalism enterprises; amateur sports organizations; sport merchandising companies; and professional sport organizations and events. Given the growing economic and political significance of sport worldwide, there is a strong need for well-educated and professionally-trained sport managers to ensure that sport is managed and delivered well for the greater good of our global society. The program provides a balance and integration of practical experience, theory, research, and policy. WSU offers a comprehensive master's degree preparation in sport management. Students have access to practical work experience opportunities in a PAC-12 university athletic department as well as in our comprehensive intramural program and state-of-the-art student recreation center. Upon completion of this degree, students will be prepared for a variety of careers in sport management.

Degree Description

The College of Education offers a Master of Arts (M.A.) in Sport Management in which students can choose either a thesis option or a non-thesis option. The program requires two years to

complete. Entering students will be expected to have appropriate pre-requisite coursework at the undergraduate level and/or work experience in sport and recreation that provides satisfactory background knowledge. Students admitted with identified background deficiencies will be required to complete undergraduate coursework prior to enrolling in graduate coursework in the identified areas. The program offers graduate assistantships teaching lower division undergraduate sport management courses. Graduate assistantships are also available in various departments on campus including the athletic department and student recreation center.

Post-Graduate Employment Opportunities

Our graduates find jobs in sport industry sectors such as professional sport, collegiate sport, recreational sport, youth sport, and international sport, with careers in areas such as event management, sport marketing and promotion, sport journalism, media relations, recreation management, ticket sales, community relations, etc.

Post-Graduate Career Placements

Intercollegiate athletics departments (event management coordinator, marketing and promotions coordinator, medial relations coordinator, compliance coordinator, assistant director of athlete academic support services); professional sports teams (group sales account executive, corporate sponsorship assistant director, ticket office assistant director, assistant general manager); high school athletics director; assistant managers for golf and tennis clubs; championships assistant for intercollegiate athletics conference; assistant director for state high school athletic association; state director of tourism.

Contact Information

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PO Box 642114
Pullman, WA 99163-2114
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Faculty

Cathryn Claussen, Tammy Crawford, Clinton Culp, Seth Haselhuhn, Christopher Lebens, Yong Rhee and John Wong.

ED AD

- 501 **Philosophy of Education 3** Development of American educational philosophy.
- 503 **Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 **Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 **Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.

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- 537 **Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 **Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.

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- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
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- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
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EDPSY

- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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SPMGT

- 521 Special Topics in Sport Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Sport Management Graduate program. Recent research, developments, issues, and /or applications in selected areas of Sport Management.

- 540 Current Issues in Sport Management 3** Solutions-oriented investigation of current issues faced by sport managers/administrators; interpretation of research literature; procedures for issue resolution.
- 564 Marketing of Sport Events and Programs 3** Principles of sport marketing including public relations, corporate sponsorship, and service quality for sport organizations.
- 565 Ethical Perspectives of Sport and Physical Activity 3** Ontological, ethical, aesthetic views of physical activity. Required preparation must include SPMGT 365 or equivalent.
- 567 Social and Cultural Issues of Physical Activity and Sport 3** Sport and physical activity as cultural forms, including the examination of subcultures, stratification, socialization and power relations.
- 568 Administrative Concepts in Sport Organizations 3** Effective management for sport programs. Analysis of dynamic management process necessary for improvement of productivity in sport organizations.
- 569 Sport in Higher Education 3** Course Prerequisite: Admission to the Sport Management Graduate program. The course examines sport in higher education institutions from the historical, cultural, and administrative perspectives.
- 577 Law and Risk Management in the Sport Industry 3** Use of risk management perspective to explore the law as it applies to the management concerns of sport organizations. Required preparation must include SPMGT 377 or equivalent.
- 578 Sports in Society 3** The social significance of sports; sociology of sport research. Required preparation must include SPMGT 367 or equivalent.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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Sport Management

Degree offered: Master of Arts in Education (Sport Management)

Faculty working with graduate students: 7

Graduate students: 6

Graduate students receiving assistantships or scholarships: 16%

Program offered: DDP, Pullman

Tests required: GRE (Combined)

Deadline: Fall: January 10

Spring: July 1

Program Description

The Sport Management Program at Washington State University offers graduate studies at the master's level at one of the nation's leading land-grant and research institutions and largest residential university campuses. Situated in the pristine, rolling hills of the Palouse in eastern Washington, many opportunities abound at Washington State University for students to pursue their academic program and their professional goals. Program faculty are dedicated to meeting students' needs as current and future leaders in a variety of sport settings within the sport industry. Opportunities include, but are not limited to, public school, college and university athletic departments; community and recreational sport agencies; sport journalism enterprises; amateur sports organizations; sport merchandising companies; and professional sport organizations and events. Given the growing economic and political significance of sport worldwide, there is a strong need for well-educated and professionally-trained sport managers to ensure that sport is managed and delivered well for the greater good of our global society. The program provides a balance and integration of practical experience, theory, research, and policy. WSU offers a comprehensive master's degree preparation in sport management. Students have access to practical work experience opportunities in a PAC-12 university athletic department as well as in our comprehensive intramural program and state-of-the-art student recreation center. Upon completion of this degree, students will be prepared for a variety of careers in sport management.

Degree Description

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Contact Information

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Faculty

Cathryn Claussen, Tammy Crawford, Clinton Culp, Seth Haselhuhn, Christopher Lebens, Yong Rhee and John Wong.

ED AD

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- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.

- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- SPMGT**
- 521 Special Topics in Sport Management V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the Sport Management Graduate program. Recent research, developments, issues, and /or applications in selected areas of Sport Management.
- 540 Current Issues in Sport Management 3** Solutions-oriented investigation of current issues faced by sport managers/administrators; interpretation of research literature; procedures for issue resolution.
- 564 Marketing of Sport Events and Programs 3** Principles of sport marketing including public relations, corporate sponsorship, and service quality for sport organizations.
- 565 Ethical Perspectives of Sport and Physical Activity 3** Ontological, ethical, aesthetic views of physical activity. Required preparation must include SPMGT 365 or equivalent.
- 567 Social and Cultural Issues of Physical Activity and Sport 3** Sport and physical activity as cultural forms, including the examination of subcultures, stratification, socialization and power relations.

- 568 Administrative Concepts in Sport Organizations** 3 Effective management for sport programs. Analysis of dynamic management process necessary for improvement of productivity in sport organizations.
- 569 Sport in Higher Education** 3 Course Prerequisite: Admission to the Sport Management Graduate program. The course examines sport in higher education institutions from the historical, cultural, and administrative perspectives.
- 577 Law and Risk Management in the Sport Industry** 3 Use of risk management perspective to explore the law as it applies to the management concerns of sport organizations. Required preparation must include SPMGT 377 or equivalent.
- 578 Sports in Society** 3 The social significance of sports; sociology of sport research. Required preparation must include SPMGT 367 or equivalent.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Statistics

Degree offered: Master of Science in Statistics

Faculty working with graduate students: 15

Graduate students: 32

Graduate students receiving assistantships or scholarships: 18%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

Stat 443 as core course - not listed below - EconS 510 may be substituted. Oral Project Defense and Oral Final Test. A written report of the student's project is due to the committee two weeks before the student's scheduled final oral examination.

Program Description

Statistics is the science that deals with the collection, analysis, display, and interpretation of data. Statistics is an interdisciplinary, intercollegiate program that emphasizes the connection of statistics to its many areas of application, as well as the traditional connection to mathematics. The Department offers courses that provide training in the application of statistical methods to the biological, physical, and social sciences, and the theory of statistical methods, probability, and statistical computing. Opportunities for individuals trained in statistics abound in business, industry, government and academia.

Degree Description

The degree program has two option areas: applied and theoretical. Courses are chosen from four field areas: *Advanced Theory and Stochastic Processes, *Linear Models and Multivariate Analysis, *Data Analysis, *and Econometrics and Time Series. For both options, the core requirements include Stat 443, 512, 530, 533, 556, at least one course in statistical computing, and a minimum of two credit hours of statistical consulting (Stat 590) spread over two semesters. The remainder of the 30 hours must include a total of at least 3 courses from 2 field areas, chosen from the following: *Advanced Theory and Stochastic Processes: Stat 542, 544, 548, or 549. *Linear Models and Multivariate Analysis: Stat 519, 520, 535. *Data Analysis: Stat 422, 428, 513, 514, 515, 518, 536, 547, 555, 572, or 573. *Econometrics and Time Series: Stat 516, 531, 552, 555, or 586. The final Master's oral exam is a two-hour oral exam conducted by the student's M.S. committee. The oral exam will consist of (i) a 30-minute presentation of the student's Master's project, (ii) a 15-minute period following the Master's project presentation for questions by the committee related to the results contained in the Master's project, and, (iii) a 75-minute period devoted to a comprehensive oral exam covering the material in Stat 443, Stat 512, Stat 530, Stat 533, Stat 556 as well as material covered in additional course work. The student is expected to be thoroughly familiar with a wide array of statistical concepts as contained in the list of topics and concepts obtained from the department.

Post-Graduate Employment Opportunities

Opportunities for individuals trained in statistics abound in business, industry, government and academia.

Post-Graduate Career Placements

pharmacy, banking, credit card companies, consulting, government agencies

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Jacroux, Venkata Jandhyala, Harry Johnson, Thomas Marsh, R
Mittelhammer, Francis Pascual, David Sclar and Ping Ye.

STAT

- 443 Applied Probability 3** Course Prerequisite: MATH 172 or MATH 182; MATH 220 or MATH 230. Axioms of probability theory; random variables; expectation; generating function; law of large numbers; central limit theorem; Markov chains. (Cross-listed course offered as STAT 443, MATH 443).
- 500 Macroeconomic Theory I 3** Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.
- 501 Microeconomic Theory I 3** Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus. Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II 3** Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II 3** Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics 3** Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making 3** Managerial economics with specific applications to agricultural issues.

- 510 Statistics for Economists 3** Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra. Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I 3** Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II 3** Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences V 1-3** May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics 3** Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I 3** Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II 3** Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods V 1-2** May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics 3** Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy 3** International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.

- 534 Production Economics 3** Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making 3** Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.
- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.

- 587 Professional Ethics and Practice in Business 3** Course
Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course
Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course
Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.
- 593 Managerial Leadership and Productivity 3** Course
Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.

- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Statistics

Degree offered: Master of Science in Statistics – Minor

Faculty working with graduate students: 5

Graduate students: 3

Deadline: Fall: January 10
Spring: July 1

Requirements

Theoretical statistics minor requires: Stat 443, Stat 556, one of Stat 530, Stat 531, or Stat 533, and two additional 500 level statistics courses. Applied Statistics requires: five 500 level statistics courses or four 500 level statistics courses and Stat 443. Emphasis is on breadth, so credit toward the minor will only be given for courses that do not have a significant degree of overlap. The courses that are credited towards graduate minor in statistics shall have all been approved by the mathematics faculty member who is appointed to the student's Doctoral Committee.

Program Description

Statistics is the science that deals with the collection, analysis, display, and interpretation of data. Statistics is an interdisciplinary, intercollegiate program that emphasizes the connection of statistics to its many areas of application, as well as the traditional connection to mathematics. The Department offers courses that provide training in the application of statistical methods to the biological, physical, and social sciences, and the theory of statistical methods, probability, and statistical computing. Opportunities for individuals trained in statistics abound in business, industry, government and academia.

Degree Description

To receive a minor in Statistics a student completes 15 graded

credit hours and a faculty member from Statistics sits as a fourth faculty on their committee.

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Faculty

Nairanjana Dasgupta, Marc Evans, Michael Jacroux, Venkata Jandhyala and Francis Pascual.

Statistics

Degree offered: Master of Science in Statistics – Non Thesis

Faculty working with graduate students: 13

Graduate students: 32

Graduate students receiving assistantships or scholarships: 18%

Tests required: GRE (Quantitative), GRE (Verbal), TOEFL

Deadline: Fall: January 10

Spring: July 1

Requirements

2 hours oral defense of project and oral final test, Students earn a M.S. in statistics by completing 26 graded credit hours and 4 non-graded credit hours. Students complete a project in conjunction with their committee chair, turn in a paper on the project two weeks before their oral exams.

Program Description

Statistics is the science that deals with the collection, analysis, display, and interpretation of data. Statistics is an interdisciplinary, intercollegiate program that emphasizes the connection of statistics to its many areas of application, as well as the traditional connection to mathematics. The Department offers courses that provide training in the application of statistical methods to the biological, physical, and social sciences, and the theory of statistical methods, probability, and statistical computing. Opportunities for individuals trained in statistics abound in business, industry, government and academia.

Degree Description

Statistics is the science that deals with the collection, analysis, display, and interpretation of data. Statistics is an interdisciplinary, intercollegiate program that emphasizes the connection of statistics to its many areas of application, as well as the traditional connection to mathematics. The Department offers courses that provide training in the application of statistical methods to the biological, physical, and social sciences, and the theory of statistical methods, probability, and statistical computing. Opportunities for individuals trained in statistics abound in business, industry, government and academia.

Post-Graduate Employment Opportunities

pharmacy, banking, credit card companies, consulting, government agencies

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Faculty

Sung Ahn, J Alldredge, Nairanjana Dasgupta, Marc Evans, Stergios Fotopoulos, Michael Jacroux, Venkata Jandhyala, Harry Johnson, Thomas Marsh, R Mittelhammer, Francis Pascual, David Sclar and Ping Ye.

STAT

443 Applied Probability 3 Course Prerequisite: MATH 172 or MATH 182; MATH 220 or MATH 230. Axioms of probability theory; random variables; expectation; generating function; law of large numbers; central limit theorem; Markov chains. (Cross-listed course offered as STAT 443, MATH 443).

500 Macroeconomic Theory I 3 Introduction to dynamics, growth and investment, overlapping generations models, Ramsey model, consumption and investment. (Cross-listed course offered as ECONS 500, FIN 500). Required preparation must include intermediate macroeconomics and one year of calculus. Required preparation must include intermediate macroeconomics and one year of calculus.

- 501 Microeconomic Theory I** 3 Microeconomic theory, multi-variate optimization, consumer and producer theory, competitive partial equilibrium, introduction to imperfect competition. (Cross-listed course offered as ECONS 501, FIN 501). Required preparation must include intermediate microeconomics and one year of calculus.
- 502 Macroeconomic Theory II** 3 Course Prerequisite: ECONS 500. Macroeconomic theory, short-run fluctuations and nominal rigidities, monetary economics and inflation, real business cycle models, unemployment international macroeconomics. (Cross-listed course offered as ECONS 502, FIN 502).
- 503 Microeconomic Theory II** 3 Course Prerequisite: ECONS 501. General equilibrium, welfare economics and social choice, market failure, game theory, economics of information. (Cross-listed course offered as ECONS 503, FIN 503).
- 504 Production and Consumption Economics** 3 Course Prerequisite: ECONS 502; ECONS 503. Advanced duality topics, demand and supply system modeling, financial economics and risk. (Cross-listed course offered as ECONS 504, FIN 504).
- 505 Economics for Agricultural Decision Making** 3 Managerial economics with specific applications to agricultural issues.
- 510 Statistics for Economists** 3 Statistical theory underlying econometric techniques utilized in quantitative analysis of problems in economics and finance. (Cross-listed course offered as ECONS 510, FIN 510). Required preparation must include college calculus and matrix algebra.
- 511 Econometrics I** 3 Course Prerequisite: ECONS 510. Single equation linear and nonlinear models; estimation, inference, finite and asymptotic properties, effects and mitigation of violations of classical assumptions. (Cross-listed course offered as ECONS 511, FIN 511).
- 512 Econometrics II** 3 Course Prerequisite: ECONS 501; ECONS 511. Econometric methods for systems estimation; simultaneous equations, discrete and limited dependent variable, panel data, and time series data. (Cross-listed course offered as ECONS 512, FIN 512).
- 513 Econometrics III** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Linear and non-linear models and maximum likelihood estimation and inference; semi-parametric and parametric methods; limited dependent variable models.
- 514 Econometrics IV** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 512. Constrained estimation, testing hypotheses, bootstrap resampling, BMM estimation and inference, nonparametric regression analysis, and an introduction to Bayesian econometrics.
- 521 Topics in Economic Sciences** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Current topics in the development and application of the economic sciences. Required preparation must include intermediate micro- and macro-economics, and econometrics course work.
- 525 Master's Econometrics** 3 Theory and practice of multiple regression methods; applications to the study of economic and other phenomena; use of computer regression programs. Required preparation must include introductory statistics course.
- 526 Master's Microeconomic Analysis I** 3 Master's-level, calculus-based analysis of consumer and producer behavior, partial and general equilibrium, and strategic behavior. Required preparation must include intermediate microeconomics and calculus course work.
- 527 Master's Microeconomic Analysis II** 3 Master's-level, linear algebra-based analysis of consumer and producer theory, comparative statics and constrained optimization. Required preparation must include intermediate microeconomics and calculus course work.
- 529 Research Methods** V 1-2 May be repeated for credit; cumulative maximum 3 hours. Prepare and communicate professional-quality research with an emphasis on learning how to identify, develop, write, and present research.
- 532 Environmental and Natural Resource Economics** 3 Economic principles and models applied to natural resource and environmental problems, issues, and policies.
- 533 International Trade and Policy** 3 International trade theories, policies, and research issues related to world trade with emphasis on agricultural commodity markets.
- 534 Production Economics** 3 Course Prerequisite: ECONS 526. Production economics theory and methods applied to problems of production response, economic optimization, technology, policy, risk and dynamics.
- 555 Managerial Economics for Decision Making** 3 Course Prerequisite: Admission to the MBA program. Optimal economic decision making for business in a global environment. Not open to economics graduate students.
- 571 International Trade** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Recent developments in trade theory and policy, including international factor movements, empirical analysis of trade flows and strategic trade policies.
- 572 International Development** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Structural and two-sector growth models of developing countries and countries in transition; empirical estimation of sources of growth.
- 581 Natural Resource Economics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic dynamics of natural resource systems.
- 582 Environmental Economics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Economic theory for environmental issues; externalities, property rights, and welfare analysis; policy design and implementation; non-market valuation and cost/benefit analysis.
- 583 Public Sector Economics** 3 Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Public sector and public choice economics, including government debt and tax policy, public decision making, bureaucratic behavior and rent-seeking, with applications.

- 593 Applications in Microeconomic Topics 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Applied topics in healthcare, sports, transportation and other markets. (Cross-listed course offered as ECONS 593, FIN 593).
- 594 Theory of Industrial Organization 3** Course Prerequisite: ECONS 502; ECONS 503; ECONS 511. Theory of market structure and firm behavior, including price and non-price competition, information and strategic behavior, and technological change. (Cross-listed course offered as ECONS 594, FIN 594).
- 596 Advanced Topics in Financial Economics V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to PhD programs in business. Topics may include financial theory and empirical methods as applied to financial management, investments, international finance, and markets/institutions. (Cross-listed course offered as FIN 596, ECONS 596).
- 598 PhD Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Seminar focusing on PhD students presenting their own research and critically assessing the research of other PhD students.
- 599 Special Topics in Economics 3**
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 540 Deterministic Business Models 3** Decision analysis, linear optimization models, nonlinear models, network analysis including PERT, and dynamic programming as applied to business.
- 556 Advanced Business Modeling 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Spreadsheet modeling and solution of business problems using mathematical programming; Monte Carlo simulation, queuing theory, and decision analysis.
- 581 Operations Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Analytical approach to solving problems in production and operations management.
- 582 Personnel and Human Resource Management 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Human resources and personnel administration; selection, training, compensation, performance appraisal, labor relations, health and safety, EEO legislation.
- 587 Professional Ethics and Practice in Business 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Ethical issues faced by businesses in the current environment; traditional sources for discerning professional and ethical practices.
- 588 Management of Innovation 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Technological transitions and technology strategy; knowledge and creativity in organizations; managing innovation processes, technical employees, and cross-functional cooperation. (Cross-listed course offered as MGTOP 588, ENTRP 588).
- 589 Seminar in Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Special topics in management, organization behavior, organization theory, human resource management and strategic management.
- 590 Strategy Formulation and Organizational Design 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Relationship between the formulation of strategy and the selection of effective organizational structures and systems.
- 591 Statistical Analysis for Business Decisions 3** Course Prerequisite: Admission to the Master of Accounting program, MBA program, Master of Public Affairs (MPA) program, or Business Ph.D. programs. Analytical skills for decision-making; data collection and analysis, sampling, inferential, regression methodologies, experimental design, time series, forecasting analysis.

- 593 Managerial Leadership and Productivity 3** Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Organizational behavior and human motivation in the workplace; organization and leadership theories, studies, projects and models leading to improved productivity.
- 596 Doctoral Topics V 1-4** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 597 Doctoral Topics 3** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to PhD programs in business. Advanced topics in management and operations.
- 598 Research and Professional Development 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to PhD programs in business. Ph.D.-level professional development colloquium designed to improve research, teaching, and presentation skills and to provide professional socialization.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA, Master of Accounting, or Business PhD programs. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to the MBA program. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: Admission to PhD programs in business. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.

- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Supply Chain Management – Cert in Logistics and Supply Chain Management

Degree offered: Graduate Certificate in Supply Chain Management

Graduate students: 5

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)

Spring: November 15 (July 1 international)

Requirements

Student will apply to receive the certificate and pay the fee in

first half of the final semester.

Program Description

Every organization has internal supply chains and links to external suppliers and customers. Interlinking organizations span the spectrum from raw materials to finished products and services in the hands of the consumer. A well-functioning supply chain can dramatically reduce waste and increase productivity and profits for all members. Graduates of the program should understand strategy and tactics of supply chain management, including dysfunctional actions, how to position inventory, and describe ways to reduce variability of the supply chain. The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs.

Degree Description

Every organization has internal supply chains, and links to external suppliers and customers. Interlinking organizations span the spectrum from raw materials to finished products and services in the hands of the consumer. The supply chain extends even to final disposition of the commodities we consume from concept to grave. The structured dependency of such chains, the uncertainty of forecasts and systemic delays are amplified as individual links in the supply chain try to optimize their performance. Even minor changes in the market can cause wild swings in economic performance. Modern design for manufacturability, six sigma quality, operation theories, information systems, such as ERP systems, and theory of constraints hold the promise of stabilizing some of the variability by providing visibility along the whole supply chain. Additional control and operational performance factors are needed to provide a complete solution. This course examines the strategy and tactics of supply chain management to include "how to" techniques to implement, measure and reward the individual links in the supply chain.

Contact Information

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Engineering Management

E M

501 Management of Organizations 3 Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.

- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.
- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Sustainable Agriculture – Cert in Sustainable Agriculture

Degree offered: Graduate Certificate in Sustainable Agriculture

Faculty working with graduate students: 4

Graduate students: 5

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Program Description

The Graduate Certificate in Sustainable Agriculture provides post-baccalaureate students with an interdisciplinary understanding of practices and current issues in sustainable agriculture, along with the science that makes it work. Students who earn this certificate may take these skills into all industries and agencies involved in the food chain; from production, processing, and delivery to policy, regulation, education, and research. Students in any graduate program are eligible for the certificate if they meet the prerequisites of the courses needed for the certificate. Non-degree-seeking students may also complete the certificate if they are accepted to the WSU Graduate School.

Degree Description

The Graduate Certificate in Sustainable Agriculture requires a minimum of 9 graded credits. Two core courses provide 6 credits, and 3 credits must be earned from courses in relevant disciplines outside the student's primary degree program. No more than 3 of the graded credits toward the certificate may be undergraduate credits. Certificate Core (6 credits) AFS 501: Current Research in Organic and Sustainable Agriculture (3 credits) AFS 545: Field Analysis of Sustainable Food Systems (3 credits) Scientific Breadth Component (3 credits). Because sustainable agriculture is inherently interdisciplinary, the Breadth Component ensures that students gain knowledge of a relevant discipline outside their primary degree department. The student is required to complete at least 3 graded credits in disciplines other than the home department. The course(s) must be clearly and directly relevant to the practice or understanding of sustainable agriculture.

Post-Graduate Employment Opportunities

The Graduate Certificate in Sustainable Agriculture increases knowledge and employment potential in any position focused on sustainability. This will include educational, commercial, and research endeavors for production, processing, or policy.

Post-Graduate Career Placements

Agricultural Research Associate County Agricultural Extension Agent Vineyard and Winery Technology Grant Director Landscape Design Specialist

Contact Information

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Faculty

Preston Andrews, Lynne Carpenter-Boggs, William Pan and William Snyder.

Animal Sciences

A S

- 313 Feeds and Feeding 4** (3-3) Course Prerequisite: BIOLOGY 106. Utilization, practices, requirements, nutritive characteristics, and calculations of rations for animals. Field trip required.
- 360 Meat Science 3** (2-3) Course Prerequisite: BIOLOGY 107. Anatomy, slaughter, classification, and processing of meat animal species. Special clothing and equipment required.
- 378 Advanced Livestock and Meat Selection and Evaluation 2** (0-6) May be repeated for credit. Course Prerequisite: ANIM SCI 260. Principles and practices of livestock and meat selection and evaluation. Off-campus and weekend participation required.
- 408 Ruminant Nutrition 3** Course Prerequisite: ANIM SCI 313. Anatomy, physiology, and metabolism in ruminant animals.
- 472 Dairy Cattle Management 3** Course Prerequisite: ANIM SCI 313; ANIM SCI 330; ANIM SCI 350. Principles of breeding, feeding, and management of dairy cattle. Field trip required.
- 474 Beef Cattle Production 3** (2-3) Course Prerequisite: ANIM SCI 313; ANIM SCI 330; ANIM SCI 350. Breeding, feeding, and management; commercial and purebred enterprises; management of beef cattle on ranges, pastures and in the feedlot. Field trip required.
- 478 Swine Production 3** (2-3) Course Prerequisite: ANIM SCI 313; ANIM SCI 330; ANIM SCI 350. Principles of breeding, feeding, management, and marketing of swine. Field trips and special clothing required.

Agricultural and Food Systems

AFS

- 302 Introduction to Agroecology 3** Agroecological crop production through case study analyses and applications of ecological principles in traditional and modern farming systems. (Cross-listed course offered as SOIL SCI 302, AFS 302). Recommended preparation: SOIL SCI 201.

Agricultural and Food Systems

AGTM

- 305 Agricultural Precision Systems 3** (2-3) Systems for precision agriculture, equipment, software uses, principles, construction, care, tillage, planting, spraying, harvesting, and materials handling machinery. Field trips required.
- 405 Advanced Agricultural Precision Systems 2** (1-3) Course Prerequisite: AGTM 305. Advanced principles of precision agricultural systems, software uses, management of controllers on equipment, geographical information systems and global positioning systems.

Agricultural and Food Systems

BIOL

- 420 Plant Physiology 3** Course Prerequisite: BIOLOGY 106 or 120. Water relations, mineral nutrition, photosynthesis, respiration, and growth of plants. Recommended: Organic chemistry.
- 421 Plant Physiology Laboratory 1** (0-3) Course Prerequisite: BIOLOGY 420 or concurrent enrollment. Laboratory for Biol 420.

Agricultural and Food Systems

CROPS

- 302 Forage Crops 3** (2-3) Course Prerequisite: BIOLOGY 102, 106, 107, 120, or 135. Adaptation, production, and utilization of forage crops. Field trip required.
- 305 Ecology and Management of Weeds 3** (2-3) Course Prerequisite: HORT 202 or AFS 201. Weed ecology/management in crop and non-crop systems; weed growth/development, identification, weed control (chemical, mechanical, biological), and environmental issues
- 360 World Agricultural Systems 3** Course Prerequisite: 3 units of [B] or [BSCI] GER or UCORE categories. Study of agro-environmental characteristics of world agriculture; historical and contemporary features of world food production. (Cross-listed course offered as CROP SCI 360, SOIL SCI 360).
- 403 Advanced Cropping Systems 3** Course Prerequisite: HORT 202. Understanding the management of constraints to crop production and quality; biological, physical, and chemical approaches to crop health management. Field trips required. (Cross-listed course offered as CROP SCI 403, PL P 403). Recommended preparation: CROP SCI 305; PL P 429.
- 443 Plant Breeding for Organic Agriculture 3** Course Prerequisite: HORT 202; BIOLOGY 106 or 120. Concepts and practice of breeding in and for organic agriculture with an emphasis on field-based, on-farm techniques.

Agricultural and Food Systems

ENTOM

- 340 Agricultural Entomology 3** (2-3) Course Prerequisite: BIOLOGY 106 or 107. Control, identification, and biology of insects and related arthropods. Course equivalent to OSU's Ent 311 and UI's Ent 322.

- 343 General Entomology 3** Biology, natural history, and importance of insects and related arthropods.
- 350 Pest Management in Organic Agriculture Production Systems 2** Course Prerequisite: BIOLOGY 106 or 372. Principles, methodologies and implementation of arthropod pest suppression in organic cropping systems.
- 361 Honey Bee Biology 3** Biology of the honey bee, including behavior, genetics, evolution, pollination, sociality, and beekeeping practices.

Environmental Science & Regional Planning

ES/RP

- 410 Global Biogeochemistry 3** Cycles of biogeochemically important elements and anthropogenic changes to those cycles in terrestrial and aquatic environments on a global scale. Field trip required.
- 469 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.

Environmental Science & Regional Planning

HORT

- 310 Pomology 3** Course Prerequisite: BIOLOGY 106, BIOLOGY 107, BIOLOGY 120, or HORT 202. Botany, history, production, and uses of temperate-zone tree and small fruit crops.
- 313 Viticulture 3** Course Prerequisite: BIOLOGY 106, BIOLOGY 107, BIOLOGY 120, or HORT 202. Botanical relationships, plant characteristics, fruiting habits, location, culture, marketing, and utilization of grapes, berries, and other small or bush fruits. Field trip required. (Cross-listed course offered as HORT 313, VIT ENOL 313).
- 320 Olericulture 3** Science, business, and art of vegetable crop production: culture, fertility, growth, physiology, handling, marketing; garden, commercial, greenhouse, tropical, specialty vegetables. Recommended preparation: BIOLOGY 106, BIOLOGY 107, BIOLOGY 120, or HORT 202.
- 321 Olericulture Laboratory 1** (0-3) Course Prerequisite: Concurrent enrollment in HORT 320. Production principles and practices of vegetable crops; plant characteristics, cultivars, nutrition, growth, and development. Field trip required.
- 421 Fruit Crops Management 3** Course Prerequisite: 6 hours HORT, BIOLOGY, or VIT ENOL. Current research and management strategies for production and quality of temperate-zone fruit crops. Credit not granted for both HORT 421 and HORT 521. Recommended preparation: HORT 310 or HORT 313.

Integrated Pest Management

IPM

- 462 Systems of Integrated Pest Management 3** (2-3) Utilization of the systems approach in agricultural pest management; design, implementation, and analysis of IPM programs for selected crops.

Natural Resource Sciences

NATRS

- 455 Elements of Range Management Sciences 3** Course Prerequisite: BIOLOGY 107. Systems science, ecology, wildlife, livestock, social science, concept design, and their contributions to a management science involving rangelands.

Natural Resource Sciences

PL P

- 300 Diseases of Fruit Crops 2** Course Prerequisite: BIOLOGY 120, HORT 310, or HORT 313. Comprehensive understanding of the diseases of fruit crops grown in the state of Washington.
- 429 General Plant Pathology 3 (2-3)** Classification, symptoms, causes, epidemiology, and control of plant diseases.

Natural Resource Sciences

SOILS

- 301 Ecological Soil Management 3** Soil and water conservation and management; land classification and reclamation; soils and environmental quality; sustainable agroecosystems.
- 360 World Agricultural Systems 3** Course Prerequisite: 3 units of [B] or [BSCI] GER or UCORE categories. Study of agro-environmental characteristics of world agriculture; historical and contemporary features of world food production. (Cross-listed course offered as CROP SCI 360, SOIL SCI 360).
- 441 Soil Fertility 3** Course Prerequisite: SOIL SCI 201. Nutrient management impacts on crop productivity, soil and water quality; mineral requirements; soil testing; plant analysis; inorganic and organic fertilizers.
- 480 Practicum in Organic Agriculture V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By permission only. Applied principles and practices of organic agriculture; immersion and participation in all required farming/gardening activities.
- 499 Special Problems V 1-4** May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.
- 500 Seminar in Animal Sciences 1** May be repeated for credit. Current developments in animal sciences.
- 501 Milk, Meat, and Methane: Contemporary Animal Production Issues 3** Provides knowledge and understanding of livestock issues that affect contemporary livestock production.
- 504 Special Topics V 1-4** May be repeated for credit; cumulative maximum 12 hours.
- 507 Advanced Nutrient Metabolism 3** Advanced topics in metabolic regulation of carbohydrate, fat and amino acid use by animals.
- 510 Digestion and Nutrient Utilization in Animals 3 (2-3)** Gastrointestinal physiology, rate of passage, feed intake regulation, measures of digestibility, starch, fat and nonstarch polysaccharide, and digestion and utilization of nutrients.

- 513 Mineral and Vitamin Metabolism 4** Absorption, excretion, metabolism, dietary requirements and interactions of minerals and vitamins in animals and humans.
- 520 Preparation of Scientific Literature in Animal Sciences 2** Preparation of grant proposals, manuscripts, and literature reviews on research topics.
- 528 Topics in Animal Breeding 2** May be repeated for credit; cumulative maximum 4 hours. Systems of selection and mating for genetic improvement in farm animals.
- 551 Endocrine Physiology 3** Anatomy, physiology, and biochemistry of endocrine systems and hormone action; emphasis on comparative, veterinary, and biomedical models. Credit not granted for both ANIM SCI 451 and ANIM SCI 551.
- 558 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 581 Stem Cell Biology, Therapeutics and Regenerative Medicine 3** Provides information on the latest cutting edge research in the areas of stem cell biology and tissue regeneration; covers stem cell therapeutics, gene transfer vectors and methods for isolating, characterizing, and generating stem cells. (Course offered as PHARMSCI 581, ANIM SCI 581).
- 582 Seminar in Reproductive Biology 1** Current developments in reproductive biology.
- 588 Perspectives in Biotechnology 3** Theory and application of biotechnology in agriculture, industry, and medicine; methodological, environmental, social, and economic concerns. Credit not granted for both ANIM SCI 488 and ANIM SCI 588.
- 598 Advanced Topics in Animal Sciences V 1-2** May be repeated for credit. Recent research in various disciplines of animal sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Current Research in Organic and Sustainable Agriculture 3** Multidisciplinary framework to assess the sustainability of a range of farming and food systems.
- 545 Field Analysis of Sustainable Food Systems 3** Experiential course visiting farms, food processing and marketing facilities to develop understanding of issues and relationships of sustainable food systems. (Cross-listed course offered as AFS 445, CRS 445).
- 505 Precision Agricultural Systems Management 3** Evolving technologies involved in precision agriculture and their application to agricultural systems.

- 536 Agricultural Technology Design 2** Design applications to methodologies as applied to precision agricultural systems; group problem solving activities, data analysis utilizing computers, and team design efforts. Credit not granted for both AGTM 436 and AGTM 536.
- 500 Seminar 1** May be repeated for credit.
- 501 Proposal Defense Seminar 2** Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.
- 504 Experimental Methods in Plant Physiology 3 (2-3)** Advanced techniques and instrumental methods applicable to research in plant physiology.
- 509 Plant Anatomy 4 (2-6)** Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.
- 512 Molecular Mechanisms of Plant Development 3** Physiology of growth; metabolism during development and reproduction.
- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.
- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.
- 533 Modern Methods in Phylogenetics 4 (2-6)** Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3 (2-3)** Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2 (0-6)** Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)** Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.

- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.
- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 512 Research and Teaching Methods 3 (2-3)** Graduate research with an emphasis on biological systems engineering and college instruction.
- 530 Machine Vision for Biological Systems 3** Image analysis techniques as applied to machine vision applications integrated into autonomous equipment used in specialty crops.
- 532 Electrohydraulic Systems Control 3** Fluid power transmission, E/H control, control systems and controller design.
- 550 Soil and Water Conservation Engineering 3** Land, water and air conservation emphasizing on soil and water engineering concepts, state of science solution techniques, and engineering design.
- 551 Advanced Biological Systems Engineering Topics V 1-4** May be repeated for credit; cumulative maximum 6 hours. Directed group study of selected advanced topics in biological systems engineering.
- 552 Advanced Biological Systems Engineering Topics V 1-4** May be repeated for credit. Directed group study of selected advanced topics in biological systems engineering.
- 554 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 555 Natural Treatment Systems 3** Principles and design procedures of natural systems for wastewater treatment for agricultural and non-agricultural applications. (Cross-listed course offered as CE 555, BSYSE 555).
- 556 Surface Hydrologic Processes and Modeling 3 (2-3)** Fundamental hydrologic processes, governing equations and solution methods, GIS techniques commonly used in hydrology, class project on modeling surface hydrology.
- 557 Nutrient Cycling and Transport 3** Cycling of carbon, nitrogen and phosphorus at global and watershed scales; modeling of transportation and transport in agricultural systems
- 558 Groundwater Flow and Contaminant Transport 4 (3-3)** Physics of flow and contaminant transport in saturated porous media including governing equations, well hydraulics and computer modeling.

- 560 Aquatic Chemistry 3** Chemical principles as applied to natural environmental system, water supply and pollution and control engineering. (Cross-listed course offered as CE 583, BSYSE 560).
- 564 Agricultural Waste and Air Quality Management 3** Detailed analyses of agricultural wastes and their potential adverse impacts on the environment; current management systems; reuse and recycle.
- 581 Advanced Physical Properties of Foods 3** Analysis, modeling, and experimental procedures to measure food physical properties for use in food processing system design.
- 582 Food Process Engineering I 3** Design of food processing systems; design and simulation of sterilization and pasteurization processes in foods.
- 583 Food Process Engineering II 3** Design of food separation unit operations including concentration, dehydration, and membrane processes.
- 584 Thermal and Nonthermal Processing of Foods 3** Food preservation methods based on application of thermal and nonthermal processes.
- 585 Food Packaging 3** Properties of packaging materials, manufacturing of packages, shelf-life testing and food packaging interaction.
- 593 Renewable Energy Technologies 3** Thermochemical biorefinery technologies for biofuels and bioproducts; facility operations, analysis, and design of integrated processes for biofuel and bioproduct production
- 594 Design and Analysis of Biomass Conversion Processes and Systems 3** Analysis of bioprocessing and biotreatment processes including energetics, stoichiometry, species competition, process infiltration, product separation and optimization.
- 595 Biosystems Engineering for Fuel and Chemicals 3** Design and optimization of biological systems for industrial functions, modeling and simulation of cell processes, bioreactors and system integration.
- 596 Biomass Thermo-Chemical Conversion 3** Biomass chemistry, analytical thermo-chemistry, torrefaction, pyrolysis, gasification and combustion; characterization and uses of thermochemical products.
- 597 Biomass Biological Process Engineering 3** Technical issues in the biological process engineering field, commercial application and evaluation of new technologies in resource, environment and economic contexts.
- 598 Graduate Seminar 1** May be repeated for credit. Required of all graduate students in biological systems engineering.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Cropping Systems 3** Understanding the management of constraints to crop production and quality; biological, physical, and chemical approaches to crop health management. Field trips required. (Cross-listed course offered as CROP SCI 403, PL P 403). Recommended preparation: CROP SCI 305; PL P 429.
- 504 Plant Transmission Genetics 3** Transmission of genes across generations; detailed study of the basic laws of genetics to predict and describe inheritance.
- 505 Advanced Classical and Molecular Breeding 3** Characterization and principles of improving crop quality and adaptation traits with emphasis on molecular breeding strategies. Required preparation must include upper-division course in biology, genetics, or plant breeding.
- 510 Seminar 1** May be repeated for credit. Literature review; preparation and presentation of reports in crop science.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 512 Topics in Crop Science V 1-2** May be repeated for credit. Concepts of plant breeding, seed physiology, and technology; crop physiology and management.
- 545 Quantitative Trait Improvement 3** Concepts and applications in modern plant breeding programs.
- 554 Chromosome Structure and Function 3** Structural and functional organization of eukaryotic chromosomes. Required preparation must include upper-division course in biology, genetics, or plant breeding.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 535 Resolving Environmental Conflicts 4** (3-3) Introduction to environmental conflict resolution via readings, discussions, simulation role plays and required papers; emphasis on interest-based approaches.
- 590 Sociology of Agriculture and Food Systems 3** Theories, concepts, debates and methods associated with the sociology of agriculture and food systems.
- 540 Taxonomy of Immature Insects V** 2-4 Identification of eggs, larvae, nymphs, and pupal stages of insects. Insect collection required.
- 548 Medical and Veterinary Entomology 3** Biology and ecology of parasitic arthropods and their direct impacts on human and animal health; transmission of pathogens. Credit not granted for both ENTOM 448 and ENTOM 548.
- 550 Insect Physiology 3** General principles of insect physiology; the mechanisms of vital processes in insects; organ, cellular, subcellular, chemical and physical levels. Required preparation must include BIOLOGY 332, 352, CHEM 345, ENTOM 340, or 343.
- 555 Agricultural Chemical Technology for Crop Protection & Production 3** Mechanistic examination of agricultural chemical technology; synthetic and biological pesticides and fertilizers; mechanism of biological activity; deployment; management.
- 556 Insecticides: Toxicology and Mode of Action 1** Insecticides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 557 Herbicides: Toxicology and Mode of Action 1** Herbicides in terms of historical perspective, classification, synthesis, toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 558 Pesticide Topics 1** Current issues concerning pesticides in terms of toxicity, mode of action, and metabolism. Required preparation must include MBIOS 303; CHEM 345; BIOLOGY 352, 420, or 350.
- 590 Special Topics in Entomology V** 1-4 May be repeated for credit; cumulative maximum 10 hours. Credit not granted for both ENTOM 490 and ENTOM 590.
- 593 Seminar 1** May be repeated for credit. Reporting and discussing problems and research in entomology.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Graduate Skills Seminar 1** Seminar designed to introduce first year graduate students to the science graduate program; roles and responsibilities of graduate students, teaching assistants and researchers.
- 504 Ecosystem Management 3** Analysis of ecosystem processes; dual emphasis on ecological principles and development of methods and concepts to evaluate policies for management.
- 531 Fundamentals of Environmental Toxicology 3** Fundamentals of toxicology; environmental fate and biological deposition and effects of natural products, drugs, food chemicals, and pollutants.
- 532 Applied Environmental Toxicology 3** Course Prerequisite: ENVR SCI 531 or PHARMSCI 505. Overview of the field of environmental toxicology; interactions of xenobiotics with natural systems.
- 540 Agroecology 3** Social and ecological aspects of agriculture and human food systems.
- 544 Environmental Assessment 4** Environmental impact statements and their national and state policy frameworks, methods of assessment, and team preparation of an impact statement. Credit not granted for both ENVR SCI 444 and ENVR SCI 544.
- 545 Hazardous Waste Management 3** Environmental, technical, and political aspects of hazardous waste management; evaluative methods, risk assessment, and current management requirements. Credit not granted for both ENVR SCI 445 and ENVR SCI 545.
- 550 System Dynamics Models of Environmental Systems 3** Analysis of environmental system dynamics; development and uses of simulation models using the Stella software on Macintosh.

- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 585 Aquatic System Restoration 3** Study of natural, damaged and constructed ecosystems with emphasis on water quality protection and restoration of lakes, rivers, streams and wetlands. (Cross-listed course offered as CE 585, BSYSE 554, ENVR SCI 585). Required preparation must include CHEM 345; MBIOS 101. Required preparation must include CHEM 345; MBIOS 101.
- 586 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 590 Special Topics 2** May be repeated for credit; cumulative maximum 6 hours.
- 592 Special Topics V 1-4** May be repeated for credit; cumulative maximum 4 hours.
- 593 Seminar in Environmental Science and Regional Planning 1** May be repeated for credit; cumulative maximum 8 hours. May be repeated for credit, cumulative maximum 8 hours.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 503 Advanced Topics in Horticulture V 1-4** May be repeated for credit; cumulative maximum 8 hours. Current topics and research techniques in horticulture.
- 509 Seminar 1** May be repeated for credit; cumulative maximum 12 hours. Continuous enrollment required for regularly enrolled graduate students in horticulture. Recent developments in horticulture.
- 510 Graduate Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Literature reviews and research progress reports.
- 513 Advanced Viticulture 3** Wine and juice grape production in eastern Washington; wine and fruit physiology, climate and soils, and fruit quality. (Cross-listed course offered as HORT 413, VIT ENOL 413).
- 516 Advanced Horticultural Crop Physiology 3** Physiological processes related to growth, development, and productivity of horticultural crops; advances in recombinant DNA technology; the impact on horticultural practices. Credit not granted for both HORT 416 and HORT 516. Recommended preparation: BIOLOGY 420.
- 518 Post-harvest Biology and Technology 3 (2-3)** Physical and physiological basis for handling and storage practices; perishable organ ontogeny and physiological disorders; post-harvest environment requirements. Field trip required. Credit not granted for both HORT 418 and HORT 518. Recommended preparation: HORT 202.
- 521 Fruit Crops Management 3** Current research and management strategies for production and quality of temperate-zone fruit crops. Credit not granted for both HORT 421 and HORT 521. Recommended preparation: HORT 310 or HORT 313.
- 535 Chemistry and Biochemistry of Fruit and Wine 3** Study of the chemistry and biochemistry of fruits; biochemistry and physiology of individual fruit compounds, aspects of processing including winemaking. (Cross-listed course offered as HORT 435, VIT ENOL 435). Recommended preparation: Analytical chemistry.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

- 552 Pesticides and the Environment 2** Immediate and prolonged effects of pesticides on human and other animals; legal and moral repercussions of pesticide use. Recommended for graduate-level course: 12 credit hours of biology or ecology courses.
- 519 Advanced Topics V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 535 Wildlife Ecology 4 (3-3)** The ecology of wildlife species and the contributing biological processes. Overnight field trip required.
- 550 Conservation Biology 3** Patterns of biological diversity, factors producing changes in diversity, values of diversity, management principles applied to small populations, protected areas, landscape linkages, biotic integrity, restoration, legal issues and funding sources. Credit not granted for both NATRS 450 and NATRS 550.
- 554 Restoration Ecology 3 (2-3)** Ecological principles used to restore biological communities; ecological processes and species on degraded landscapes. Credit not granted for both NATRS 454 and NATRS 554.
- 556 Foraging Ecology of Herbivores 2** Synthesis of foraging behavior concepts including nutritive quality of forages, digestive and metabolic constraints, and diet and habitat selection.
- 560 Watershed Management 3** Principles and practices of management of forest and rangelands for protection, maintenance, and improvement of water resource values. Field trip required. Recommended preparation: NATRS 204 or sufficient background in spreadsheets.
- 564 Landscape Ecology 3 (2-3)** Linkages between spatial patterns and processes in a variety of landscapes and the qualitative tools used in the investigation of these linkages. Credit not granted for both NATRS 464 and NATRS 564.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 595 Seminar in Natural Resource Sciences 1** May be repeated for credit. Literature review; preparation and presentation of reports in natural resource sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Biology and Control of Plant Diseases 3 (2-3)** Introduction to the biology and control of plant diseases covering disorders caused by fungi, viruses, bacteria, and nematodes.
- 503 Advanced Cropping Systems 3** Understanding the management of constraints to crop production and quality; biological, physical, and chemical approaches to crop health management. Field trips required. (Cross-listed course offered as CROP SCI 403, PL P 403). Recommended preparation: CROP SCI 305; PL P 429.
- 511 Viruses and Virus Diseases of Plants 4 (3-3)** Course Prerequisite: MBIOS 503 or 504. Nature of plant viruses, vector-virus relationships and virus diseases of plants.
- 513 Plant Nematology 4 (3-3)** Anatomy and morphology of plant-parasitic nematodes, molecular plant-nematode interactions, genomics, symptoms, identification, techniques and control.
- 514 Phytobacteriology 4 (3-3)** Isolation and characterization of bacteria having a saprophytic, symbiotic or pathogenic association with plants, molecular structure, function, and genetics.
- 515 Seminar 1** May be repeated for credit.
- 521 General Mycology 4 (2-6)** The structure, life histories, classification, and economic importance of the fungi.
- 525 Field Plant Pathology and Mycology V 1 (0-3) to 2 (0-6)** May be repeated for credit; cumulative maximum 4 hours. Field trips, forays, and demonstrations dealing with various aspects of plant pathology and mycology.
- 526 Advanced Fungal Biology 4 (2-6)** Course Prerequisite: PL P 521. Advanced topics in fungal biology, ecology, systematics, evolution and coevolution via discussions of literature and special laboratory projects.
- 535 Molecular Genetics of Plant and Pathogen Interactions 3** Genetic and molecular biological aspects of host-pathogen interactions.
- 551 Epidemiology and Management of Plant Diseases 3** Principles of plant disease epidemiology, control and ecology of pathogens. Recommended preparation: PL P 429.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.

- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3 (2-3)** Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Systems Engineering Management – Cert in Systems Eng Management

Degree offered: Graduate Certificate in Systems Engineering Management

Graduate students: 5

Program offered: DDP

Deadline: Fall: July 15 (January 10 international)
 Spring: November 15 (July 1 international)
 Summer: April 1 (Default international)

Requirements

Student will apply for the certificate in the final semester.

Program Description

The ETM Certificate Program allows students to complete shorter professional blocks of coursework relevant to their specific needs. Rather than completing all the course requirements for an ETM master's degree, students may take four courses (12-credit hours) in specialized areas. A certificate is awarded upon completion of these courses. Course credits earned for a certificate may also apply to a master's degree in the ETM Program or other graduate degree programs. A student may earn more than one certificate and may work on the certificate and master's program concurrently. Eight certificates are available in the Master of Engineering and Technology Management degree program.

Degree Description

The complexity of modern systems and projects has demonstrated that it is no longer possible to rely on design evolution and associated tools to improve and develop a system. To address this complexity, system engineering has evolved along with new methods and modeling techniques to better comprehend engineering systems as they grow more complex. System engineering is a holistic, robust approach to the design, creation and operation of systems. It consists of identification and quantification of system goals, creation of alternative system design concepts, performance of trade studies, selection and identification of the best design, verification that the design is properly built and integrated, and post implementation assessment of how well the system meets the customer goals and needs. The system engineering method deals with systems as an integrated whole comprised of diverse subsystems and functions and works to optimize overall system functions and achieve maximum compatibility of its elements. This course focuses on how complex engineering projects should be managed over the life cycle of the project. It deals with the work processes and tools to handle large scale complex engineering projects in a sustainable environment and overlaps with the technical and human disciplines characteristic of these projects.

Contact Information

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Engineering Management

E M

501 Management of Organizations 3 Exploration of issues related to individual behavior in work organizations, including motivation, leadership, team-building, and team management skills.

- 505 Finance for Technical Systems 3** Time value of money, capital budgeting, accounting principles, cost, valuation, risk, cost accounting and sensitivity analyses: concepts for engineering decision-making.
- 508 Legal Concepts for Engineering and Technical Managers 3** Basic legal obligations of engineering/technical managers; identify, minimize and recognize risks and liability; contemporary legal environment and business law.
- 520 Construction Project Management 3** Construction project bids, proposals, contracts, project delivery/organization; estimating, scheduling, resource loading, project monitoring and controls, safety and quality
- 522 Supervision and Leadership for Engineering and Technology Managers 3** Strategies of supervision with practical application techniques presented to create individual and organizational motivation.
- 526 Constraints Management 3** Identifies factors that block improvements in any system; effective breakthrough solutions; continual systems improvements for manufacturing, administration, projects. Credit not granted for both E M 426 and E M 526.
- 530 Applications of Constraints Management 3** Understanding and applying proved solutions developed by the theory of constraints in areas of production, project management, finance, and distribution. Credit not granted for both E M 430 and E M 530.
- 534 Contemporary Topics in Constraints Management 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: E M 526 or 530. Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.
- 538 Lean Agility 3** Integration of the best of Lean, Six Sigma, and Theory of Constraints to accelerate the continuous improvement process.
- 540 Operations Research for Managers 3** Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions.
- 545 Technical Decision Analysis 3** Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Recommended preparation: Basic STAT course.
- 555 Enterprise Resource Management 3** Focusing the flow of quality, timely products and cooperative supply chain operations and planning using simulation and effective enterprise resource management.
- 560 Integrated Supply Chain Management 3** How technical managers analyze and manage the flow of materials, services, and information for products from inception to final customer.
- 564 Project Management 3** Technical tools, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), cost/schedule control systems, behavioral issues and organizational structure. Credit not granted for both E M 464 and E M 564.

- 565 Introduction to Systems Management 3** Design manufacture, operation of complex system development for engineering managers; project planning, organizing, and controlling tools for engineering system constraints.
- 566 System Engineering Analysis and Practice 3** Problem-solving methodologies based on system concepts and design applications for complex, large-scale technical systems pertinent to program managers.
- 567 System Supportability and Logistics Management 3** Supportability and logistics engineering and management in a system life cycle, from concept to retirement.
- 570 Six Sigma Quality Management 3** Graduate-level counterpart of E M 470; additional requirements.
- 575 Performance Management in Technical Organizations 3** Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation and performance systems.
- 580 Quality Control and Reliability 3** Quality analysis, modeling process, product quality, statistical process control, process capability studies; sampling concepts, reality models, predictions, design testing. Credit not granted for both E M 480 and E M 580. Recommended preparation: STAT 430.
- 585 Quality Improvement Using Design of Experiments 3** Design for quality improved products; processes and services using designed experiments, including robust/parameter design. Credit not granted for both E M 485 and E M 585. Recommended preparation: Undergraduate statistics.
- 590 Design for Product and Service Realization 3** Techniques and tools to optimize cost, quality, time to market, and to improve comprehensive product design, manufacturability and service components. Credit not granted for both E M 490 and E M 590.
- 591 Strategic Management of Technology and Innovations in Engineering 3** Management of technological innovation; integrating strategy, new product development, corporate entrepreneurship, and innovation; features action-oriented cases.
- 595 Advanced Topics in Engineering Management I V 1-3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 596 Advanced Topics in Engineering Management II 3** May be repeated for credit; cumulative maximum 9 hours. A wide range of current high-interest engineering management topics.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Teaching and Learning – Cultural Studies and Social Thought in Education

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 2

Graduate students: 27

Graduate students receiving assistantships or scholarships: 55%

Deadline: Fall: January 10

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The Cultural Studies and Social Thought in Education (CSSTE) Ph.D. option is a rigorous, flexible, and individually-tailored course of study that focuses on the issues of culture and power in the contemporary and historical contexts of education. Cultural studies includes popular culture and media, social justice, environment, ethics, aesthetics, race, ethnicity, gender, and social class, which are applied to a range of educational sub-fields that include literacy, educational leadership, teacher leadership, school reform, curriculum theory, higher education, science, art, special education, and bilingual/ELL (English Language Learners). The overall goal of the faculty is to articulate a cohesive and supportive community of educational scholarship and practice. While coursework is important, we work to establish a strong program of mentorship in which doctoral candidates are mentored into the world of research, knowledge generation and dissemination, and pedagogical and social action. We are committed to the idea that our scholarly endeavors stimulate positive change in schools and

the communities and society those schools serve. Education, whether it takes place in the formal settings of schools and museums or the informal contexts of home and the movie theater, is defined by its cultural context. Cultural studies take these cultural contexts as the essential starting point to build research projects and define teaching practices.

Post-Graduate Employment Opportunities

University faculty in cultural studies, social foundations, or related fields; administrator or researcher in a school district or state/national educational organization or non-profit or non-governmental organization.

Post-Graduate Career Placements

Assistant Professor, Eastern Washington University Academic Counselor, Eastern Washington University Assistant Professor, Northern Illinois University. Assistant Professor, University of Portland Assistant Professor, California State University at Stanislaus. Assistant Professor, Gonzaga University Climate Change Adaptation Coordinator for the Province of Alberta

Contact Information

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Faculty

Pamela Bettis and Paula Price.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.

- 562 Professional Issues in Student Affairs Administration 3**
Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDRES**
- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.

- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.
- Teaching And Learning**
- T & L**
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.

- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.

- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates "what we know" about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.

- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-Internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Curriculum and Instruction

Degree offered: Master of Arts in Education (Curriculum and Instruction)

Faculty working with graduate students: 6

Graduate students: 5

Deadline: Fall: January 10

Spring: July 1

Requirements

The Master of Arts (MA) degree is designed for students who desire to study and explore educational research. The MA degree is well suited for those students wishing to eventually pursue a doctoral degree or a research/leadership role in schools or organizations/agencies. The MA degree program consists of a minimum of 30 semester credit hours, 21 of which must be graded course work. Three research courses, three credits each, are a component of the 21 graded credits. A minimum of nine additional credits of T&L 700 (independent research work) are required and usually involve research/scholarship activities associated with the thesis and final oral examination. The purpose of the thesis is to demonstrate your understanding of educational research and theory. The thesis also demonstrates your ability to design and implement a research study, as well as analyze and synthesize the results of the study.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The Curriculum and Instruction specialization offers students

rigorous and individually tailored programs of study. The M.A. and Ed.M. degree programs are designed for students with bachelor degrees who have an interest in deepening their knowledge in a specific content area (in or outside the College of Education) as well as educational research in curriculum and instruction. The master's degree programs also emphasize applying research, theory, and evidence-based practices to improve education. This specialization is designed especially for teachers who wish to take courses in their teaching field as well as advanced coursework in teaching and learning.

Post-Graduate Employment Opportunities

Teachers, program coordinators

Post-Graduate Career Placements

Instructors Teachers

Contact Information

Office of Graduate Studies
 Washington State University - Pullman
 Cleveland Hall 252
 PO Box 642114
 Pullman, WA 99164-2114
 Telephone: 509-335-9195
 Fax: 509-335-2097
 E-mail: gradstudies@wsu.edu

Faculty

Tariq Akmal, Pamela Bettis, Janet Frost, Leslie Hall, Jo Olson and Paula Price.

ED AD

- 501 **Philosophy of Education 3** Development of American educational philosophy.
- 503 **Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 **Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 **Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 **Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 **Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 **Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 **Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 **Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 **Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 **Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 **Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 **Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 **Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 **Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 **Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 **Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 **Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 **Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 **Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 **Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 **Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 **Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 **Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.

- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.

- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- SP ED**
- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).

- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.

- 533 **Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 **Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 **Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 **Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 **Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 **Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 **Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 **Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 **Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 **Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 **Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning; set new goals; learn about National Board options.
- 544 **Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 **Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 **Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 **Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 **Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 **Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 **Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 **Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 **Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 **Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 **Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 **Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 **Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 **Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 **Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 **Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 **Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 **Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 **Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 **Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.

- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates "what we know" about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Curriculum and Instruction

Degree offered: Master of Education (Curriculum and Instruction)

Faculty working with graduate students: 6

Graduate students: 79

Program offered: Pullman, Spokane, Tri-Cities

Deadline: Fall: January 10

Spring: July 1

Requirements

The Master of Education (EdM) degree is designed for students wishing to extend their knowledge and skills in education, expand their content knowledge, and/or pursue leadership roles in schools and organizations/agencies. The EdM degree program consists of a minimum of 35 credits, 33 of which must be graded course work. A minimum of one, three credit research course and one, three credit foundations course must be included in the 33 graded credits. A minimum of 2 credits of T&L 702 are required and usually involve research/scholarship activities associated with the special project and final oral examination. The Special Project is a personal inquiry project that you design in collaboration with your advisor/committee chair and the members of your committee. The purpose of the project is to demonstrate your understanding of educational research and its applicability to practice in your field of study. In addition, it is a demonstration of your ability to understand, evaluate, and critique educational research.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The Curriculum and Instruction specialization offers students rigorous and individually tailored programs of study. The M.A. and Ed.M. degree programs are designed for students with bachelor degrees who have an interest in deepening their knowledge in a specific content area (in or outside the College of Education) as well as educational research in curriculum and instruction. The master's degree programs also emphasize applying research, theory, and evidence-based practices to improve education. This specialization is designed especially for teachers who wish to take courses in their teaching field as well as advanced coursework in teaching and learning.

Post-Graduate Employment Opportunities

Teachers, program coordinators

Post-Graduate Career Placements

Instructors Teachers

Contact Information

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Faculty

Tariq Akmal, Pamela Bettis, Janet Frost, Leslie Hall, Jo Olson
and Paula Price.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.

- 562 Professional Issues in Student Affairs Administration 3**
Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.

- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- SP ED**
- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).

- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.

- 533 **Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 **Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 **Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 **Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 **Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 **Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 **Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 **Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 **Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 **Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 **Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning; set new goals; learn about National Board options.
- 544 **Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 **Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 **Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 **Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 **Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 **Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 **Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 **Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 **Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 **Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 **Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 **Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 **Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 **Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 **Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 **Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 **Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 **Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 **Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 **Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.

- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.

- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – English Language Learners

Degree offered: Master of Arts in Education

Faculty working with graduate students: 3

Graduate students: 10

Deadline: Fall: January 10

Spring: July 1

Requirements

The purpose of the thesis is to demonstrate your understanding of educational research and theory. The thesis also demonstrates your ability to design and implement a research study, as well as analyze and synthesize the results of the study. The outcome of the thesis research should add to the body of research in the particular area. The final examination of the thesis is intended to explore your ability to integrate and interpret material in the major and supporting fields with emphasis on the work presented in the thesis. The thesis may utilize quantitative and/or qualitative research methods. With committee approval, the thesis may follow an alternate format. A thesis is designed to address a hypothesis or answer a researchable question. These hypotheses/questions should be specific, clear, and focused on some aspect of educational inquiry. The thesis includes a review of the pertinent literature related to the research hypothesis/question, a description of the methodology used to investigate the hypothesis/question, the results of the study, and a discussion of the results.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

WSU offers two Master's degree programs in English language learners (ELL) education. The non-thesis Ed.M. degree focuses on K-12. Its purpose is to develop teachers' or other professionals' knowledge and skills. The M.A. degree is designed for students who wish to focus on educational research in language and literacy and who may pursue a doctoral degree.

Contact Information

Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Joy Egbert, David Johnson and Thomas Salsbury.

STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 502 Theoretical Foundations of Learning and Instruction** 3 Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology** 3 Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods** 2 Methods, design, implementation, and application of results in classroom context.

- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.

- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.

- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
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- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.

- 540 Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.

- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – English Language Learners

Degree offered: Master of Education

Faculty working with graduate students: 6

Graduate students: 22

Program offered: Pullman, Tri-Cities, Vancouver

Deadline: Fall: January 10

Spring: July 1

Requirements

The Special Project is a personal inquiry project that you design in collaboration with your advisor/committee chair and the members of your committee. The purpose of the project is to demonstrate your understanding of educational research and its applicability to practice in your field of study. In addition, it is a demonstration of your ability to understand, evaluate, and critique educational research.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The non-thesis Ed.M. degree with a specialization in ELL/Bilingual Education focuses on developing teachers' or other professionals' knowledge and skills in working with culturally diverse students and communities. The required coursework emphasizes both theoretical and practical issues concerning language policies, second language acquisition, cultivating relationships with diverse communities and households, and the implementation of linguistically appropriate classroom teaching techniques. Candidates

for the Ed.M. with a specialization in ELL/Bilingual Education may also choose to complete the required coursework for an endorsement in English Language Learners (ELL) and Bilingual Education (BLE).

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Faculty

Joy Egbert, Gisela Ernst-Slavit, David Johnson, Eric Johnson, Tonda Liggett and Thomas Salsbury.

STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 502 Theoretical Foundations of Learning and Instruction** 3 Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology** 3 Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods** 2 Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I** 3 Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics** 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.

- 509 Educational Measurements: Test Development and Assessment V** 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V** 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.

- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.

- 508 Seminar in Literacy in Multicultural Settings II** 3 Course
Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education** 3 Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education** 3 Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics** 3 Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education** 3 For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education** 3 Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students** 3 Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning** 3 Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools** 2 (1-2) Course
Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum** 3 Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I** 3 Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations** V 1-4 May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education** V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education** V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar** V 2-3 Course
Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education** 3 Course
Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
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- 528 Literacy within the Disciplines** 3 Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education** 3 Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading** V 2-3 Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education** 3 Exploration of research frameworks and methodologies specific to mathematics and science education.
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- 539 Innovations in Language Arts** 3 The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies** 3 Course
Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.

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- 542 Teacher Professional Certification: Researching Exemplary Practices V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
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- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V** 2-3 Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
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- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.

- 575 Globalization and Identity in Education** 3 Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education** 3 Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory** 3 Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I** 3 Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II** 3 Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society** 3 Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science** 3 This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education** 3 Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science** 3 Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education** V 1-3 May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education** 3 Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research** 3 Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education** 3 Interdisciplinary research in race, identity and representations in education.
- 590 Internship** V 2-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education** 3 May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education** 3 Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar** 2 (1-3) Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum** 2 Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar** 10 (1-27) Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education** V 1-3 May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education** V 1-3 May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education** 1 May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination** V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Language, Literacy and Technology

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 4

Graduate students: 36

Deadline: Fall: January 10
Spring: July 1

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The Language, Literacy and Technology (LLT) program addresses issues of teaching, learning and the wide range of literacies as they play out in formal and informal learning contexts. The course of study for the Doctor of Philosophy specialization in LLT is rigorous, flexible and individually tailored. It includes a minimum of 52 graded credits plus minimum 20 dissertation hours (72 total hours).

Post-Graduate Employment Opportunities

Faculty at research universities, clinical faculty, central administrator at K-12 school district, administrator at state educational agency or non-governmental organization.

Post-Graduate Career Placements

Teacher, specialist, researcher, faculty member at a research university

Contact Information

Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Joy Egbert, David Johnson, Jane Kelley and Thomas Salsbury.

EDRES

- 562 Epistemology, Inquiry, and Representation** 3 Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research** 3 Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research** 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research** 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar** 1 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis** 3 Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography** 3 Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research** 3 Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research** 3 Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation** 3 Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education** 3 May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning** V 2-3 Instruction in sound assessment practices for preservice and inservice graduate students.

- 503 ESL Methods and Material for Secondary Content Teachers** 2 Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators** 3 Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8)** 2 Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management** 4 Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I** 3 Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II** 3 Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education** 3 Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education** 3 Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics** 3 Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education** 3 For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education** 3 Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students** 3 Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning** 3 Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools** 2 (1-2) Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum** 3 Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I** 3 Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V** 1-4 May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V** 2-3 Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education** 3 Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction** 1 May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines** 3 Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education** 3 Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V** 2-3 Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education** 3 Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum** 2 Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy** 3 Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking** 3 Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education** 3 Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education** 3 Historical and conceptual background of the field of cultural studies.

- 537 **Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 **Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 **Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 **Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 **Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 **Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 **Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning; set new goals; learn about National Board options.
- 544 **Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 **Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 **Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 **Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 **Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 **Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 **Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 **Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 **Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 **Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 **Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 **Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 **Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 **Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 **Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 **Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 **Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 **Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 **Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 **Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 **Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 **Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 **Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 **Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.

- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
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- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Literacy Education

Degree offered: Master of Arts in Education (Literacy)

Faculty working with graduate students: 7

Graduate students: 1

Deadline: Fall: January 10

Spring: July 1

Requirements

The Master of Arts (MA) degree is designed for students who desire to study and explore educational research. The MA degree is well suited for those students wishing to eventually pursue a doctoral degree or a research/leadership role in schools or organizations/agencies. The MA degree program consists of a minimum of 30 semester credit hours, 21 of which must be graded course work. Three research courses, three credits each, are a component of the 21 graded credits. A minimum of nine additional credits of T&L 700 (independent research work) are required and usually involve research/scholarship activities associated with the thesis and final oral examination. The purpose of the thesis is to demonstrate your understanding of educational research and theory. The thesis also demonstrates your ability to design and implement a research study, as well as analyze and synthesize the results of the study.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in

general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

WSU offers two Master's degree programs in literacy education. The non-thesis Ed.M. degree focuses on K-12. Its purpose is to develop teachers' or other professionals' knowledge and skills. The M.A. degree is designed for students who wish to focus on educational research in language and literacy and who may pursue a doctoral degree.

Post-Graduate Employment Opportunities

Teaching, educational specialist, K-12 administration

Post-Graduate Career Placements

Teacher, specialist

Contact Information

Office of Graduate Studies
Washington State University - Pullman
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Deanna Day-Wiff, Joy Egbert, David Johnson, Eric Johnson, Jane Kelley, Stephen Kucer and Thomas Salsbury.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V** 2-3 The application of theoretical concepts and approaches in the planning and design of curricula.

- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.

- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.

- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.

- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.

- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.

- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-Internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Literacy Education

Degree offered: Master of Education (Literacy)

Faculty working with graduate students: 7

Graduate students: 59

Program offered: Pullman, Tri-Cities, Vancouver

Deadline: Fall: January 10

Spring: July 1

Requirements

The Master of Education (EdM) degree is designed for students wishing to extend their knowledge and skills in education, expand their content knowledge, and/or pursue leadership roles in schools and organizations/agencies. The EdM degree program consists of a minimum of 35 credits, 33 of which must be graded course work. A minimum of one, three credit research course and one, three credit foundations course must be included in the 33 graded credits. A minimum of 2 credits of T&L 702 are required and usually involve research/scholarship activities associated with the special project and final oral examination. The Special Project is a personal inquiry project that you design in collaboration with your advisor/committee chair and the members of your committee. The purpose of the project is to demonstrate your understanding of educational research and its applicability to practice in your field of study. In addition, it is a demonstration of your ability to understand, evaluate, and critique educational research.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

WSU offers two Master's degree programs in literacy education. The non-thesis Ed.M. degree focuses on K-12. Its purpose is to develop teachers' or other professionals' knowledge and skills. The M.A. degree is designed for students who wish to focus on educational research in language and literacy and who may pursue a doctoral degree.

Post-Graduate Employment Opportunities

Teaching, educational specialist, K-12 administration

Post-Graduate Career Placements

Teacher, specialist

Contact Information

Office of Graduate Studies
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Faculty

Deanna Day-Wiff, Joy Egbert, David Johnson, Eric Johnson, Jane Kelley, Stephen Kucer and Thomas Salsbury.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.

- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.

- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

502 Theoretical Foundations of Learning and Instruction 3 Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.

503 Advanced Educational Psychology 3 Contemporary theories, models, and empirical research in educational psychology.

504 Classroom-focused Research Methods 2 Methods, design, implementation, and application of results in classroom context.

505 Research Methods I 3 Research methods; literature review; design, implementation, and interpretation of results.

508 Educational Statistics 3 Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.

509 Educational Measurements: Test Development and Assessment V 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.

510 Assessment of Learning 3 Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.

511 Classical and Modern Test Theory 3 Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.

521 Topics in Educational Psychology V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.

563 Principles of Research 3 The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

564 Qualitative Research 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

565 Quantitative Research 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).

568 Quasi-Experimental Design 3 Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.

569 Seminar in Quantitative Techniques in Education V 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.

570 Introduction to Program Evaluation 3 Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.

571 Advanced Program Evaluation 3 Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.

572 Introduction to Systematic Literature Reviews and Meta-Analyses 3 Introduction to the steps involved in conducting systematic reviews and meta-analyses.

573 Motivation Theories 3 Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.

574 Seminar in Educational Psychology 1 May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.

597 Educational Psychology Internship V 2-4 May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

501 Bilingual/ESL Education 3 May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.

502 Assessment for Teaching and Learning V 2-3 Instruction in sound assessment practices for preservice and inservice graduate students.

503 ESL Methods and Material for Secondary Content Teachers 2 Research-based ESL strategies and methods for pre-service and secondary content area teachers.

504 Advanced Study in Linguistics for Educators 3 Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.

505 ESL Methods for General Educators (K-8) 2 Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.

506 Multicultural Classroom Instruction and Management 4 Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.

507 Seminar in Literacy in Multicultural Settings I 3 Multicultural perspective to curriculum development and classroom literacy practices.

508 Seminar in Literacy in Multicultural Settings II 3 Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.

509 Research in Curriculum and Assessment for Bilingual/ESL Education 3 Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.

510 Theoretical Foundations of Bilingual/ESL Education 3 Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.

512 Language and Cultural Factors in Mathematics 3 Research and instructional strategies related to linguistic and cultural influences on learning math.

513 Seminar in Middle School Education 3 For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.

514 Methods and Materials for Bilingual/ESL Education 3 Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.

515 The Education of Cultural and Linguistic Minority Students 3 Issues in the education of language minority students.

516 Advanced Study in Computer-Assisted Language Learning 3 Research, theory, and practice in computer-assisted language learning.

517 Educational Technology in K-8 Schools 2 (1-2) Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.

518 Integrating Technology into the Curriculum 3 Examination and articulation of the potential for new technologies to expand learning opportunities.

519 Instructional Media Production I 3 Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.

520 Topics in Special Student Populations V 1-4 May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.

521 Topics in Education V 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.

522 Topics in Education V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.

523 Topics in Education V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.

524 Topics in Education V 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.

525 Classroom Management Seminar V 2-3 Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.

526 Research in Multicultural Education 3 Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.

527 Seminar in Teacher Education Instruction 1 May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.

528 Literacy within the Disciplines 3 Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.

529 Place-Based Education 3 Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.

- 530 **Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 **Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 **Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 **Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 **Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 **Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 **Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 **Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 **Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 **Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 **Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 **Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 **Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 **Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 **Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 **Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 **Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 **Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 **Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 **Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 **Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 **Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 **Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 **Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 **Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 **Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 **Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 **Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 **Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 **Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 **Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 **Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.

- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.

- 598 Research Seminar in Mathematics and Science Education 1**
May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The PhD. in Mathematics and Science Education is designed to develop scholars capable of making important contributions to the research base, professional context, and learning environments related to mathematics and science education. Areas of emphases can include student learning, teacher education, professional development, curriculum, and technology throughout the PK-16 grade spectrum.

Post-Graduate Employment Opportunities

University faculty Mathematics instruction (K-12 or post-secondary)

Post-Graduate Career Placements

Professor, private consultant, Teacher

Teaching and Learning – Mathematics Education

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 9

Graduate students: 4

Program offered: Pullman, Spokane, Tri-Cities, Vancouver

Tests required: GRE (Quantitative)

Deadline: Spring: July 1

Fall: November 1

Requirements

A set of approved courses in one of the following areas: Mathematics, a scientific discipline, cognition, instruction, curriculum, professional development, equity, diversity, technology, philosophy, or research.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer

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EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

MATH

- 500 Proseminar 1** May be repeated for credit; cumulative maximum 2 hours.
- 501 Real Analysis 3** Metric spaces, convergence, continuous functions, infinite series, differentiation and integration of functions of one and several variables. Required preparation must include advanced calculus or real analysis.
- 502 Introduction to Functional Analysis 3** Course Prerequisite: MATH 501. Normed linear spaces, Banach spaces, introduction to Hilbert space, linear operators. Required preparation: Advanced linear algebra.
- 503 Complex Analysis 3** Course Prerequisite: MATH 501. Analytic functions, complex integration, Taylor and Laurent series, conformal mapping, Riemann surfaces and analytic continuation.
- 504 Measure and Integration 3** Course Prerequisite: MATH 501. Lebesgue measure, Lebesgue integration, differentiation, L spaces, general measure and integration, Radon-Nikodym Theorem, outer measure and product measures.
- 505 Abstract Algebra 3** Groups, rings, fields, and homological algebra. Required preparation must include abstract algebra.
- 507 Advanced Theory of Numbers 3** May be repeated for credit; cumulative maximum 6 hours. Analytic and algebraic number theory.

- 508 Topics in Applied Analysis 3** Course Prerequisite: MATH 502. Advanced treatment of applications using techniques from fundamental analysis, convexity, analytic function theory, asymptotics, and differential equations.
- 511 Advanced Linear Algebra 3** Vector spaces, inner products, unitary equivalence, similarity, Jordan forms, normality, spectral theory, singular value decomposition, norms and inequalities. Required preparation must include advanced linear algebra.
- 512 Ordinary Differential Equations 3** Existence of solutions; linear systems; qualitative behavior, especially stability; periodic solutions. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 516 Simulation Methods 3** Model formulation and simulation in business, industry, and government; simulation languages; analysis of simulation output; applications. Credit not granted for both MATH 416 and MATH 516. Required preparation must include probability and statistics and programming experience.
- 525 General Topology 3** Sets, metric spaces, topological spaces; continuous mappings, compactness, connectedness, local properties, function spaces, and fundamental groups. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 531 Intersections of Culture and Mathematics 3** Gender/race/ethnicity differences; social consequences; cultural influences on development and learning of mathematics; role of women, people of color in mathematics. Credit not granted for both MATH 431 and MATH 531.
- 532 Mathematics for College and Secondary Teachers 3** Course Prerequisite: By instructor permission. Pre-algebra, algebra functions and geometry examined from an advanced perspective, for secondary and lower level college teachers. Credit not granted for both MATH 432 and MATH 532.
- 533 Teaching College Mathematics 1** May be repeated for credit; cumulative maximum 3 hours. Course Prerequisite: Graduate standing in Mathematics. Theory and practice of mathematics instruction at the collegiate level.
- 534 Theories of Learning in Mathematics 3** Math learning theories, including behaviorism, information processing, constructivism, situated cognition, communities of practice; influence on teaching and learning mathematics.
- 535 Research Paradigms in Mathematics Education 3** Course Prerequisite: MATH 534. Current research paradigms in math education research; critique research designs used in current mathematics education research article; design and carry out a research project.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 540 Applied Mathematics I 3** Partial differential equations; Fourier series and integrals; Bessel functions; calculus of variations; vector calculus; applications. Credit not granted for both MATH 440 and MATH 540. Required preparation must include differential equations.
- 541 Applied Mathematics II 3** Complex variable theory including analytic functions, infinite series, residues, and conformal mapping; Laplace transforms; applications. Credit not granted for both MATH 441 and MATH 541. Required preparation must include differential equations.
- 543 Approximation Theory 3** Univariate polynomial and rational approximation techniques; approximation using splines and wavelets; selected topics in multivariate approximation; algorithms for approximation. Required preparation must include numerical analysis.
- 544 Advanced Matrix Computations 3** Advanced topics in the solution of linear systems and eigenvalue problems, including parallel matrix computations. (Cross-listed course offered as MATH 544, CPT S 531). Required preparation must include numerical analysis. Required preparation must include numerical analysis.
- 545 Numerical Analysis of Evolution Equations 3** Discretization and numerical solution of partial differential equations of evolution; stability, consistency, and convergence; shocks; conservation of forms. Required preparation must include numerical analysis.
- 546 Numerical Analysis of Elliptic PDEs 3** Methods of discretizing elliptic partial differential equations and solving the resulting systems of equations; error analysis. Required preparation must include numerical analysis.
- 548 Numerical Analysis 3** Fundamentals of numerical computation; finding zeroes of functions, approximation and interpolation; numerical integration (quadrature); numerical solution of ordinary differential equations. (Cross-listed course offered as MATH 448, CPT S 430, CPT S 530). Required preparation must include differential equations and a programming course.
- 553 Graph Theory 3** Graphs and their applications, directed graphs, trees, networks, Eulerian and Hamiltonian paths, matrix representations, construction of algorithms. (Cross-listed course offered as MATH 453, CPT S 453). Required preparation must include linear algebra. Required preparation must include linear algebra.
- 555 Topics in Combinatorics 3** May be repeated for credit; cumulative maximum 6 hours. Combinatorics, generating functions, recurrence relations, inclusion-exclusion, coding theory; experimental design, graph theory.
- 560 Partial Differential Equations I 3** Partial differential equations and other functional equations: general theory, methods of solution, applications. Required preparation must include a year-long sequence in advanced calculus or real analysis.
- 561 Partial Differential Equations II 3** Course Prerequisite: MATH 560. Continuation of MATH 560.
- 563 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.

- 564 Nonlinear Optimization I** 3 Theory and algorithms for unconstrained nonlinear optimization problems, including line search, trust region, conjugate gradient, Newton and quasi-Newton methods. Required preparation must include advanced multivariate calculus, and a programming language. Recommended preparation: MATH 464, 544.
- 565 Nonlinear Optimization II** 3 Course Prerequisite: MATH 564. Theory and algorithms for constrained linear and nonlinear optimization including interior point, quadratic programming, penalty, barrier and augmented Lagrangian methods.
- 566 Optimization in Networks** 3 Formulation and solution of network optimization problems including shortest path, maximal flow, minimum cost flow, assignment, covering, postman, and salesman. Credit not granted for both MATH 466 and MATH 566. Required preparation must include linear programming.
- 567 Integer and Combinatorial Optimization** 3 Theory and applications of integer and combinatorial optimization including enumerative, cutting plane, basis reduction, relaxation and matching methods. Required preparation must include linear optimization.
- 568 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 569 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 570 Mathematical Foundations of Continuum Mechanics I** 3 The basic mathematical theory of continuum mechanics and its relation to perturbation techniques and stability methods. Required preparation must include differential equations and advanced calculus or real analysis.
- 571 Mathematical Foundations of Continuum Mechanics II** 3 Course Prerequisite: MATH 570. Continuation of MATH 570.
- 574 Topics in Optimization** 3 May be repeated for credit; cumulative maximum 12 hours. Advanced topics in the theory and computing methodology in optimization with emphasis on real-life algorithmic implementations. Required preparation must include advanced multivariable calculus and a programming language.
- 575 Asset Pricing in Financial Engineering** 3 Mathematical methods for various models on valuation of stocks and options, with rigorous mathematical analysis on pricing and hedging techniques. Recommended preparation: Advanced calculus and some knowledge on differential equations.
- 576 Quantitative Risk Management** 3 Fundamental concepts in modern risk theory and mathematical methods in quantitative risk management; coherent risk measures, volatility modeling, multivariate dependence analysis using copulas, risk aggregation and allocation, and extreme value theory.
- 579 Mathematical Modeling in the Biological and Health Sciences** 3 Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Topics in Mathematics V** 1-3 May be repeated for credit. Topics in mathematics.
- 583 Topics in Applied Mathematics V** 1-3 May be repeated for credit. Topics in applied mathematics.
- 586 Mathematical Modeling in the Natural Science** 3 Development of mathematical models for solutions of problems in the physical and life sciences. Credit not granted for both MATH 486 and MATH 586. Required preparation must include differential equations.
- 590 Topics in Mathematics Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Topics in mathematics education.
- 597 Mathematics Instruction Seminar** 1 May be repeated for credit; cumulative maximum 5 hours. Introduction to the teaching of university mathematics.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education** 3 May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V** 2-3 Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers** 2 Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators** 3 Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.

- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.

- 539 **Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 **Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 **Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 **Teacher Professional Certification: Researching Exemplary Practices V 1-3** May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 **Teacher Professional Certification: Culminating Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 **Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 **Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 **Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 **Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 **Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 **Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 **Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 **Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 **Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 **Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 **Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 **Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 **Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 **Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 **Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 **Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 **Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 **Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 **Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 **Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 **Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 **Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 **Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 **Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 **Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 **Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.

- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Special Education

Degree offered: Doctor of Philosophy (Education)

Faculty working with graduate students: 4

Graduate students: 12

Deadline: Fall: January 10

Spring: July 1

Requirements

There are many courses offered in the department, college, and university that you can use and your Program of Study. Beyond the requirements, your Program of Study can be individualized to address your interests and needs. You develop your Program of Study with your advisor/committee chair and other committee members' suggestions, and ultimately their approval.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The Doctor of Philosophy (Ph.D.) prepares graduates for academic positions in research and teaching. The program in special education includes the study of response to intervention across the curriculum, diversity issues, social development and school based prevention practices for students with social and behavioral adjustment problems, universal design, and single subject design in addition to the comprehensive Carnegie core of research courses in quantitative, qualitative and program evaluation research methods. The faculty support a strong program of mentorship and encourage doctoral students to work

closely with faculty of their choosing in investigating the world of research, knowledge generation and dissemination, pedagogical action and advocacy.

Post-Graduate Employment Opportunities

Faculty at a research university, clinical faculty, central administrator at K-12 school district, administrator at state educational agency.

Post-Graduate Career Placements

Teacher, faculty member at a research university

Contact Information

Office of Graduate Studies
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Cleveland Hall 252
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Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Faculty

Susan Banks, Michael Dunn, Darcy Miller and Paulette Mills.

EDRES

562 Epistemology, Inquiry, and Representation 3 Course Pre-requisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.

563 Principles of Research 3 Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).

564 Qualitative Research 3 Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

565 Quantitative Research 3 Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).

566 Research Seminar 1 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.

567 Discourse Analysis 3 Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.

568 Critical Ethnography 3 Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.

- 569 Arts-Informed Perspectives in Educational Research 3**
Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.
- SP ED**
- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).
- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.

- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Special Education

Degree offered: Master of Arts in Education (Special Education)

Faculty working with graduate students: 6

Graduate students: 6

Deadline: Fall: January 10

Requirements

The Master of Arts (MA) degree is designed for students who desire to study and explore educational research. The MA degree is well suited for those students wishing to eventually pursue a doctoral degree or a research/leadership role in schools or organizations/agencies. The MA degree program consists of a minimum of 30 semester credit hours, 21 of which must be graded course work. Three research courses, three credits each, are a component of the 21 graded credits. A minimum of nine additional credits of T&L 700 (independent research work) are required and usually involve research/scholarship activities associated with the thesis and final oral examination. The purpose of the thesis is to demonstrate your understanding of educational research and theory. The thesis also demonstrates your ability to design and implement a research study, as well as analyze and synthesize the results of the study.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The College of Education offers two master's degrees and a doctoral degree with specializations in special education. The M.A. degree requires a thesis, while the Ed.M. degree requires a special project, both of which are research focused. The M.A. is designed for students who will potentially enter a doctoral program or who desire to focus on educational research, as opposed to application of educational strategies. The Ed.M. allows students to study a variety of education-related areas within structured coursework. A specific set of coursework also can lead to a supporting endorsement in special education. Although students enroll in research courses and engage in research endeavors, the emphasis in this degree option is on application of educational research strategies in schools settings.

Post-Graduate Employment Opportunities

Teaching, educational specialist, K-12 administration

Post-Graduate Career Placements

Teacher

Contact Information

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Faculty

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ED AD

- 501 **Philosophy of Education 3** Development of American educational philosophy.
- 503 **Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 **Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 **Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 **Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 **Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 **Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 **Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 **Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 **Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 **Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 **Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 **Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 **Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 **Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 **Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 **Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 **Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 **Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 **Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 **Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 **Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 **Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 **Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 **Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 **Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 **Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 **Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 **Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 **College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 **History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 **Issues in Higher Education 3** Selected contemporary issues in higher education.

- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction; application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).

- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- SP ED**
- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).
- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.

- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Teaching And Learning**
- T & L**
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.

- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2) Course** Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3 Course** Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3 Course** Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3 Course** Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.

- 542 Teacher Professional Certification: Researching Exemplary Practices V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V** 2-3 Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4** (3-3) Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.

- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Special Education

Degree offered: Master of Education (Special Education)

Faculty working with graduate students: 6

Graduate students: 33

Program offered: Pullman, Vancouver

Deadline: Fall: January 10

Requirements

The Master of Education (EdM) degree is designed for students wishing to extend their knowledge and skills in education, expand their content knowledge, and/or pursue leadership roles in schools and organizations/agencies. The EdM degree program consists of a minimum of 35 credits, 33 of which must be graded course work. A minimum of one, three credit research course and one, three credit foundations course must be included in the 33 graded credits. A minimum of 2 credits of T&L 702 are required and usually involve research/scholarship activities associated with the special project and final oral examination. The Special Project is a personal inquiry project that you design in collaboration with your advisor/committee chair and the members of your committee. The purpose of the project is to demonstrate your understanding of educational research and its applicability to practice in your field of study. In addition, it is a demonstration of your ability to understand, evaluate, and critique educational research. 4000 Character Limit.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The College of Education offers two master's degrees and a doctoral degree with specializations in special education. The M.A. degree requires a thesis, while the Ed.M. degree requires a special project, both of which are research focused. The M.A. is designed for students who will potentially enter a doctoral program or who desire to focus on educational research, as opposed to application of educational strategies. The Ed.M. allows students to study a variety of education-related areas within structured coursework. A specific set of coursework also can lead to a supporting endorsement in special education. Although students enroll in research courses and engage in research endeavors, the emphasis in this degree option is on application

of educational research strategies in schools settings.

Post-Graduate Employment Opportunities

Teaching, educational specialist, K-12 administration

Post-Graduate Career Placements

Teacher

Contact Information

Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
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Jill Homme
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E-mail: jhomme22@vancouver.wsu.edu

Faculty

Susan Banks, June Canty, Michael Dunn, Darcy Miller, Paulette Mills and Tamara Nelson.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.
- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.

- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.
- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.

- 587 Seminar in School Administration V** 1-6 May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V** 1-6 May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- EDPSY**
- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V** 2-3 Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V** 2-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.
- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.

- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- SP ED**
- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).
- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.

- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.

- 517 Educational Technology in K-8 Schools 2** (1-2) Course
Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V** 1-4 May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V** 1-4 May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V** 2-3 Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V** 2-3 Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
- 542 Teacher Professional Certification: Researching Exemplary Practices V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning; set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.

- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V 2-3** Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.
- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.

- 581 Learning and Development in Mathematics and Science 3**
This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3**
Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3**
Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3**
May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3**
Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3**
Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3**
Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6**
May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3**
May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3**
Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)**
Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2**
Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)**
Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3**
May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3**
May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1**
May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18**
May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18**
May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18**
May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18**
May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Teacher Leadership

Degree offered: Doctor of Education

Faculty working with graduate students: 6

Graduate students: 22

Program offered: Pullman, Spokane, Tri-Cities, Vancouver

Deadline: Fall: January 10

Requirements

The required Program of Study for the EdD consists of a minimum of 72 credits including course work in: the foundations of education, advanced research, a teacher leadership core, preliminary examination, and dissertation research. The Program of Study must include a minimum of 42 credits of graded course work and at least 2- credits of dissertation research (T&L 800). The remaining credits may be graded or non-graded course work credits relevant to the student's area of interest in such areas as Mathematics and Science Education; Special Education; Language, Literacy and Technology; and Cultural Studies and Social Thought in Education.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in

education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

One of the strands in the Washington State University statewide EdD, the specialization in Teacher Leadership is designed to develop K-12 teachers and teacher leaders for intellectual and practical leadership within classrooms, schools, districts, and the larger educational policy arena. The program is built on an inquiry stance where students draw from theory, research, and practical experiences to investigate local and statewide problems of teaching and learning. Goals for students include generation of applicable knowledge as well as practical recommendations and solutions for complex problems, including those related to equity and diversity. Coursework will be centered on a series of collaborative and individual projects that build from critical examination of participants' work and contexts. Program participants will broaden their capacity for instructional and programmatic leadership in both informal and formal roles within schools, districts, and educational communities.

Post-Graduate Employment Opportunities

Positions as administrative and instructional leaders in educational institutions or related organizations (e.g., faculty/staff developer, curriculum director, teacher leader).

Contact Information

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Faculty

Gisela Ernst-Slavit, Janet Frost, Eric Johnson, Tonda Liggett, Paula Price and Richard Sawyer.

ED AD

- 501 Philosophy of Education 3** Development of American educational philosophy.
- 503 Values and Ethics for Educational Leaders 3** Study of ethical theories, the moral dilemmas of public schooling, and the skills of ethical reasoning; professional code of ethics.
- 506 Social Context of Education 2** The interpretation of social context issues including historical, legal and cultural factors as these influence policies and practice in education.
- 507 Social Foundations of Education 3** Educational adaptations to the economic and social trends and forces.
- 510 Improvement of Instruction 3** Analysis and evaluation of instructional models with emphasis on information processing; implications for changing teaching style.

- 512 Leadership Studies for Social Justice 3** Leadership theories and approaches including present educational problems, leadership theories, and perspectives.
- 513 Organizational Behavior 3** Human behavior within various social and cultural organizational settings.
- 514 Basic Principles of Curriculum Design V 2-3** The application of theoretical concepts and approaches in the planning and design of curricula.
- 515 Curriculum Implementation 3** Research and practice; innovation and change in curricular organization emphasizing implementation.
- 516 Instructional and Curricular Leadership V 2-3** Theory, research, and practice of providing instructional and curricular leadership in schools and other educational settings.
- 518 Media Literacy and Educational Technology 3** Relates research and theory of media literacy to instructional resources and current leadership practices; problems of planning and administering programs.
- 520 Seminar in Curriculum and Instruction V 2-3** Contemporary issues, analyses and developments of educational programs.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and /or applications in selected areas of education.
- 531 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 532 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 534 Special Topics 1** May be repeated for credit; cumulative maximum 3 hours. Topical issues in education responding to shifting demands and skills needed by parents, teachers, school administrators and community leaders.
- 536 Introduction to Qualitative Research in Education 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to the theory and methods of qualitative research; field relations, data collections, data analysis, hypothesis development, and theory generation.
- 537 Advanced Qualitative Research in Education 3** Course Prerequisite: ED RES 564 or ED AD 536. Advanced theory and methods of qualitative research; theoretical foundations, data collection and analysis, and reporting.
- 538 Special Topics in Qualitative Research in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 564 or ED AD 536.
- 539 Applied Research for Educational Leaders 3** Integrates the principles, skills, and tools of research into the leadership and managerial practices of educational leaders.
- 560 Student Personnel Services in Higher Education V 2-3** Philosophy, structure, functions, and organization of student affairs administration.
- 561 Introduction to College Student Development 3** Student development theory, related research and the application of theory to practice in student affairs work.
- 562 Professional Issues in Student Affairs Administration 3** Course Prerequisite: ED AD 560; ED AD 561. The organization, programs and professional issues related to selected student affairs programs and units.
- 563 Research in College Student Development 3** Course Prerequisite: ED AD 561; admission to EdD program. Critique, understand, and apply college social identity models as they relate to teaching, advising, and working with diverse student populations.
- 565 Practicum in Higher Education 3 (0-9)** Course Prerequisite: Graduate student with 15 hours of completed course work in TCH LRN, ED AD, ED PSYCH, or ED RES courses. Selected supervised experiences in general higher education and student affairs settings provide for the investigation/application of theory/methods gained through formal course work.
- 567 Diversity in Higher Education 3** Reflection on experience and examination of the theory of practice or organizational leadership in the context of diversity.
- 568 Finance and Budgeting in Higher Education 3** Course Prerequisite: By instructor permission. Exposes students to the fundamentals of higher education budgeting and finance.
- 570 Community and Technical Colleges 3** For teachers and administrators. Development and function of community and technical colleges.
- 571 College Teaching 3** Concepts, principles, issues, and procedures in college curriculum development, and college teaching.
- 572 History of Higher Education 3** History, philosophy, objectives, and issues of colleges and universities as social institutions.
- 573 Issues in Higher Education 3** Selected contemporary issues in higher education.
- 578 Higher Education Law and Ethics 3** Legal and ethical aspects of higher education with special reference to administrators, faculty, and students in higher education institutions.
- 579 Administration of Higher Education 3** Organization, administration and leadership of universities, colleges, and community colleges.
- 580 School Organization and Administration 3** Readings and discussions on the theories and practices of school organization and administration.
- 581 Politics in Education 3** Examining the intrapersonal, organizational politics and political dilemma, particularly as they pertain to marginalized groups.
- 582 Policy Formation and Analysis in Education 3** Political and organizational policy formation processes in educational organizations; policy analysis in education.

- 583 Community and Communications 3** Social, political, and economic relationships between education and the community; methods of public polling and campaign strategy techniques.
- 584 Human Resource Management 3** Human relations in education; problems involved and practical solutions considered.
- 585 Financial Management in Education 3** Economics and financing of education; financial planning, budget development, investment analysis, bonding, cost effectiveness; current trends in educational finance.
- 587 Seminar in School Administration V 1-6** May be repeated for credit; cumulative maximum 6 hours. Interdisciplinary seminars; related studies; discussions in several areas by specialists.
- 588 The Law and Education 3** Fundamental legal principles within which public education functions; applicable school codes of Washington and other states; review important court cases.
- 589 Leadership Development Seminar 3** Improving knowledge and skills in strategic planning, decision making, leadership issues, conflict, motivation, staff development, productivity, and stress.
- 590 Internship V 1-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Internship in professional positions.
- 596 Preparing Grant Proposals 3** Identification of funding sources; analysis, evaluation, and production of grant proposals.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

EDPSY

- 502 Theoretical Foundations of Learning and Instruction 3** Historical and contemporary theories of learning and instruction: application of theory in counseling and teaching settings.
- 503 Advanced Educational Psychology 3** Contemporary theories, models, and empirical research in educational psychology.
- 504 Classroom-focused Research Methods 2** Methods, design, implementation, and application of results in classroom context.
- 505 Research Methods I 3** Research methods; literature review; design, implementation, and interpretation of results.
- 508 Educational Statistics 3** Introductory course for graduate students in applied statistics for the behavioral sciences. Recommended preparation: ED PSYCH 505.
- 509 Educational Measurements: Test Development and Assessment V 2-3** Theory and use of standardized educational measurement instruments; intelligence, aptitude, and achievement tests; measurement of outcomes.
- 510 Assessment of Learning 3** Assessment of student learning, school and district evaluation; particularly appropriate for school administrators.
- 511 Classical and Modern Test Theory 3** Course Prerequisite: ED PSYCH 508; ED PSYCH 509. Large-scale educational assessment and test development and evaluation; history and policy uses of achievement tests.
- 521 Topics in Educational Psychology V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of educational psychology.
- 563 Principles of Research 3** The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 568 Quasi-Experimental Design 3** Course Prerequisite: ED PSYCH 505; ED RES 565. Integration and application of research skills in writing proposals, dissertations, papers for publication; interpreting, critiquing, and synthesizing research studies.
- 569 Seminar in Quantitative Techniques in Education V 2-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: ED RES 565. Application of parametric and nonparametric statistics, data processing using computer packages in educational research.

- 570 Introduction to Program Evaluation 3** Course Prerequisite: ED PSYCH 505 or ED RES 563. Introduction to strategies and techniques for evaluation of educational and social programs.
- 571 Advanced Program Evaluation 3** Course Prerequisite: ED PSYCH 570. Advanced methods and techniques of program evaluation.
- 572 Introduction to Systematic Literature Reviews and Meta-Analyses 3** Introduction to the steps involved in conducting systematic reviews and meta-analyses.
- 573 Motivation Theories 3** Antecedents, consequences, and processes of motivated behavior examined from theoretical, empirical, and applied perspectives.
- 574 Seminar in Educational Psychology 1** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: Graduate student in Educational Psychology. Reading and discussion of papers in the educational psychology literature and the presentation of student's work.
- 597 Educational Psychology Internship V 2-4** May be repeated for credit; cumulative maximum 8 hours. Supervised internship experience in educational psychology, measurement and evaluation.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 563 Principles of Research 3** Course Prerequisite: COUN PSY 501, ED RES 562, or admission to EdD program. The centrality of literature review and the understanding of methods used in educational research; practice in designing research questions. (Cross-listed course offered as ED RES 563, ED PSYCH 563).
- 564 Qualitative Research 3** Course Prerequisite: ED RES 563. Theoretical underpinnings of qualitative research; familiarity with published qualitative research in education; practical research skills. (Cross-listed course offered as ED RES 564, ED PSYCH 564).
- 565 Quantitative Research 3** Course Prerequisite: ED PSYCH 508; ED RES 563. Statistical literacy in educational research; parametric and non-parametric methods. (Cross-listed course offered as ED RES 565, ED PSYCH 565).
- 566 Research Seminar 1** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Doctoral standing in Education. Presentation and analysis of research; professional development in research presentation.
- 567 Discourse Analysis 3** Course Prerequisite: ED RES 562; ED RES 564. Examination of and preparation for discourse analysis research approach.
- 568 Critical Ethnography 3** Course Prerequisite: ED RES 562; ED RES 564. In-depth focus on issues in qualitative research and ethnography and critical ethnography.
- 569 Arts-Informed Perspectives in Educational Research 3** Course Prerequisite: ED RES 562; ED RES 564. Exploration and application of alternative forms of qualitative research and representation through the arts.
- 570 Action Research 3** Philosophical assumptions and methodological strategies of action research; theoretical and practical foundations for conducting action research studies in schools and other organizations.
- 571 Doctoral Dissertation Preparation 3** Conceptualization and development of a structured dissertation prospectus; socializes students to academic culture.

SP ED

- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).

EDRES

- 562 Epistemology, Inquiry, and Representation 3** Course Prerequisite: Doctoral standing in education; ED PSYCH 505 or concurrent enrollment. Epistemological assumptions and methodological strategies of research.

- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching And Learning

T & L

- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.

- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
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- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
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- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.
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- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
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- 553 Assessment and Instruction for Reading: K-8 4 (3-3)** Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
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- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
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- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
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- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
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- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.

- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Teaching (elementary)

Degree offered: Master in Teaching

Faculty working with graduate students: 18

Graduate students: 50

Program offered: Pullman, Spokane, Vancouver

Deadline: Summer: November 15

Requirements

The Master in Teaching program is based on national teaching standards (i.e., NCATE, INTASC), state accreditation codes, and research-based effective practices. The curriculum is designed to provide students with a foundation of knowledge in the first summer, and build on that foundation throughout the next two semesters by linking course work to teaching practice in the schools. The goal of the MIT program is to provide learning opportunities for students to acquire the critical skills and abilities needed to become effective teachers and to provide opportunities for reflective practice and inquiry.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree

from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The MIT is intended for those who possess a bachelor's degree in a field other than education and is designed to prepare students to become effective elementary or secondary education teachers. This program of study leads to a master's degree and a State of Washington elementary or secondary education teaching certificate. The MIT degree is available to students the Pullman, Spokane, and Vancouver campuses; however the programs differ slightly from campus to campus. The programs at the Vancouver campus consist of 15 months of intensive study and internships. The program on the Pullman/Spokane campuses consists of 13 months of intensive study and internships to complete teacher certification with additional time to complete the Master's project. All of the MIT programs are cohort-based, forming a supportive network. The program consists of a wide range of pedagogy course work. Depending on the student's focus (elementary or secondary education), these courses may include literacy, social studies, science, math, reading, health, fitness, or fine arts methods. Students also study diversity in schools and society, educational technology, the social context of education, and research-based effective practices. When successfully completed, the MIT program results in a master's degree and teacher certification. Therefore all MIT students complete both certification and graduate research courses. All MIT students complete a research project and present the project results at the culmination of their program. The research projects are usually aimed at examining teaching and educational issues, with the focus on understanding the positive impact of education on student learning.

Post-Graduate Employment Opportunities

Elementary Education Teacher School/Curriculum Leadership Positions Agency Services Positions

Post-Graduate Career Placements

Elementary Education Director of Preschool Programs

Contact Information

Office of Graduate Studies
Washington State University
Cleveland Hall 252
PO Box 642114
Pullman, WA 99164-2114
Telephone: 509-335-9195
Fax: 509-335-2097
E-mail: gradstudies@wsu.edu

Elizabeth Benner
MIT Program Coordinator
Washington State University - Vancouver
VUB, Room 307
14204 NE Salmon Creek Avenue
Vancouver, WA 98686
Telephone: (360) 546-9673
Fax: (360) 546-9040
E-mail: elizabeth.benner@vancouver.wsu.edu

Faculty

Tariq Akmal, Susan Banks, Pamela Bettis, Michael Dunn, Joy Egbert, Gisela Ernst-Slavit, Janet Frost, Leslie Hall, Michael Hayes, Leslie Huff, David Johnson, Eric Johnson, Tonda Liggett, Darcy Miller, Paulette Mills, Jo Olson, Paula Price and Thomas Salsbury.

SP ED

- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).
- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.
- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.

- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Teaching And Learning**
- T & L**
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.
- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2)** Course Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.

- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3** Course Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3** Course Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
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- 574 **Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
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- 585 **Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.

- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Teaching and Learning – Teaching (secondary)

Degree offered: Master in Teaching (Secondary)

Faculty working with graduate students: 19

Graduate students: 79

Program offered: Pullman, Spokane, Vancouver

Deadline: Summer: November 15

Requirements

The Master in Teaching program is based on national teaching standards (i.e., NCATE, INTASC), state accreditation codes, and research-based effective practices. The curriculum is designed to provide students with a foundation of knowledge in the first summer, and build on that foundation throughout the next two semesters by linking course work to teaching practice in the schools. The goal of the MIT program is to provide learning opportunities for students to acquire the critical skills and abilities needed to become effective teachers and to provide opportunities for reflective practice and inquiry.

Program Description

Our mission is to advance knowledge and ethical practice in the field of education. We do so through collaboration among universities, schools, families, and local, regional and global communities in a manner that reflects the ideals of democracy, social justice, and ecological sustainability. In brief, we offer teacher certification in elementary education (Bachelor of Arts in education, master in teaching) and secondary education (degree from major plus certification, master in teaching), and additional endorsements. We also offer professional certification, as well as a master of education (Ed.M.) and Master of Arts in education (M.A.) degrees. At the doctoral level, we offer two Pullman-based degrees. Those are the doctor of education (Ed.D.) in teacher leadership and the doctor of philosophy (Ph.D.) in education with specializations in cultural studies and social thought in education, language and literacy education, and special education. The research of our faculty contributes knowledge to our undergraduate and graduate programs and to the field of education in general. Our programs rely heavily on research-based, theoretical frameworks and the close connections we maintain with classroom teachers and other practitioners. We stress active engagement, critical problem-solving, and equity/fairness for all learners.

Degree Description

The MIT is intended for those who possess a bachelor's degree in a field other than education and is designed to prepare students to become effective elementary or secondary education teachers. This program of study leads to a master's degree and a State of Washington elementary or secondary education teaching certificate. The MIT degree is available to students the Pullman, Spokane, and Vancouver campuses; however the programs differ slightly from campus to campus. The programs at the Vancouver campus consist of 15 months of intensive study and internships. The program on the Pullman/Spokane campuses consists of 13 months of intensive study and internships to complete teacher certification with additional time to complete the Master's project. All of the MIT programs are cohort-based, forming a supportive network. The program consists of a wide range of pedagogy course work. Depending on the student's focus (elementary or secondary education), these courses may include literacy, social studies, science, math, reading, health, fitness, or fine arts methods. Students also study diversity in schools and society, educational technology, the social context of education, and research-based effective practices. When successfully completed, the MIT program results in a master's degree and teacher certification. Therefore all MIT students complete both certification and graduate research courses. All MIT students complete a research project and present the project results at the culmination of their program. The research projects are usually aimed at examining teaching and educational issues, with the focus on understanding the positive impact of education on student learning.

Post-Graduate Employment Opportunities

Secondary Education Teacher School/Curriculum Leadership Positions Agency Services Positions

Post-Graduate Career Placements

Secondary Education Director of Preschool Programs

Contact Information

Office of Graduate Studies
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Telephone: 509-335-9195
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Faculty

Tariq Akmal, Susan Banks, Pamela Bettis, Michael Dunn, Joy Egbert, Gisela Ernst-Slavit, Janet Frost, Leslie Hall, Michael Hayes, Leslie Huff, David Johnson, Eric Johnson, Jane Kelley, Tonda Liggett, Darcy Miller, Paulette Mills, Jo Olson, Paula Price and Thomas Salsbury.

SP ED

- 501 Teaching Students with Disabilities 3** Intervention and instructional strategies for managing academic, social, and behavior problems in classroom settings. Credit not granted for both SPEC ED 401 and SPEC ED 501. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 502 Assessment and Curriculum for Students with Disabilities 3** Methods of individual and group, formal and informal assessment for students with disabilities. Credit not granted for both SPEC ED 402 and SPEC ED 502. Graduate level required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; concurrent enrollment SPEC ED 590 (2 credits).
- 503 Secondary Education for Students with Disabilities 3** Overview of instruction and intervention strategies for secondary students with disabilities; assessment, and curriculum/program development. Credit not granted for both SPEC ED 403 and SPEC ED 503. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504; or permission of instructor.
- 504 Professional Skills in Special Education 3** Legal aspects of special education, individualized education plans, roles and responsibilities of teachers, collaboration techniques, service delivery/design, and supervision of paraprofessionals. Credit not granted for both SPEC ED 404 and SPEC ED 504. Required preparation must include completion of an introductory special education course, SPEC ED 520.
- 509 Early Childhood Special Education 3** Assessment, curriculum, and instructional techniques for teaching young children with handicaps and their families in a variety of settings. Credit not granted for both SPEC ED 409 and SPEC ED 509. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 520 Teaching in Inclusive Classrooms V 2-3** Designed for preservice/in-service general education (K-12) teachers to learn how to teach students with disabilities. Credit not granted for both SPEC ED 420 and SPEC ED 520.
- 521 Inclusion Strategies for Special Education Teachers 3** Roles and responsibilities of special education professionals in inclusion programs, including legal aspects and collaboration. Credit not granted for both SPEC ED 421 and SPEC ED 521. Required preparation must include completion of an introductory special education course, or SPEC ED 520; SPEC ED 504.

- 522 Topics in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Recent research developments, issues and/or applications in selected areas of special education.
- 540 Methods in Intensive Educational Supports 3** Assessment, curriculum development and modification, and instructional methods for students with severe disabilities. Credit not granted for both SPEC ED 440 and SPEC ED 540. Required preparation must include completion of an introductory special education course, or SPEC ED 520.
- 541 Foundations of Education of Children with Hearing Loss 2** Historical and contemporary forces impacting education of children with hearing loss with emphasis on technology.
- 542 Development of Language for Teachers of Children with Hearing Loss 3** Language from birth through school-age with emphasis on development and relationship of pragmatics, semantics and syntax.
- 543 Teaching Speech to Children with Hearing Loss 3** Strategies for assessing, developing and remediating the speech of children with hearing loss.
- 544 Developing Language in Children with Hearing Loss 3** Strategies for assessing and developing language in children with hearing loss.
- 545 Curriculum for Children with Hearing Loss 3** Strategies for modifying and adapting instruction in academic areas to meet the needs to students with hearing loss.
- 546 Working with Parents of Children with Hearing Loss 3** Impact of hearing loss on parents and strategies for helping parents cope at various stages of their child's life.
- 571 Prevention and Remediation of Reading Disabilities 3** Theoretical concepts, research, and strategies of reading assessment and instruction for students with disabilities. Required preparation must include completion of an introductory special education course, or SPEC ED 520; or permission of instructor.
- 589 Seminar in Disability Studies 3** Current research, issues, trends in disabilities within the broader context of education, society, history.
- 590 Practicum in Special Education V 1-4** May be repeated for credit; cumulative maximum 8 hours. Supervised experiences in application of theories and practices in special education. Required preparation must include completion of an introductory special education course, or SPEC ED 520; certified education major or completed certificate.
- 591 Response to Intervention Across the Core Academic Curriculum 3** New method of assessment for learning disability referred to as response to intervention. Recommended preparation: Admission to a doctoral program.
- 592 Single Subject Research Design and Methods 3** In-depth study of single subject research designs; critical analysis of strengths and weaknesses of each design. Recommended preparation: Admission to a doctoral program.
- 593 Diversity Issues in Special Education: Theory, Research and Practice 3** Diversity issues in special education examined and critically reflected upon for future use and practice. Recommended preparation: Admission to a doctoral program.
- 594 Prevention and Intervention for Emotional and Behavioral Disorders (EBD) 3** Cross-disciplinary perspectives on preventing mental, emotional, and behavioral disorders; analysis of evidence-based practices, research to practice gap, implementation and sustainability. Recommended preparation: Admission to a doctoral program.
- 595 Universal Design 3** Factors associated with developing, implementing and assessing curricular materials for individuals with disabilities. Recommended preparation: Admission to a doctoral program.
- 596 Seminar in Quality Indicators for Research in Special Education 1** May be repeated for credit; cumulative maximum 3 hours. Examines quality indicators of research designs and approaches in special education.
- 600 Special Projects or Independent Study V 1-8** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Teaching And Learning**
- T & L**
- 501 Bilingual/ESL Education 3** May be repeated for credit; cumulative maximum 6 hours. Work with students from diverse linguistic and cultural backgrounds in educational settings.
- 502 Assessment for Teaching and Learning V 2-3** Instruction in sound assessment practices for preservice and inservice graduate students.
- 503 ESL Methods and Material for Secondary Content Teachers 2** Research-based ESL strategies and methods for pre-service and secondary content area teachers.
- 504 Advanced Study in Linguistics for Educators 3** Use of linguistics to better understand second language learning and teaching and the physical aspects of acquiring a language.
- 505 ESL Methods for General Educators (K-8) 2** Course Prerequisite: For candidates admitted to MIT. Research-based ESL strategies and methods for pre-service and experienced teachers.
- 506 Multicultural Classroom Instruction and Management 4** Instructional and management strategies for maximizing students' opportunities to learn in a multicultural setting.
- 507 Seminar in Literacy in Multicultural Settings I 3** Multicultural perspective to curriculum development and classroom literacy practices.
- 508 Seminar in Literacy in Multicultural Settings II 3** Course Prerequisite: TCH LRN 507. Multicultural perspective to curriculum development and classroom literacy practices.

- 509 Research in Curriculum and Assessment for Bilingual/ESL Education 3** Research in curriculum development for and assessment of language minority students. Recommended preparation: TCH LRN 510; TCH LRN 549.
- 510 Theoretical Foundations of Bilingual/ESL Education 3** Theoretical foundations related to research and instructional strategies for effective schooling of language minority students. Credit not granted for TCH LRN 410 and 510. Credit not granted for both TCH LRN 410 and TCH LRN 510.
- 512 Language and Cultural Factors in Mathematics 3** Research and instructional strategies related to linguistic and cultural influences on learning math.
- 513 Seminar in Middle School Education 3** For experienced teachers. Curriculum patterns and recent research regarding instruction and materials in the contemporary middle school.
- 514 Methods and Materials for Bilingual/ESL Education 3** Research and instructional methods related to English language acquisition across content areas. Credit not granted for both TCH LRN 414 and TCH LRN 514. Recommended preparation: Recommended: TCH LRN 410 or 510; TCH LRN 509; TCH LRN 549.
- 515 The Education of Cultural and Linguistic Minority Students 3** Issues in the education of language minority students.
- 516 Advanced Study in Computer-Assisted Language Learning 3** Research, theory, and practice in computer-assisted language learning.
- 517 Educational Technology in K-8 Schools 2 (1-2) Course** Prerequisite: For candidates admitted to MIT. Technology standards for teachers, technology use in schools, production techniques and instructional methods.
- 518 Integrating Technology into the Curriculum 3** Examination and articulation of the potential for new technologies to expand learning opportunities.
- 519 Instructional Media Production I 3** Instructional media development, emphasizing the theory and methods of instructional design, digital media production and evaluation.
- 520 Topics in Special Student Populations V 1-4** May be repeated for credit; cumulative maximum 6 hours. For K-12 teachers. Knowledge of special student populations and guidance in developing appropriate curricula.
- 521 Topics in Education V 1-4** May be repeated for credit; cumulative maximum 6 hours. Recent research, developments, issues, and/or applications in selected areas of education.
- 522 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 523 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 524 Topics in Education V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent research, development, issues, and/or applications in selected areas of education.
- 525 Classroom Management Seminar V 2-3 Course** Prerequisite: For candidates admitted to MIT. Contemporary issues in management of elementary, middle school, and secondary classrooms; issues of abuse.
- 526 Research in Multicultural Education 3 Course** Prerequisite: TCH LRN 515. Research and instructional practices focusing on multicultural education.
- 527 Seminar in Teacher Education Instruction 1** May be repeated for credit; cumulative maximum 4 hours. Teacher preparation program components and rationale, university teaching strategies, and evaluation methods.
- 528 Literacy within the Disciplines 3** Explores literacy research and practices that enhance the learning of various disciplines taught in K-12 settings.
- 529 Place-Based Education 3** Theory and practice of place-based education with an emphasis on community-based action research and curriculum planning.
- 530 Innovations in Reading V 2-3** Graduate-level counterpart of TCH LRN 431; additional requirements.
- 531 Frameworks for Research in Mathematics and Science Education 3** Exploration of research frameworks and methodologies specific to mathematics and science education.
- 532 Children's Literature in the Curriculum 2** Theory and classroom applications for selecting and using literature and storytelling in content areas; reading, writing, language development, the arts.
- 533 Middle Level Mathematics Pedagogy and Philosophy 3** Middle-school philosophy; understanding of effective standards and research-based instructional methods.
- 534 Conceptualization of Proportional Thinking 3** Investigation of the development of K-14 students' understanding of proportional reasoning.
- 535 Gender, Power and Education 3** Interdisciplinary focus on the relationships among gender, power and education.
- 536 Cultural Studies in Education 3** Historical and conceptual background of the field of cultural studies.
- 537 Seminar in Language, Literacy, and Culture 3** Interrelationships between schools, literacy, and student cultural background.
- 538 Writing Across the Curriculum 3** Writing for learning at grade levels K-12.
- 539 Innovations in Language Arts 3** The most recent developments in language arts instruction for pre-service and in-service teachers K-12.
- 540 Elementary School Social Studies 3 Course** Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation and experienced teachers. Elementary structures of various social sciences; research findings related to instruction; classroom applications and materials.
- 541 Teacher Professional Certification: Pre-Assessment Seminar V 1-3** May be repeated for credit; cumulative maximum 6 hours. Candidates evaluate current teaching against standards to determine steps for professional growth plans which measure positive impact on student learning.

- 542 Teacher Professional Certification: Researching Exemplary Practices V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Teachers will apply exemplary practices, continue to assess their performance and college evidence of positive impact on student learning.
- 543 Teacher Professional Certification: Culminating Seminar V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Candidates will complete ProCert requirements to document positive impact on students' learning: set new goals; learn about National Board options.
- 544 Advanced Children's Literature 3** Trends, issues, and research in children's literature.
- 546 Teaching Writing in the Elementary School 3** Theory and research relevant to instructional approaches and practices for teaching writing in elementary schools.
- 547 Teaching Folk Literature to Children and Adolescents 3** Folk literature as a genre in child and adolescent literature; curriculum applications; reading, language development, social studies, creative expression.
- 548 Teaching Adolescent Literature 3** Evaluating, selecting, and using literature for middle school and teenage students.
- 549 Communicating in a Multilingual Society 3** Study of language in social and educational context and its relation to cultural and linguistic diversity. Recommended preparation: TCH LRN 510.
- 550 Second Language Learning and Literacy 3** Research on second language teaching and learning in literacy education with a focus on English language learners in US schools. Recommended preparation: Admission to a doctoral program.
- 551 Psychology of Reading V** 2-3 Psychological, perceptual, motivational, developmental and physiological aspects of reading.
- 552 Literacy Development I 3** Course Prerequisite: For candidates admitted to MIT. For candidates admitted to graduate teacher preparation. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 553 Assessment and Instruction for Reading: K-8 4** (3-3) Evaluation techniques and instructional practices for impacting the reading achievement of K-8 students.
- 554 Sociolinguistics 3** Interaction between language use and sociopolitical and cultural contexts; cultural and linguistic delivery and educational opportunity. Recommended preparation: TCH LRN 504.
- 555 Seminar in Literacy Development 3** May be repeated for credit; cumulative maximum 6 hours. Current and historical research in reading/language arts, infancy through college and adult years; papers presented by faculty, invited speakers, and students.
- 556 Literacy Development II 3** Course Prerequisite: For candidates admitted to MIT. Review of current research and approaches to instruction in the development of literacy in elementary and middle grades.
- 557 Research in Reading 3** Exploration of qualitative and quantitative reading research covering topics of current and historical importance.
- 558 Improving Comprehension through Literature 3** Key theoretical concepts and their implications for improved comprehension instruction, using children's literature.
- 559 Readings in Cultural Studies and Social Thought in Education 1** May be repeated for credit; cumulative maximum 3 hours. Current scholarship in the field of cultural studies in education and practices of schools.
- 560 Research in Teaching 3** May be repeated for credit; cumulative maximum 6 hours. Recent developments in research on teaching; both quantitative and qualitative research methodologies emphasized.
- 561 Elementary School Mathematics 3** Course Prerequisite: For candidates admitted to MIT. Research on curriculum and instruction issues in elementary school mathematics.
- 564 Elementary School Mathematics Methods 3** Course Prerequisite: For candidates admitted to MIT. Introduction to research, theory, and methods of teaching K-8 mathematics; emphasis on integrating theory and practice.
- 565 Introduction to Scholarly Inquiry 1** Introduction to the Ed.M program including the scholarship and research requirements and the role of students and action research.
- 566 Democratic Education 3** Rationale and skill to assist teachers in making classrooms more democratic.
- 567 Social Foundations of Literacy 3** Social, cultural and political factors which influence the acquisition and use of literacy. Recommended preparation: Admission to a doctoral program.
- 568 Psychological Foundations and Assessment of Literacy 3** Historical look that blends the assessment of literacy and its psychological components. Recommended preparation: Admission to a doctoral program.
- 569 Critical Analysis of Children's and Young Adult Literature 3** Multicultural analysis of children's and adolescent literature and its pedagogical and sociopolitical implications and possibilities. Recommended preparation: Admission to a doctoral program.
- 570 Theory and Research in Electronic Literacies 3** . Ideas of literacy and effects of technology on literacy and policy, particularly those issues addressing diverse learners.
- 571 Elementary School Science 3** Course Prerequisite: For candidates admitted to MIT. Theories and research underlying science programs with classroom implications.
- 572 Elementary School Science Methods 3** Course Prerequisite: For candidates admitted to MIT. Theoretical base to design and implement appropriate standards-based elementary science instruction.
- 573 Theory and Research in Computer-Assisted Language Learning 3** Information and tools needed to contribute to the CALL research literature.
- 574 Science for All: An Individual and Multicultural Perspective 3** Course Prerequisite: For candidates admitted to MIT. Implications of cultural and individual diversity for understanding western scientific and mathematical thought; an activity-based, educational perspective.
- 575 Globalization and Identity in Education 3** Issues relating to the complexities of globalization and identity in education.

- 576 Youth Cultures in Education 3** Analysis of how youth cultures operate in society and how they are practiced in schools.
- 577 Curriculum Theory 3** Curriculum theory as the interdisciplinary study of educational experience.
- 578 National Board for Professional Teaching Standards (NBPTS) I 3** Development of evidence aligned with National Board standards and allowance for reflection on the impact of teaching and student learning. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 579 National Board for Professional Teaching Standards (NBPTS) II 3** Construct/submit portfolio of evidence meeting national standards in classrooms for National Board Certification assessment. Required background must include: Bachelor's degree from accredited institution, valid state teaching/counseling certificate, completion of minimum 3 years successful full-time teaching in a U.S. P-12 school.
- 580 Multicultural Education in a Global Society 3** Multicultural and multilingual education from a global perspective; development of multicultural curriculum. Credit not granted for more than one of TCH LRN 480, 580, 582. Credit not granted for both TCH LRN 480 and TCH LRN 580.
- 581 Learning and Development in Mathematics and Science 3** This course explores and illustrates what we know about various aspects of mathematical learning at various grade levels.
- 583 Problem Solving in Elementary and Middle Level Education 3** Course Prerequisite: For candidates admitted to MIT. Integration of knowledge and skills to address complex cases in teaching and learning.
- 584 Research in Teaching Mathematics and Science 3** Development of an understanding for the research literature that is particularly related to mathematics and science teaching.
- 585 Focused Reading and Conference in Math/Science Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. Designed to foster ongoing scholarship for individuals interested in mathematics and/or science educational research.
- 587 Environment, Culture and Education 3** Role of education in the social, ecological, and political conflicts between culture and environment.
- 588 Action Research: Teachers as Research 3** Theoretical concepts, research, issues, models, and strategies for implementation of action research.
- 589 Race, Identity and Representation in Education 3** Interdisciplinary research in race, identity and representations in education.
- 590 Internship V 2-6** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: By interview only. Opportunities in professional positions.
- 591 Research Internship in Math/Science Education 3** May be repeated for credit; cumulative maximum 6 hours. Provides opportunities for students to work closely with an accomplished researcher to observe, learn, and practice research methods.
- 592 Social Theory in Education 3** Social theory and how it applies to intellectual work in education. Recommended preparation: Admission to a doctoral program.
- 593 Pre-internship and Seminar 2 (1-3)** Course Prerequisite: For candidates admitted to MIT. Instructional practice in diverse classroom settings and reflection on that practice.
- 594 Integrating Fine Arts into K-8 Curriculum 2** Course Prerequisite: For candidates admitted to MIT. Integrating Fine Arts (art, music, dance, drama) into K-8 curriculum; designed for pre-service MIT.
- 595 Internship and Seminar 10 (1-27)** Course Prerequisite: TCH LRN 593. Instructional practice in classroom settings, reflection on practice; professional certification.
- 596 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 12 hours. Advanced study of research, practice, and contemporary issues in education.
- 597 Topics in In-Service Education V 1-3** May be repeated for credit; cumulative maximum 9 hours. New developments and applications on selected in-service and staff development topics.
- 598 Research Seminar in Mathematics and Science Education 1** May be repeated for credit; cumulative maximum 4 hours. Through targeted readings and discussion, students will develop knowledge base proficiencies related to areas of mathematics/science education.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Combined Anatomic Pathology Residency

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 23

Graduate students: 7

Graduate students receiving assistantships or scholarships: 100%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: Rolling Deadline

Spring: Rolling Deadline

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The program's research and training programs are focused in the immunology, epidemiology and host-pathogen interactions at the molecular level of bacterial, parasitic, and viral infections of animals and humans. The academic research environment is enriched by integration of the Department of Veterinary Microbiology and Pathology, the School of Molecular Biosciences, the Paul G. Allen School for Global Animal Health (<http://globalhealth.wsu.edu/>), the Washington State University Animal Health Research Center and the USDA-ARS Animal Disease Research Unit. Dissertation research is carried out under the direction of a highly collaborative research faculty internationally recognized for infectious disease research and who are experienced in mentoring trainees within state-of-the-art laboratories funded by federal agencies including NIH, NSF, USAID, and USDA, non-profit research foundations such as The Wellcome Trust and the Bill and Melinda Gates Foundation, and other federal, state, regional, and private institutions and organizations. The residency training occurs within the Washington Animal Disease Diagnostic Laboratory (WADDL), a full service veterinary diagnostic laboratory staffed by faculty of the Departments of Veterinary Microbiology and Pathology and Veterinary Clinical Sciences. WADDL has 3 primary facilities, a primary full service laboratory in Pullman, an Aquatic Health laboratory in Pullman and an Avian Health and Food Safety Laboratory branch in Puyallup. The laboratories are accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), WADDL is one of 12 founding members of the National Animal Health Laboratory Network, and one of the 9 veterinary diagnostic laboratories that serve as a reference lab in the Laboratory Response Network for Bioterrorism. This ensures that residents develop a strong background in all aspects of laboratory medicine, including detection and diagnosis of emerging and

zoonotic pathogens. The faculty includes 12 ACVP- and ACLAM-certified pathologists with training focused on close interaction among faculty and trainees. The high level surgical biopsy and necropsy case loads provide direct experiential learning and are supported by specialized pathology seminars. Overview of the Graduate Program: Training is tailored to the individual's background and career goals, with the proviso that a strong basic sciences foundation is indispensable in preparation for disease research. Core knowledge is advanced through regularly scheduled research seminars, special research seminar series, and through directed readings with the Graduate faculty. Mentored laboratory research is the most critical part of the training and the strength of our program. This is the primary mechanism by which the philosophy of research is imparted to new scientists. Together the major professor and graduate student trainee develop a directed course of research. Throughout the training period, all graduate students attend weekly research seminars where faculty and trainees present recent results. The goal of trainee participation in these seminars is exposure to critical analysis of data, experimental design and discussion of research significance. Trainees are expected to conduct original research leading to a significant contribution to knowledge in the trainee's area of emphasis and culminating in publication in leading international scientific journals. This publication is required for and constitutes the PhD dissertation. The final PhD examination is preceded by a public presentation of the research, attended by the faculty, graduate students, and post-doctoral fellows, followed by an oral examination.

Contact Information

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Faculty

Timothy Baszler, Thomas Besser, Kelly Brayton, Wendy Brown, Douglas Call, William Davis, William Foreyt, Gary Haldorson, Stephen Hines, Douglas Jasmer, Donald Knowles, Kevin Lahmers, Audrey Lau, Charles Leathers, Terry McElwain, Robert Mealey, Guy Palmer, Kathleen Potter, David Prieur, Devendra Shah, Kevin Snekvik, Subramaniam Srikumaran and James Stanton.

MBIOS

- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.

- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.

- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- V MIC**
- 535 Advanced Readings in Veterinary Microbiology 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised reading program which peruses publications of intermediate technical difficulty and advanced textbooks.
- 541 Advanced Diagnostic Microbiology 1 (0-3)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 534; VET MED 535; VET MED 536. Microbiology laboratory for performing and interpreting virologic, serologic, and related tests for the diagnosis of animal diseases.
- 572 Advanced Topics in Microbiology, Parasitology, or Immunology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in microbiology, parasitology, or immunology presented in short-course, or workshop format.
- 591 Seminar in Diagnostic Microbiology 1** May be repeated for credit; cumulative maximum 8 hours. Seminar in diagnostic veterinary microbiology.
- 592 Advances in Immunobiology 1** May be repeated for credit.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- V PA**
- 501 Case-based Learning in Veterinary Pathology V 1 (0-3) to 3 (0-9)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Principles of pathophysiology, infectious disease, laboratory diagnosis, zoonoses, and food safety learned through the development of multistep teaching cases.
- 525 Introductory Readings in Veterinary Pathology 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Supervised introductory readings of publications, books, and research proposals.
- 542 Advanced Diagnostic Pathology V 1 (0-3) to 4 (0-12)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 546. Necropsy laboratory for techniques and skills in performing and interpreting necropsy material.
- 544 Immunopathology 4** Course Prerequisite: VET MED 545; VET MED 531. The role of immune processes in the pathogenesis of disease.
- 545 Mechanisms of Disease 4** Course Prerequisite: VET MED 545; VET MED 531. Biochemical and immunological mechanisms involved in disease processes from the comparative standpoint.
- 548 Introduction to Research 1** Introduction to research.
- 555 Research in Progress Seminar 1** May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results.
- 571 Advanced Topics in Pathology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in pathology presented in short-course, or workshop, format.
- 592 Anatomic Pathology Seminar 1** May be repeated for credit. Histopathologic description and diagnosis.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18
May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Combined Anatomic Pathology Residency

Degree offered: Master of Science in Veterinary Science

Faculty working with graduate students: 23

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: Rolling Deadline
Spring: Rolling Deadline

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The program's research and training programs are focused in the immunology, epidemiology and host-pathogen interactions at the molecular level of bacterial, parasitic, and viral infections of animals and humans. The academic research environment is enriched by integration of the Department of Veterinary Microbiology and Pathology, the School of Molecular Biosciences, the Paul G. Allen School for Global Animal Health (<http://globalhealth.wsu.edu/>), the Washington State University Animal Health Research Center and the USDA-ARS Animal Disease Research Unit. Dissertation research is carried out under the direction of a highly collaborative research faculty internationally recognized for infectious disease research and who are experienced in mentoring trainees within state-of-the-art laboratories funded by federal agencies including NIH, NSF, USAID, and USDA, non-profit research foundations such as The Wellcome Trust and the Bill and Melinda Gates Foundation, and other federal, state, regional, and private institutions and organizations. The residency training occurs within the Washington Animal Disease Diagnostic Laboratory (WADDL), a full service veterinary diagnostic laboratory staffed by faculty of the Departments of

Veterinary Microbiology and Pathology and Veterinary Clinical Sciences. WADDL has 3 primary facilities, a primary full service laboratory in Pullman, an Aquatic Health laboratory in Pullman and an Avian Health and Food Safety Laboratory branch in Puyallup. The laboratories are accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), WADDL is one of 12 founding members of the National Animal Health Laboratory Network, and one of the 9 veterinary diagnostic laboratories that serve as a reference lab in the Laboratory Response Network for Bioterrorism. This ensures that residents develop a strong background in all aspects of laboratory medicine, including detection and diagnosis of emerging and zoonotic pathogens. The faculty includes 12 ACVP- and ACLAM-certified pathologists with training focused on close interaction among faculty and trainees. The high level surgical biopsy and necropsy case loads provide direct experiential learning and are supported by specialized pathology seminars. Overview of the Graduate Program: Training is tailored to the individual's background and career goals, with the proviso that a strong basic sciences foundation is indispensable in preparation for disease research. Core knowledge is advanced through regularly scheduled research seminars, special research seminar series, and through directed readings with the Graduate faculty. Mentored laboratory research is the most critical part of the training and the strength of our program. This is the primary mechanism by which the philosophy of research is imparted to new scientists. Together the major professor and graduate student trainee develop a directed course of research. Throughout the training period, all graduate students attend weekly research seminars where faculty and trainees present recent results. The goal of trainee participation in these seminars is exposure to critical analysis of data, experimental design and discussion of research significance. Trainees are expected to conduct original research leading to a significant contribution to knowledge in the trainee's area of emphasis and culminating in publication in leading international scientific journals. This publication is required for and constitutes the MS thesis. The final MS examination is preceded by a public presentation of the research, attended by the faculty, graduate students, and post-doctoral fellows, followed by an oral examination.

Contact Information

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MBIOS

- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
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- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
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- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.

- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- V MIC**
- 535 Advanced Readings in Veterinary Microbiology 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised reading program which peruses publications of intermediate technical difficulty and advanced textbooks.
- 541 Advanced Diagnostic Microbiology 1 (0-3)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 534; VET MED 535; VET MED 536. Microbiology laboratory for performing and interpreting virologic, serologic, and related tests for the diagnosis of animal diseases.
- 572 Advanced Topics in Microbiology, Parasitology, or Immunology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in microbiology, parasitology, or immunology presented in short-course, or workshop format.
- 591 Seminar in Diagnostic Microbiology 1** May be repeated for credit; cumulative maximum 8 hours. Seminar in diagnostic veterinary microbiology.
- 592 Advances in Immunobiology 1** May be repeated for credit.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- V PA**
- 501 Case-based Learning in Veterinary Pathology V 1 (0-3) to 3 (0-9)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Principles of pathophysiology, infectious disease, laboratory diagnosis, zoonoses, and food safety learned through the development of multistep teaching cases.
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- 545 Mechanisms of Disease 4** Course Prerequisite: VET MED 545; VET MED 531. Biochemical and immunological mechanisms involved in disease processes from the comparative standpoint.
- 548 Introduction to Research 1** Introduction to research.
- 555 Research in Progress Seminar 1** May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Combined Clinical Microbiology Residency

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 23

Graduate students: 3

Graduate students receiving assistantships or scholarships: 100%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: Rolling Deadline
Spring: Rolling Deadline

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The program's research and training programs are focused in the immunology, epidemiology and host-pathogen interactions at the molecular level of bacterial, parasitic, and viral infections of animals and humans. The academic research environment is enriched by integration of the Department of Veterinary Microbiology and Pathology, the School of Molecular Biosciences, the Paul G. Allen School for Global Animal Health (<http://globalhealth.wsu.edu/>), the Washington State University

Animal Health Research Center and the USDA-ARS Animal Disease Research Unit. Dissertation research is carried out under the direction of a highly collaborative research faculty internationally recognized for infectious disease research and who are experienced in mentoring trainees within state-of-the-art laboratories funded by federal agencies including NIH, NSF, USAID, and USDA, non-profit research foundations such as The Wellcome Trust and the Bill and Melinda Gates Foundation, and other federal, state, regional, and private institutions and organizations. The residency training occurs within the Washington Animal Disease Diagnostic Laboratory (WADDL), a full service veterinary diagnostic laboratory staffed by faculty of the Departments of Veterinary Microbiology and Pathology and Veterinary Clinical Sciences. WADDL has 3 primary facilities, a primary full service laboratory in Pullman, an Aquatic Health laboratory in Pullman and an Avian Health and Food Safety Laboratory branch in Puyallup. The laboratories are accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), WADDL is one of 12 founding members of the National Animal Health Laboratory Network, and one of the 9 veterinary diagnostic laboratories that serve as a reference lab in the Laboratory Response Network for Bioterrorism. Specialized sections in aquaculture, bacteriology, molecular diagnostics, parasitology, serology, and virology ensures that residents develop a strong background in all aspects of clinical microbiology, including detection and diagnosis of emerging and zoonotic pathogens. Additional information about WADDL is available at http://www.vetmed.wsu.edu/depts_waddl/Training occurs under the direction of ACVM-certified microbiologists and is enriched by faculty with expertise in infectious diseases, including zoonotic agents and emerging pathogens. The rich and diverse case load provides direct experiential learning and is supported by specialized infectious diseases seminars. Overview of the Graduate Program: Training is tailored to the individual's background and career goals, with the proviso that a strong basic sciences foundation is indispensable in preparation for disease research. Core knowledge is advanced through regularly scheduled research seminars, special research seminar series, and through directed readings with the Graduate faculty. Mentored laboratory research is the most critical part of the training and the strength of our program. This is the primary mechanism by which the philosophy of research is imparted to new scientists. Together the major professor and graduate student trainee develop a directed course of research. Throughout the training period, all graduate students attend weekly research seminars where faculty and trainees present recent results. The goal of trainee participation in these seminars is exposure to critical analysis of data, experimental design and discussion of research significance. Trainees are expected to conduct original research leading to a significant contribution to knowledge in the trainee's area of emphasis and culminating in publication in leading international scientific journals. This publication is required for and constitutes the PhD dissertation. The final PhD examination is preceded by a public presentation of the research, attended by the faculty, graduate students, and post-doctoral fellows, followed by an oral examination.

Training and Professional Development Opportunities

The training incorporates full residency training in an AAVLD accredited laboratory.

Post-Graduate Employment Opportunities

Academic, state and national laboratories, biotechnology companies.

Post-Graduate Career Placements

Director of Laboratory, Professor, Chief Scientist

Contact Information

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MBIOS

- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.

- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.

- 568 Advanced Topics in Molecular Biosciences V** 1-3 May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V** 1-2 May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

STAT

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T₂ and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.

- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- V MIC**
- 535 Advanced Readings in Veterinary Microbiology 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised reading program which peruses publications of intermediate technical difficulty and advanced textbooks.
- 541 Advanced Diagnostic Microbiology 1 (0-3)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 534; VET MED 535; VET MED 536. Microbiology laboratory for performing and interpreting virologic, serologic, and related tests for the diagnosis of animal diseases.
- 572 Advanced Topics in Microbiology, Parasitology, or Immunology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in microbiology, parasitology, or immunology presented in short-course, or workshop format.
- 591 Seminar in Diagnostic Microbiology 1** May be repeated for credit; cumulative maximum 8 hours. Seminar in diagnostic veterinary microbiology.
- 592 Advances in Immunobiology 1** May be repeated for credit.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

V PA

- 501 Case-based Learning in Veterinary Pathology V 1 (0-3) to 3 (0-9)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Principles of pathophysiology, infectious disease, laboratory diagnosis, zoonoses, and food safety learned through the development of multistep teaching cases.
- 525 Introductory Readings in Veterinary Pathology 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Supervised introductory readings of publications, books, and research proposals.
- 542 Advanced Diagnostic Pathology V 1 (0-3) to 4 (0-12)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 546. Necropsy laboratory for techniques and skills in performing and interpreting necropsy material.
- 544 Immunopathology 4** Course Prerequisite: VET MED 545; VET MED 531. The role of immune processes in the pathogenesis of disease.
- 545 Mechanisms of Disease 4** Course Prerequisite: VET MED 545; VET MED 531. Biochemical and immunological mechanisms involved in disease processes from the comparative standpoint.
- 548 Introduction to Research 1** Introduction to research.
- 555 Research in Progress Seminar 1** May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results.
- 571 Advanced Topics in Pathology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in pathology presented in short-course, or workshop, format.
- 592 Anatomic Pathology Seminar 1** May be repeated for credit. Histopathologic description and diagnosis.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Combined Clinical Microbiology Residency

Degree offered: Master of Science in Veterinary Science

Faculty working with graduate students: 23

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: Rolling Deadline

Spring: Rolling Deadline

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The program's research and training programs are focused in the immunology, epidemiology and host-pathogen interactions at the molecular level of bacterial, parasitic, and viral infections of animals and humans. The academic research environment is enriched by integration of the Department of Veterinary Microbiology and Pathology, the School of Molecular Biosciences, the Paul G. Allen School for Global Animal Health (<http://globalhealth.wsu.edu/>), the Washington State University Animal Health Research Center and the USDA-ARS Animal Disease Research Unit. Dissertation research is carried out under the direction of a highly collaborative research faculty internationally recognized for infectious disease research and who are experienced in mentoring trainees within state-of-the-art laboratories funded by federal agencies including NIH, NSF, USAID, and USDA, non-profit research foundations such as The Wellcome Trust and the Bill and Melinda Gates Foundation, and other federal, state, regional, and private institutions and organizations. The residency training occurs within the Washington Animal Disease Diagnostic Laboratory (WADDL), a full service veterinary diagnostic laboratory staffed by faculty of the Departments of Veterinary Microbiology and Pathology and Veterinary Clinical Sciences. WADDL has 3 primary facilities, a primary full service laboratory in Pullman, an Aquatic Health laboratory in Pullman and an Avian Health and Food Safety Laboratory branch in Puyallup. The laboratories are accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), WADDL is one of 12 founding members of the National Animal Health Laboratory Network, and one of the 9 veterinary diagnostic laboratories that serve as a reference lab in the Laboratory Response Network for Bioterrorism. Specialized sections in aquaculture, bacteriology, molecular diagnostics, parasitology, serology, and virology ensures that residents develop a strong background in all aspects of clinical microbiology, including detection and diagnosis of emerging and zoonotic pathogens. Additional information about WADDL is available at http://www.vetmed.wsu.edu/depts_waddl/Training occurs under the

direction of ACVM-certified microbiologists and is enriched by faculty with expertise in infectious diseases, including zoonotic agents and emerging pathogens. The rich and diverse case load provides direct experiential learning and is supported by specialized infectious diseases seminars. Overview of the Graduate Program: Training is tailored to the individual's background and career goals, with the proviso that a strong basic sciences foundation is indispensable in preparation for disease research. Core knowledge is advanced through regularly scheduled research seminars, special research seminar series, and through directed readings with the Graduate faculty. Mentored laboratory research is the most critical part of the training and the strength of our program. This is the primary mechanism by which the philosophy of research is imparted to new scientists. Together the major professor and graduate student trainee develop a directed course of research. Throughout the training period, all graduate students attend weekly research seminars where faculty and trainees present recent results. The goal of trainee participation in these seminars is exposure to critical analysis of data, experimental design and discussion of research significance. Trainees are expected to conduct original research leading to a significant contribution to knowledge in the trainee's area of emphasis and culminating in publication in leading international scientific journals. This publication is required for and constitutes the MS thesis. The final MS examination is preceded by a public presentation of the research, attended by the faculty, graduate students, and post-doctoral fellows, followed by an oral examination.

Contact Information

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MBIOS

- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.

- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
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- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.

- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
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- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
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- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
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- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- STAT**
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- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
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- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.

- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- V MIC**
- 535 Advanced Readings in Veterinary Microbiology 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised reading program which peruses publications of intermediate technical difficulty and advanced textbooks.
- 541 Advanced Diagnostic Microbiology 1 (0-3)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 534; VET MED 535; VET MED 536. Microbiology laboratory for performing and interpreting virologic, serologic, and related tests for the diagnosis of animal diseases.
- 572 Advanced Topics in Microbiology, Parasitology, or Immunology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in microbiology, parasitology, or immunology presented in short-course, or workshop format.
- 591 Seminar in Diagnostic Microbiology 1** May be repeated for credit; cumulative maximum 8 hours. Seminar in diagnostic veterinary microbiology.
- 592 Advances in Immunobiology 1** May be repeated for credit.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

V PA

501 Case-based Learning in Veterinary Pathology V 1 (0-3) to 3 (0-9) Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Principles of pathophysiology, infectious disease, laboratory diagnosis, zoonoses, and food safety learned through the development of multistep teaching cases.

525 Introductory Readings in Veterinary Pathology 1 (0-3) May be repeated for credit; cumulative maximum 2 hours. Supervised introductory readings of publications, books, and research proposals.

542 Advanced Diagnostic Pathology V 1 (0-3) to 4 (0-12) May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 546. Necropsy laboratory for techniques and skills in performing and interpreting necropsy material.

544 Immunopathology 4 Course Prerequisite: VET MED 545; VET MED 531. The role of immune processes in the pathogenesis of disease.

545 Mechanisms of Disease 4 Course Prerequisite: VET MED 545; VET MED 531. Biochemical and immunological mechanisms involved in disease processes from the comparative standpoint.

548 Introduction to Research 1 Introduction to research.

555 Research in Progress Seminar 1 May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results.

571 Advanced Topics in Pathology V 1-3 May be repeated for credit; cumulative maximum 4 hours. Advanced topics in pathology presented in short-course, or workshop, format.

592 Anatomic Pathology Seminar 1 May be repeated for credit. Histopathologic description and diagnosis.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Immunology and Infectious Diseases

Degree offered: Doctor of Philosophy

Faculty working with graduate students: 23

Graduate students: 31

Graduate students receiving assistantships or scholarships: 100%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: Rolling Deadline

Spring: Rolling Deadline

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

We offer outstanding doctoral education in the immunology, epidemiology and host-pathogen interactions of bacterial, parasitic, and viral infections of animals and humans. The academic research environment is enriched by integration of the Department of Veterinary Microbiology and Pathology, the School of Molecular Biosciences, the Paul G. Allen School for Global Animal Health (<http://globalhealth.wsu.edu/>), the Washington State University Animal Health Research Center and the USDA-ARS Animal Disease Research Unit. Dissertation research is carried out under the direction of a highly collaborative research faculty internationally recognized for infectious disease research and who are experienced in mentoring trainees within state-of-the-art laboratories funded by federal agencies including NIH, NSF, USAID, and USDA, non-profit research foundations such as The Wellcome Trust and the Bill and Melinda Gates Foundation, and other federal, state, regional, and private institutions and organizations. Overview of the Graduate Program: Training is tailored to the

individual's background and career goals, with the proviso that a strong basic sciences foundation is indispensable in preparation for disease research. Core knowledge is advanced through regularly scheduled research seminars, special research seminar series, and through directed readings with the Graduate faculty. Mentored laboratory research is the most critical part of the training and the strength of our program. This is the primary mechanism by which the philosophy of research is imparted to new scientists. Together the major professor and graduate student trainee develop a directed course of research. Throughout the training period, all graduate students attend weekly research seminars where faculty and trainees present recent results. The goal of trainee participation in these seminars is exposure to critical analysis of data, experimental design and discussion of research significance. Trainees are expected to conduct original research leading to a significant contribution to knowledge in the trainee's area of emphasis and culminating in publication in leading international scientific journals. This publication is required for and constitutes the PhD dissertation. The final PhD examination is preceded by a public presentation of the research, attended by the faculty, graduate students, and post-doctoral fellows, followed by an oral examination.

Training and Professional Development Opportunities

Collaborative research in laboratories and research sites associated with the Paul G. Allen School for Global Animal Health

Post-Graduate Employment Opportunities

Academia, national and international laboratories, biotechnology companies.

Post-Graduate Career Placements

Professor, Director of Laboratory, Chief Scientist

Contact Information

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MBIOS

501 Cell Biology 3 Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.

- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.

- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T² and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.

- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- V MIC**
- 535 Advanced Readings in Veterinary Microbiology 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised reading program which peruses publications of intermediate technical difficulty and advanced textbooks.
- 541 Advanced Diagnostic Microbiology 1 (0-3)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 534; VET MED 535; VET MED 536. Microbiology laboratory for performing and interpreting virologic, serologic, and related tests for the diagnosis of animal diseases.
- 572 Advanced Topics in Microbiology, Parasitology, or Immunology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in microbiology, parasitology, or immunology presented in short-course, or workshop format.
- 591 Seminar in Diagnostic Microbiology 1** May be repeated for credit; cumulative maximum 8 hours. Seminar in diagnostic veterinary microbiology.
- 592 Advances in Immunobiology 1** May be repeated for credit.

- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

V PA

- 501 Case-based Learning in Veterinary Pathology V 1 (0-3) to 3 (0-9)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Principles of pathophysiology, infectious disease, laboratory diagnosis, zoonoses, and food safety learned through the development of multistep teaching cases.
- 525 Introductory Readings in Veterinary Pathology 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Supervised introductory readings of publications, books, and research proposals.
- 542 Advanced Diagnostic Pathology V 1 (0-3) to 4 (0-12)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 546. Necropsy laboratory for techniques and skills in performing and interpreting necropsy material.
- 544 Immunopathology 4** Course Prerequisite: VET MED 545; VET MED 531. The role of immune processes in the pathogenesis of disease.
- 545 Mechanisms of Disease 4** Course Prerequisite: VET MED 545; VET MED 531. Biochemical and immunological mechanisms involved in disease processes from the comparative standpoint.
- 548 Introduction to Research 1** Introduction to research.
- 555 Research in Progress Seminar 1** May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results.
- 571 Advanced Topics in Pathology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in pathology presented in short-course, or workshop, format.
- 592 Anatomic Pathology Seminar 1** May be repeated for credit. Histopathologic description and diagnosis.

- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Immunology and Infectious Diseases

Degree offered: Master of Science in Veterinary Science

Faculty working with graduate students: 23

Graduate students: 7

Graduate students receiving assistantships or scholarships: 100%

Tests required: IELTS, TOEFL, TOEFLI

Deadline: Fall: Rolling Deadline

Spring: Rolling Deadline

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

We offer outstanding doctoral education in the immunology, epidemiology and host-pathogen interactions of bacterial, parasitic, and viral infections of animals and humans. The academic research environment is enriched by integration of the Department of Veterinary Microbiology and Pathology, the School of Molecular Biosciences, the Paul G. Allen School for Global Animal Health (<http://globalhealth.wsu.edu/>), the Washington State University Animal Health Research Center and the USDA-ARS Animal Disease Research Unit. Dissertation research is carried out under

the direction of a highly collaborative research faculty internationally recognized for infectious disease research and who are experienced in mentoring trainees within state-of-the-art laboratories funded by federal agencies including NIH, NSF, USAID, and USDA, non-profit research foundations such as The Wellcome Trust and the Bill and Melinda Gates Foundation, and other federal, state, regional, and private institutions and organizations. Overview of the Graduate Program: Training is tailored to the individual's background and career goals, with the proviso that a strong basic sciences foundation is indispensable in preparation for disease research. Core knowledge is advanced through regularly scheduled research seminars, special research seminar series, and through directed readings with the Graduate faculty. Mentored laboratory research is the most critical part of the training and the strength of our program. This is the primary mechanism by which the philosophy of research is imparted to new scientists. Together the major professor and graduate student trainee develop a directed course of research. Throughout the training period, all graduate students attend weekly research seminars where faculty and trainees present recent results. The goal of trainee participation in these seminars is exposure to critical analysis of data, experimental design and discussion of research significance. Trainees are expected to conduct original research leading to a significant contribution to knowledge in the trainee's area of emphasis and culminating in publication in leading international scientific journals. This publication is required for and constitutes the MS thesis. The final MS examination is preceded by a public presentation of the research, attended by the faculty, graduate students, and post-doctoral fellows, followed by an oral examination.

Training and Professional Development Opportunities

Collaborative research in national and international laboratories.

Post-Graduate Employment Opportunities

Academic research, state and national laboratories, biotechnology companies.

Post-Graduate Career Placements

Research technologist, Senior Scientist

Contact Information

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MBIOS

- 501 Cell Biology 3** Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.
- 503 Advanced Molecular Biology I 3** DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.
- 504 Advanced Molecular Biology II 3** Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.
- 505 Cell Biology of Disease 3** Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.
- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.

- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.

- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- V MIC**
- 535 Advanced Readings in Veterinary Microbiology 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised reading program which peruses publications of intermediate technical difficulty and advanced textbooks.
- 541 Advanced Diagnostic Microbiology 1 (0-3)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 534; VET MED 535; VET MED 536. Microbiology laboratory for performing and interpreting virologic, serologic, and related tests for the diagnosis of animal diseases.
- 572 Advanced Topics in Microbiology, Parasitology, or Immunology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in microbiology, parasitology, or immunology presented in short-course, or workshop format.

- 591 Seminar in Diagnostic Microbiology 1** May be repeated for credit; cumulative maximum 8 hours. Seminar in diagnostic veterinary microbiology.
- 592 Advances in Immunobiology 1** May be repeated for credit.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

V PA

- 501 Case-based Learning in Veterinary Pathology V 1 (0-3) to 3 (0-9)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Principles of pathophysiology, infectious disease, laboratory diagnosis, zoonoses, and food safety learned through the development of multistep teaching cases.
- 525 Introductory Readings in Veterinary Pathology 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Supervised introductory readings of publications, books, and research proposals.
- 542 Advanced Diagnostic Pathology V 1 (0-3) to 4 (0-12)** May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: VET MED 546. Necropsy laboratory for techniques and skills in performing and interpreting necropsy material.
- 544 Immunopathology 4** Course Prerequisite: VET MED 545; VET MED 531. The role of immune processes in the pathogenesis of disease.
- 545 Mechanisms of Disease 4** Course Prerequisite: VET MED 545; VET MED 531. Biochemical and immunological mechanisms involved in disease processes from the comparative standpoint.
- 548 Introduction to Research 1** Introduction to research.
- 555 Research in Progress Seminar 1** May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results.

- 571 Advanced Topics in Pathology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Advanced topics in pathology presented in short-course, or workshop, format.
- 592 Anatomic Pathology Seminar 1** May be repeated for credit. Histopathologic description and diagnosis.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science - Veterinary and Comparative Anatomy, Pharmacology & Physiology

Degree offered: Doctor of Philosophy (Veterinary Science)

Faculty working with graduate students: 25

Graduate students: 4

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: December 31

Requirements

Students wishing to pursue graduate studies in Neuroscience need to have a strong math and science background. Applicants need to submit an application on the Graduate School website. Applicants also need to submit: college transcripts (unofficial acceptable for initial review--upon admittance official are required), three (3) letters of reference, a resume or curriculum vita, a personal statement describing why you are interested in studying in the Veterinary Science program, a writing sample, and official Graduate Record Exam (GRE) scores (WSU code 4705). Include the % below as well as the raw score. Application review begins 12/31 each year. Only complete applications with all accompanying documents will be considered and reviewed for admission.

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers spe-

cialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The Department of Integrative Physiology and Neuroscience offers a course of study leading to the degrees of Master of Science and Doctor of Philosophy in Veterinary Science. These degrees are designed to provide broad training in specific aspects of veterinary science and related disciplines to prepare students for careers in teaching, research, and service. The curriculum is research intensive emphasizing the acquisition of theoretical understanding of a field and or research skills in preparation for a career in teaching and research. The veterinary science degree allows for maximum flexibility within the curriculum. Students will design their degree plan in consultation with a faculty mentor, emphasizing the specialty fields of anatomy, pharmacology or physiology. It is required that a student contact and arrange for a faculty mentor prior to admission to the program. The objectives for the Ph.D. level training are to prepare the candidate for a career as an independent investigator (i.e., can compete for extramural private and federal funds as the principal investigator).

Training and Professional Development Opportunities

n/a

Post-Graduate Employment Opportunities

Post-Doctoral Fellow at Higher Education Institutions, Industry (e.g. pharmaceutical, biotech)

Post-Graduate Career Placements

Post-Doctoral Fellow at Higher Education Institutions, faculty at Higher Education Institutions, Industry (e.g. pharmaceutical, biotech)

Contact Information

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R Brown, Murali Chandra, Krzysztof Czaja, Wenji Dong, Samantha Gizerian, Joseph Harding, Barbara Ingermann, Heiko Jansen, Iliia Karatsoreos, James Krueger, David Lin, Ruth Newberry, Jaak Panksepp, James Peters, Robert Ritter, W Ritter, Steve Simasko, Bryan Slinker, Leslie Sprunger, Bertrand Tanner, Michael Varnum, Anita Vasavada, Gary Wayman, Suzanne Wayman and Jun Xu.

MBIOS

303 Introductory Biochemistry 4 Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

STAT

412 Statistical Methods in Research I 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.

443 Applied Probability 3 Course Prerequisite: MATH 172 or MATH 182; MATH 220 or MATH 230. Axioms of probability theory; random variables; expectation; generating function; law of large numbers; central limit theorem; Markov chains. (Cross-listed course offered as STAT 443, MATH 443).

V PH

308 Functional Anatomy of Domestic Animals 4 (3-3) Course Prerequisite: BIOLOGY 107; junior standing. Macroscopic functional morphology of domestic animals.

499 Special Problems V 1-4 May be repeated for credit. Independent study conducted under the jurisdiction of an approving faculty member; may include independent research studies in technical or specialized problems; selection and analysis of specified readings; development of a creative project; or field experiences.

501 Cell Biology 3 Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.

503 Advanced Molecular Biology I 3 DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.

504 Advanced Molecular Biology II 3 Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.

505 Cell Biology of Disease 3 Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.

- 507 Critical Analysis of Scientific Literature 2** Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.
- 508 Quantitative Approaches in Molecular Biosciences 2** Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.
- 513 General Biochemistry 3** Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.
- 514 General Biochemistry 3** Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.
- 528 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 529 Selected Topics in Cell Biology 1** Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.
- 540 Immunology 3** Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 541 Research Seminar 1** May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.
- 542 General Virology 3** The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.
- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 509 Affective Neuroscience 3** Brain mechanisms of human and animal emotions. Credit not granted for both NEUROSCI 409 and NEUROSCI 509.
- 520 Fundamentals of Neuroscience 4 (3-3)** Functional aspects of the brain from cell membrane to higher integrative processes.
- 521 Introduction to Veterinary Neurology 3 (2-3)** Course Prerequisite: VET MED 510. Neuroanatomical and neurophysiological bases of veterinary neurology, emphasizing central and peripheral sensory and motor systems. (Cross-listed course offered as VET MED 521, NEUROSCI 521).
- 526 Domestic and Exotic Animal Behavior 2 (1-3)** Course Prerequisite: Veterinary Medicine student. Advanced study of animal behavior, emphasizing difference between exotic and domestic animal behavior. (Cross-listed course offered as VET MED 526, NEUROSCI 526).
- 529 Integrative Neuroscience 3** Basic biochemical processes in the nervous system and their significance for normal and abnormal function.
- 531 Neuroscience Laboratory Rotation 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Fourteen-week rotation through each of two research laboratories; learning procedures and techniques in neuroscience.
- 540 Special Topics in Integrative Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience involving integrative properties of cell systems.
- 541 Special Topics in Cellular and Molecular Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve nerve cell function and regulation.
- 542 Special Topics in Interdisciplinary Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that revolve around traditional approaches to nervous system study.
- 543 Special Topics in Behavioral/Clinical Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve normal and pathological aspects of behavior.
- 590 Seminar 1** May be repeated for credit; cumulative maximum 7 hours. Presented by advanced graduate students and faculty (both in VCAPP and around WSU) on their research areas.
- 592 Research Writing and Seminar 3** May be repeated for credit; cumulative maximum 6 hours. Written and oral communication of scientific information; formal instruction while preparing research proposals and departmental seminar.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.

- 512 Correlation, Regression, and Quasi-Experimental Design 3**
Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3**
May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.
- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
- 538 Child Therapy Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with children and families.
- 539 Intellectual and Neuropsychological Assessment 3** Course Prerequisite: Ph.D. student in Psychology. Psychometric theory, theories of intelligence, methods of appraising intelligence in children and adults, and development of testing and interpretive skills.
- 542 Child and Adolescent Psychopathology 3** Theoretical and empirical approaches to etiology and diagnosis of mental disorders in children.
- 543 Child Clinical Psychology: Empirical Approaches to Assessment and Therapy 3** Course Prerequisite: Ph.D. student in Psychology. Research on child assessment and therapy.
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- 545 Psychology Clinic Assessment and Psychotherapy Practicum 3 (0-9)** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology with adults in the Psychology Clinic.
- 546 Counseling Service Practicum V 1-3** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Counseling Service.
- 547 Medical Psychology Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at the WSU Health and Wellness Service.
- 548 Clinical Externship V 1-3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: Ph.D. student in Psychology. Supervised practice in the clinical application of psychology at approved hospitals and medical practices.
- 550 Social Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Attitude structure, function, and change; social cognition and motivation, and attributions.
- 552 Diversity Issues in Psychology 3** Course Prerequisite: Ph.D. student in Psychology. Research, theories, and controversies regarding the role of human diversity in psychotherapy, psychological assessment, and clinical research.
- 574 Clinical and Experimental Biopsychology 3** Course Prerequisite: Ph.D. student in Psychology. Neuroanatomical, neurochemical, and other biological cases of human and animal behavior.
- 575 Foundations of Neuropsychology 3** Course Prerequisite: Ph.D. student in Psychology. Foundations in brain/behavior relationships and neuropathological syndromes; preparation for advanced training in neuropsychological assessment.
- 577 Behavioral Pharmacology 3** Survey of drugs which affect brain function with emphasis on animal models and clinical applications. Recommended preparation: PSYCH 574 or NEUROSCI 520.
- 584 Sensory Bases of Behavior 3** Sensory and physiological aspects of vision, audition, and other senses.
- 591 Principles of Learning 3** Principles of learning from a behavioral perspective using the experimental analysis of behavior. Credit not granted for both PSYCH 491 and 591. Recommended preparation: PSYCH 105.

- 592 Cognition and Affective Basis of Behavior** 3 Course Prerequisite: Ph.D. student in Psychology. Experimental approaches to human information processing, memory, and cognition.
- 595 Clinical Internship in Psychology** V 2-16 May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Clinical training in an internship approved by American Psychological Association or by WSU.
- 600 Special Projects or Independent Study** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 702 Master's Special Problems, Directed Study and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination** V 1-18 May be repeated for credit. Course Prerequisite: Ph.D. student in Psychology. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data** 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology** 3 Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists** 3 Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models** 3 (2-2) The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models** 3 Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis** 3 Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing** 3 (2-3) Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes** 3 Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.

- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

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Veterinary Science – Veterinary and Comparative Anatomy, Pharmacology & Physiology

Degree offered: Master of Science in Veterinary Science

Faculty working with graduate students: 24

Program offered: Pullman, Spokane, Vancouver

Tests required: GRE (Combined), TOEFL

Deadline: Fall: December 31

Spring: December 31

Requirements

Transcripts, 3 letters of reference, resume or curriculum vita, personal statement describing why the student is interested in studying Neuroscience and a writing sample. Application review begins 12/31 each year.

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Training and Professional Development Opportunities

n/a

Post-Graduate Employment Opportunities

Graduate education at the PhD level, Industry.

Post-Graduate Career Placements

Graduate education at the PhD level, Industry.

Contact Information

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R Brown, Murali Chandra, Krzysztof Czaja, Wenji Dong, Yan Dong, Joseph Harding, Barbara Ingermann, Heiko Jansen, James Krueger, David Lin, Ruth Newberry, Jaak Panksepp, David Rector, Robert Ritter, W Ritter, Steve Simasko, Bryan Slinker, Leslie Sprunger, Catherine Ulibarri, Michael Varnum, Anita Vasavada, Gary Wayman, Suzanne Wayman and Jun Xu.

MBIOS

303 Introductory Biochemistry 4 Course Prerequisite: CHEM 102 or 345. Modern biochemistry for undergraduates in the biological sciences.

NEURO

403 Cellular Neurobiology 3 Course Prerequisite: NEUROSCI 301 or NEUROSCI 302; MBIOS 303; certified Neuroscience major or minor. Cellular and molecular interactions occurring within the nervous system.

404 Neuroanatomy 4 (3-3) Course Prerequisite: NEUROSCI 301 or NEUROSCI 302. Fundamental principles of the organization and plans of circuitry of the nervous system.

STAT

412 Statistical Methods in Research I 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.

443 Applied Probability 3 Course Prerequisite: MATH 172 or MATH 182; MATH 220 or MATH 230. Axioms of probability theory; random variables; expectation; generating function; law of large numbers; central limit theorem; Markov chains. (Cross-listed course offered as STAT 443, MATH 443).

501 Cell Biology 3 Cellular structure and function; membrane biochemistry and transport; cell-cell communication; regulation of cell cycle and apoptosis; cell signaling; cancer biology. Credit not granted for both MBIOS 401 and MBIOS 501. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 529 highly recommended.

503 Advanced Molecular Biology I 3 DNA replication and recombination in prokaryotes and eukaryotes; recombinant DNA methods and host/vector systems; genome analysis; transgenic organisms. Recommended preparation: Introductory genetics and biochemistry coursework.

504 Advanced Molecular Biology II 3 Gene expression and regulation in prokaryotes and eukaryotes, including transcription, RNA processing, and translation; chromatin structure; DNA repair. Recommended preparation: Introductory genetics and biochemistry coursework.

505 Cell Biology of Disease 3 Course Prerequisite: MBIOS 301; MBIOS 303. Discussion of human diseases characterized by cell biological defects, using popular press and research articles as a source of information. Credit not granted for both MBIOS 405 and 505.

507 Critical Analysis of Scientific Literature 2 Course Prerequisite: MBIOS 503; MBIOS 513 or concurrent enrollment. Dissection and discussion of current molecular bioscience papers to foster development of critical reading of primary literature.

508 Quantitative Approaches in Molecular Biosciences 2 Quantitative methods and techniques using examples from the current molecular biosciences primary literature. Recommended preparation: One semester of calculus.

513 General Biochemistry 3 Structure and function of proteins, nucleic acids and biological membranes; principles of enzymology; biochemical methodology. Credit not granted for both MBIOS 413 and MBIOS 513. Recommended preparation: Introductory biochemistry coursework.

514 General Biochemistry 3 Course Prerequisite: MBIOS 513. Metabolism of carbohydrates, proteins, fats, bioenergetics; photosynthesis; control of metabolic processes. Credit not granted for both MBIOS 414 and MBIOS 514.

528 Molecular and Cellular Reproduction 3 (2-2) State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).

529 Selected Topics in Cell Biology 1 Selected topics in cell biology using current literature. Recommended preparation: Concurrent enrollment with MBIOS 501 highly recommended.

540 Immunology 3 Principles of basic immunology. Credit not granted for both MBIOS 440 and MBIOS 540. Recommended preparation: Introductory microbiology coursework; concurrent enrollment with MBIOS 548 highly recommended.

541 Research Seminar 1 May be repeated for credit; cumulative maximum 2 hours. Literature reviews and research reports.

542 General Virology 3 The biology of bacterial, animal, and plant viruses. Credit not granted for both MBIOS 442 and MBIOS 542. Recommended preparation: Introductory genetics and biochemistry coursework; concurrent enrollment with MBIOS 548 highly recommended.

- 548 Selected Topics in Immunology & Virology 1** May be repeated for credit. Selected topics in immunology and virology using the current literature. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: Concurrent enrollment with MBIOS 540 or 542.
- 549 Seminar in Immunology 1** May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment.
- 550 Microbial Physiology 3** Basic microbial physiology and its relevance to the processes of applied microbiology. Credit not granted for both MBIOS 450 and MBIOS 550. Recommended preparation: Introductory genetics, biochemistry or microbiology coursework.
- 561 Biochemical Signaling in Plants, Animals and Microorganisms 3** Course Prerequisite: MBIOS 513. New research on intra and extra cellular biochemical signaling, including communication in plants and hormone action in animals. (Cross-listed course offered as MBIOS 561, MPS 561).
- 566 Physical Biochemistry 3** Techniques for the study of biological structure and function; spectroscopy, magnetic resonance, diffusion, sedimentation, electron microscopy, diffraction and scattering. Credit not granted for both MBIOS 466 and MBIOS 566. Recommended preparation: Introductory biophysical or physical chemistry coursework.
- 568 Advanced Topics in Molecular Biosciences V 1-3** May be repeated for credit. Course Prerequisite: MBIOS 513 or concurrent enrollment. Recent research in selected areas of molecular biosciences.
- 574 Protein Biotechnology 3** Biotechnology related to the isolation, modification and large scale commercial production, patenting and marketing of useful recombinant proteins and products. (Cross-listed course offered as MBIOS 574, CHE 574). Recommended preparation: MBIOS 513.
- 578 Bioinformatics 3 (2-3)** Computer analysis of protein and nucleic acid sequences, functional genomics and proteomics data; modeling biological networks and pathways. Credit not granted for both MBIOS 478 and MBIOS 578. Recommended preparation: Introductory genetics or biochemistry coursework.
- 579 Molecular Biosciences Seminar V 1-2** May be repeated for credit; cumulative maximum 10 hours. Required of all graduate students in molecular biosciences.
- 580 Science Information Literacy 2** Efficient methods to locate and effectively use a wide variety of information resources that will be useful in the work world.
- 583 Professional Skills Seminar 1** Covers many aspects of professionalism, including professional behavior, professional dress, and professional sensitivity in social settings.
- 584 Medical Genetics 3** The mechanisms of human heredity and how these mechanisms can influence human health.
- 593 Research Proposal 2** May be repeated for credit; cumulative maximum 4 hours. Written and oral presentation of an area in molecular biosciences. May be repeated for credit; cumulative maximum 4 hours.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 509 Affective Neuroscience 3** Brain mechanisms of human and animal emotions. Credit not granted for both NEUROSCI 409 and NEUROSCI 509.
- 520 Fundamentals of Neuroscience 4 (3-3)** Functional aspects of the brain from cell membrane to higher integrative processes.
- 521 Introduction to Veterinary Neurology 3 (2-3)** Course Prerequisite: VET MED 510. Neuroanatomical and neurophysiological bases of veterinary neurology, emphasizing central and peripheral sensory and motor systems. (Cross-listed course offered as VET MED 521, NEUROSCI 521).
- 526 Domestic and Exotic Animal Behavior 2 (1-3)** Course Prerequisite: Veterinary Medicine student. Advanced study of animal behavior, emphasizing difference between exotic and domestic animal behavior. (Cross-listed course offered as VET MED 526, NEUROSCI 526).
- 529 Integrative Neuroscience 3** Basic biochemical processes in the nervous system and their significance for normal and abnormal function.
- 531 Neuroscience Laboratory Rotation 1 (0-3)** May be repeated for credit; cumulative maximum 2 hours. Fourteen-week rotation through each of two research laboratories; learning procedures and techniques in neuroscience.
- 540 Special Topics in Integrative Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience involving integrative properties of cell systems.

- 541 Special Topics in Cellular and Molecular Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve nerve cell function and regulation.
- 542 Special Topics in Interdisciplinary Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that revolve around traditional approaches to nervous system study.
- 543 Special Topics in Behavioral/Clinical Neuroscience 3** May be repeated for credit; cumulative maximum 6 hours. Concepts and controversies in neuroscience that involve normal and pathological aspects of behavior.
- 590 Seminar 1** May be repeated for credit; cumulative maximum 7 hours. Presented by advanced graduate students and faculty (both in VCAPP and around WSU) on their research areas.
- 592 Research Writing and Seminar 3** May be repeated for credit; cumulative maximum 6 hours. Written and oral communication of scientific information; formal instruction while preparing research proposals and departmental seminar.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 502 Research Design V 1-3** May be repeated for credit; cumulative maximum 16 hours. Course Prerequisite: Ph.D. student in Psychology. Research design, equipment, data collection, data analysis, and report writing.
- 504 History of Psychology: Theoretical and Scientific Foundations 3** Course Prerequisite: Ph.D. student in Psychology. Roots of scientific explanation in psychology traced through various philosophical schools and psychological movements.
- 505 Teaching Introductory Psychology V 1-3** May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Ph.D. student in Psychology. Problems and techniques related to teaching introductory psychology.
- 506 Current Research in Psychology 1** May be repeated for credit; cumulative maximum 2 hours. Course Prerequisite: Ph.D. student in Psychology. Current research being conducted by psychology faculty and members of associated departments.
- 508 Special Topics in Psychology V 1-3** May be repeated for credit.
- 510 Introduction to Online Instruction 1** Course Prerequisite: Ph.D. student in Psychology. Instruction in teaching online courses addressing issues faced by instructors and students; students are mentored while teaching online.
- 511 Analysis of Variance and Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Parametric, nonparametric, repeated-measures, and multivariate ANOVA; planned comparisons; confidence intervals and power analysis; experimental design and variants.
- 512 Correlation, Regression, and Quasi-Experimental Design 3** Course Prerequisite: Ph.D. student in Psychology. Simple and multiple correlation and regression; time-series analysis; factor analysis; field research and quasi-experimental design.
- 513 Seminar in Quantitative Methods and Research Design 3** May be repeated for credit. Course Prerequisite: PSYCH 512. Advanced topics in specialized quantitative procedures and in design of research in psychology.
- 514 Psychometrics 3** Course Prerequisite: PSYCH 512. Scientific construction of behavioral assessment instruments, including validation and reliability; types of scales and responses; statistical scaling; test theory issues.
- 515 Multilevel and Synthesized Data 3** Course Prerequisite: PSYCH 512. Structural equation modeling, hierarchical linear modeling and meta-analysis and the software used to conduct these analyses.
- 516 Applied Structural Equation Modeling with Current Software 3** Course Prerequisite: PSYCH 514; PSYCH 515. Confirmatory factor analysis, path analysis, structural regression analysis, multilevel analysis and latent growth analysis with current software.
- 520 Empirical Approaches to Psychotherapy 3** Course Prerequisite: PSYCH 533. Major therapy systems, research on process and outcome of therapy.
- 530 Professional, Ethical, and Legal Issues 3** Course Prerequisite: Ph.D. student in Psychology. Application of professional, ethical, and legal issues in clinical psychology to such topics as confidentiality, dual-relationships, research, assessment, and intervention.
- 533 Adult Psychopathology 3** Course Prerequisite: Ph.D. student in Psychology. Theoretical and empirical approaches to diagnosis, etiology and treatment of mental disorders.
- 534 Clinical Psychopharmacology 3** Course Prerequisite: PSYCH 533 or COUN PSY 517. Classification, clinical application, and mechanisms of psychotherapeutic drugs used in the treatment of mental disorders.
- 535 Personality Assessment and Diagnosis 3** Course Prerequisite: Ph.D. student in Psychology. Diagnostic interviewing, conceptualization of clinical problems, case presentations, and treatment planning.

- 536 Measurement Theory and Personality Assessment 3** Course Prerequisite: By interview only. Psychometric theory, theories of personality, objective and projective methods of assessing personality, development of testing and interpretive skills.
- 537 Psychology Clinic Assessment Practicum 3** May be repeated for credit; cumulative maximum 18 hours. Course Prerequisite: PSYCH 539. Supervised practice in psychological assessment in the Psychology Clinic.
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- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
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- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
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- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Veterinary Clinical Training Program

Degree offered: Doctor of Philosophy (Veterinary Science)

Faculty working with graduate students: 14

Graduate students: 8

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

15 minimum graded credit hours if applicant already possesses a postgraduate degree (MS or DVM), students who do not have a postgraduate degree are required a minimum of 21 credit hours.

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The

college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The graduate program in the Department of Veterinary Clinical Sciences (VCS) at Washington State University is a plan of study leading to a doctoral degree, and to prepare the resident for certification in his/her area of clinical assignment. The objectives of the program are to promote high standards of scholarly creativity, proficiency in a clinical discipline and professional service, experience in teaching, and independent and critical research. Areas of service and research may include: internal medicine, cardiology, ophthalmology, anesthesiology, neurology, surgery, radiology, clinical pathology, theriogenology, equine exercise physiology, exotic animal medicine, epidemiology, mastitis, and production medicine.

Training and Professional Development Opportunities

n/a

Post-Graduate Employment Opportunities

n/a

Contact Information

Theresa Pfaff

Program Specialist 2

Veterinary Clinical Sciences

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Faculty

Andrew Allen, George Barrington, Margaret Davis, James Evermann, Lawrence Fox, John Gay, Ramanathan Kasimanickam, Katrina Mealey, Mushtaq Memon, Kathy Seino, Debra Sellon, Rance Sellon, William Sischo and Ahmed Tibary.

STAT

412 Statistical Methods in Research I 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
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- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
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- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 565 Oncology Journal Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Small group discussion of veterinary literature, peer-reviewed literature and textbooks covering biological basis of cancer diagnosis, therapy and treatment.
- 570 Special Topics 1** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussions of problems in clinical veterinary medicine, surgery, or reproductive sciences using current literature and recent cases from Veterinary Teaching Hospital.
- 573 Special Topics in Equine Surgery 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Small group discussion and periodic laboratory/practical experience related to large animal surgery.
- 574 Cardiology Special Topics 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Clinical cardiology topics and special problems; current medical or interventional information.
- 576 Introduction to Veterinary Clinical Research 2** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Designing, executing, analyzing and reporting clinical research fundamental to practicing evidence-based medicine.
- 577 Applied Veterinary Physiology I 2 (0-2)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Review of physiology as it relates to clinical veterinary medicine and specific diseases of animals through analysis of recent medical literature.
- 578 Applied Veterinary Physiology II 2** Course Prerequisite: VET CLIN 577; admission to the MS or PhD in Veterinary Science program. Continuation of VET CLIN 577.
- 579 Oncology Rounds Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Presentation and discussion of veterinary oncology cases include imaging, pathology, clinical pathology, appropriate diagnostic steps, therapy options and potential outcomes.
- 580 Advanced Clinical Pathology 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion of laboratory and cytologic abnormalities in recent cases from the Veterinary Teaching Hospital.
- 582 Seminar in Clinical Medicine 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program.
- 584 Comparative Theriogenology V 1-2** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Lectures from WSU College of Veterinary Medicine and Department of Animal Sciences and from UI Department of Animal and Veterinary Sciences.
- 585 Selected Topics in Advanced Clinical Neurology V 1-2** May be repeated for credit; cumulative maximum 10 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced veterinary neurology as applied to clinical practice.
- 586 Diagnostic Ultrasound 2** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Diagnostic ultrasound and its application to clinical medicine in large and small animals.
- 587 Hospital Rotation 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised practical experience in all service areas of the veterinary hospital.
- 589 Advanced Clinical Veterinary Medicine V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Special topics.
- 590 Special Topics in Equine Medicine 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion of problems in equine medicine, surgery or reproductive medicine using current or recent case material from the Veterinary Teaching Hospital.
- 591 Advanced Clinical Diagnosis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced course in systems clinical and laboratory examination.
- 592 Seminar 1** May be repeated for credit.
- 593 Anesthesia Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Critical review of current topics in veterinary anesthesia.
- 596 Advanced Radiology 2 (1-3)** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced study in the field of veterinary radiology and radiation treatment.
- 597 Diagnosis and Treatment of Surgically Correctable Soft Tissue Diseases in Small Animals V 1-2** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Review of recent advances in diagnosis and treatment of diseases in the field of small animal surgery.
- 598 Surgery Residents Seminar 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Surgery residents' and interns' presentations of case reports, literature reviews and research.

- 599 Critical Analysis of Veterinary Medicinal Information: Illusional Medicine 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion, lecture and critical analysis of medical information.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
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Veterinary Science – Veterinary Clinical Training Program

Degree offered: Master of Science in Veterinary Science

Faculty working with graduate students: 14

Graduate students: 21

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: July 1

Requirements

In addition to course requirements, each student will be required to submit a minimum of one manuscript for publication to a peer-reviewed veterinary medical, human medical or basic science journal. This manuscript should be representative of some aspect of the specialty emphasis of that program. Courses: Required 2 semesters VET_CLIN 582 and additional 3 semesters of VET_CLIN 582 or alternate seminar course where oral presentation is required. Required STAT 412 or VPH 505.

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The graduate program in the Department of Veterinary Clinical Sciences (VCS) at Washington State University is a plan of study leading to a master's degree and to prepare the resident for certification in his/her area of clinical assignment. The objectives of the program are to promote high standards of scholarly creativity, proficiency in a clinical discipline and professional service, experience in teaching, and independent and critical research. Areas of service and research may include: internal

medicine, cardiology, ophthalmology, anesthesiology, neurology, surgery, radiology, clinical pathology, theriogenology, equine exercise physiology, exotic animal medicine, epidemiology, mastitis, and production medicine.

Training and Professional Development Opportunities

n/a

Post-Graduate Employment Opportunities

n/a

Contact Information

Theresa Pfaff
Program Specialist 2
Veterinary Clinical Sciences
P.O. Box 646610
Pullman, WA 99164-6610
Telephone: 509-335-0738
Fax: 509-335-0880
E-mail: tpfaff@vetmed.wsu.edu

Faculty

Andrew Allen, George Barrington, Margaret Davis, James Evermann, Lawrence Fox, John Gay, Ramanathan Kasimanickam, Katrina Mealey, Mushtaq Memon, Kathy Seino, Debra Sellon, Rance Sellon, William Sischo and Ahmed Tibary.

STAT

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- 548 Statistical Theory I** 3 Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II** 3 Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.

- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
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- 577 Applied Veterinary Physiology I 2 (0-2)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Review of physiology as it relates to clinical veterinary medicine and specific diseases of animals through analysis of recent medical literature.
- 578 Applied Veterinary Physiology II 2** Course Prerequisite: VET CLIN 577; admission to the MS or PhD in Veterinary Science program. Continuation of VET CLIN 577.
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- 584 Comparative Theriogenology V 1-2** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Lectures from WSU College of Veterinary Medicine and Department of Animal Sciences and from UI Department of Animal and Veterinary Sciences.
- 585 Selected Topics in Advanced Clinical Neurology V 1-2** May be repeated for credit; cumulative maximum 10 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced veterinary neurology as applied to clinical practice.
- 586 Diagnostic Ultrasound 2** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Diagnostic ultrasound and its application to clinical medicine in large and small animals.
- 587 Hospital Rotation 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised practical experience in all service areas of the veterinary hospital.
- 589 Advanced Clinical Veterinary Medicine V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Special topics.

- 590 Special Topics in Equine Medicine 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion of problems in equine medicine, surgery or reproductive medicine using current or recent case material from the Veterinary Teaching Hospital.
- 591 Advanced Clinical Diagnosis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced course in systems clinical and laboratory examination.
- 592 Seminar 1** May be repeated for credit.
- 593 Anesthesia Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Critical review of current topics in veterinary anesthesia.
- 596 Advanced Radiology 2 (1-3)** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced study in the field of veterinary radiology and radiation treatment.
- 597 Diagnosis and Treatment of Surgically Correctable Soft Tissue Diseases in Small Animals V 1-2** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Review of recent advances in diagnosis and treatment of diseases in the field of small animal surgery.
- 598 Surgery Residents Seminar 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Surgery residents' and interns' presentations of case reports, literature reviews and research.
- 599 Critical Analysis of Veterinary Medicinal Information: Illusional Medicine 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion, lecture and critical analysis of medical information.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Veterinary Science – Veterinary Clinical Training Program

Degree offered: Master of Science in Veterinary Science – Non Thesis

Faculty working with graduate students: 14

Graduate students: 6

Graduate students receiving assistantships or scholarships: 100%

Tests required: TOEFL, TOEFLI

Deadline: Fall:

Spring:

Program Description

The College of Veterinary Medicine offers degrees leading to the MS and PhD (in addition to the professional DVM degree). The college is composed of two schools and three departments: the Paul G. Allen School for Global Animal Health, the School of Molecular Biosciences, the Department of Veterinary Clinical Sciences, the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology, and the Department of Veterinary Microbiology and Pathology. Each unit offers specialization in fields such as anatomy, cell biology, genetics, epidemiology, immunology, microbiology, and infectious diseases, pharmacology, physiology, reproductive biology, and structural biology. The School of Molecular Biosciences also offers a Professional Master's in Science program. Post-DVM clinical residents may specialize in areas such as anatomic and clinical pathology, anesthesiology, cardiology, clinical microbiology, internal medicine, neurology, ophthalmology, radiology, surgery, and theriogenology. For more information, please see the specific programs.

Degree Description

The graduate program in the Department of Veterinary Clinical Sciences (VCS) at Washington State University is a plan of study leading to a non-thesis master's degree and to prepare the Resident for certification in his/her area of clinical assignment. The objectives of the program are to promote high standards of scholarly creativity, proficiency in a clinical discipline and professional service, experience in teaching, and independent and critical research. Areas of service and research may include: internal medicine, cardiology, ophthalmology, anesthesiology, neurology, surgery, radiology, clinical pathology, theriogenology, equine exercise physiology, exotic animal medicine, epidemiology, mastitis, and production medicine.

Training and Professional Development Opportunities

n/a

Post-Graduate Employment Opportunities

n/a

Contact Information

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STAT

- 412 Statistical Methods in Research I** 3 Course Prerequisite: STAT 212, MATH 140, 171, or 202. Intermediate statistical methods, design and analysis of research studies: completely randomized and randomized block designs, multiple regression, categorical data analysis.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics** 3 May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments** 3 (2-2) Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series** 3 ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis** 3 Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotteling's T₂ and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data** 3 Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology** 3 Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists** 3 Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models** 3 (2-2) The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.

- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 565 Oncology Journal Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Small group discussion of veterinary literature, peer-reviewed literature and textbooks covering biological basis of cancer diagnosis, therapy and treatment.
- 570 Special Topics 1** May be repeated for credit; cumulative maximum 9 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussions of problems in clinical veterinary medicine, surgery, or reproductive sciences using current literature and recent cases from Veterinary Teaching Hospital.
- 573 Special Topics in Equine Surgery 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Small group discussion and periodic laboratory/practical experience related to large animal surgery.
- 574 Cardiology Special Topics 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Clinical cardiology topics and special problems; current medical or interventional information.
- 576 Introduction to Veterinary Clinical Research 2** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Designing, executing, analyzing and reporting clinical research fundamental to practicing evidence-based medicine.
- 577 Applied Veterinary Physiology I 2 (0-2)** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Review of physiology as it relates to clinical veterinary medicine and specific diseases of animals through analysis of recent medical literature.
- 578 Applied Veterinary Physiology II 2** Course Prerequisite: VET CLIN 577; admission to the MS or PhD in Veterinary Science program. Continuation of VET CLIN 577.
- 579 Oncology Rounds Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Presentation and discussion of veterinary oncology cases include imaging, pathology, clinical pathology, appropriate diagnostic steps, therapy options and potential outcomes.

- 580 Advanced Clinical Pathology 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion of laboratory and cytologic abnormalities in recent cases from the Veterinary Teaching Hospital.
- 582 Seminar in Clinical Medicine 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program.
- 584 Comparative Theriogenology V 1-2** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Lectures from WSU College of Veterinary Medicine and Department of Animal Sciences and from UI Department of Animal and Veterinary Sciences.
- 585 Selected Topics in Advanced Clinical Neurology V 1-2** May be repeated for credit; cumulative maximum 10 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced veterinary neurology as applied to clinical practice.
- 586 Diagnostic Ultrasound 2** Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Diagnostic ultrasound and its application to clinical medicine in large and small animals.
- 587 Hospital Rotation 3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Supervised practical experience in all service areas of the veterinary hospital.
- 589 Advanced Clinical Veterinary Medicine V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Special topics.
- 590 Special Topics in Equine Medicine 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion of problems in equine medicine, surgery or reproductive medicine using current or recent case material from the Veterinary Teaching Hospital.
- 591 Advanced Clinical Diagnosis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced course in systems clinical and laboratory examination.
- 592 Seminar 1** May be repeated for credit.
- 593 Anesthesia Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Critical review of current topics in veterinary anesthesia.
- 596 Advanced Radiology 2 (1-3)** May be repeated for credit; cumulative maximum 12 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Advanced study in the field of veterinary radiology and radiation treatment.
- 597 Diagnosis and Treatment of Surgically Correctable Soft Tissue Diseases in Small Animals V 1-2** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Review of recent advances in diagnosis and treatment of diseases in the field of small animal surgery.
- 598 Surgery Residents Seminar 1** May be repeated for credit. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Surgery residents' and interns' presentations of case reports, literature reviews and research.
- 599 Critical Analysis of Veterinary Medicinal Information: Illusional Medicine 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: Admission to the MS or PhD in Veterinary Science program. Weekly small group discussion, lecture and critical analysis of medical information.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: MS in Veterinary Science only. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Course Prerequisite: PhD in Veterinary Science only. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.

- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Zoology

Degree offered: Doctor of Philosophy (Zoology)

Faculty working with graduate students: 24

Graduate students: 18

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL, TOEFLI

Deadline: Fall: January 10

Spring: September 1

Requirements

Proposal defense Exit seminar

Program Description

The School of Biological Sciences offers a rigorous and competitive degree in Zoology. Students who complete this degree are successful in a broad variety of careers, including those in: research universities, teaching colleges, federal and state government and the private sector.

Degree Description

Our zoology students generally focus on research in the broad areas of ecology, evolution, systematics, molecular biology, and animal physiology.

Training and Professional Development Opportunities

Our program offers teaching training and grant writing courses. Other professional development opportunities include weekly reading groups, ecolunch meetings and a graduate student research symposium.

Post-Graduate Employment Opportunities

Most students continue into postdoctoral research positions. Other students pursue careers at community colleges or in Federal or

State governments.

Post-Graduate Career Placements

Faculty positions at Purdue University, Kansas State University, University of North Carolina, University of Massachusetts, University of Idaho, University of Wyoming, State University of NY at Oswego, and University of Puget Sound. Recent graduates also hold positions in the Federal Government, such as National Park Service, US Fish and Wildlife Service and Bureau of Land Management.

Contact Information

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Faculty

Jesse Brunner, Patrick Carter, Erica Crespi, Mark Dybdahl, Richard Gomulkiewicz, Donna Holmes, Brian Kemp, Raymond Lee, Jon Mallatt, Michelle McGuire, David Moffett, Ruth Newberry, Jeb Owen, Christine Portfors, Charles Robbins, Buel Rodgers, Hubertus Schwabl, Elissa Schwartz, Lisa Shipley, Michael Skinner, William Snyder, Andrew Storfer, Gary Thorgaard and Paul Verrell.

Animal Sciences

A S

- 500 Seminar in Animal Sciences 1** May be repeated for credit. Current developments in animal sciences.
- 501 Milk, Meat, and Methane: Contemporary Animal Production Issues 3** Provides knowledge and understanding of livestock issues that affect contemporary livestock production.
- 504 Special Topics V 1-4** May be repeated for credit; cumulative maximum 12 hours.
- 507 Advanced Nutrient Metabolism 3** Advanced topics in metabolic regulation of carbohydrate, fat and amino acid use by animals.
- 510 Digestion and Nutrient Utilization in Animals 3 (2-3)** Gastrointestinal physiology, rate of passage, feed intake regulation, measures of digestibility, starch, fat and nonstarch polysaccharide, and digestion and utilization of nutrients.
- 513 Mineral and Vitamin Metabolism 4** Absorption, excretion, metabolism, dietary requirements and interactions of minerals and vitamins in animals and humans.
- 520 Preparation of Scientific Literature in Animal Sciences 2** Preparation of grant proposals, manuscripts, and literature reviews on research topics.

- 528 Topics in Animal Breeding 2** May be repeated for credit; cumulative maximum 4 hours. Systems of selection and mating for genetic improvement in farm animals.
- 551 Endocrine Physiology 3** Anatomy, physiology, and biochemistry of endocrine systems and hormone action; emphasis on comparative, veterinary, and biomedical models. Credit not granted for both ANIM SCI 451 and ANIM SCI 551.
- 558 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 581 Stem Cell Biology, Therapeutics and Regenerative Medicine 3** Provides information on the latest cutting edge research in the areas of stem cell biology and tissue regeneration; covers stem cell therapeutics, gene transfer vectors and methods for isolating, characterizing, and generating stem cells. (Course offered as PHARMSCI 581, ANIM SCI 581).
- 582 Seminar in Reproductive Biology 1** Current developments in reproductive biology.
- 588 Perspectives in Biotechnology 3** Theory and application of biotechnology in agriculture, industry, and medicine; methodological, environmental, social, and economic concerns. Credit not granted for both ANIM SCI 488 and ANIM SCI 588.
- 598 Advanced Topics in Animal Sciences V 1-2** May be repeated for credit. Recent research in various disciplines of animal sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Animal Sciences**
- ANTH**
- 500 Field Methods V 2 (0-6) to 8 (0-24)** Course Prerequisite: By instructor permission. Training in gathering and analyzing field data.
- 501 Verification of Catalog Number 3** Verification of Catalog Number
- 504 Tribal Peoples and Development 3** Global and historic perspectives on the complex issues surrounding the problem of tribal peoples and development.
- 507 Advanced Studies in Culture Theory 3** May be repeated for credit; cumulative maximum 6 hours. Evaluation of major theories and methods and their relationship to problems in cultural-social analysis.
- 510 Fundamentals of Cultural Anthropology 3** Overview of basic concepts and theory in cultural anthropology based on in-depth analysis of selected theoretical and ethnographic materials.
- 513 Lithic Technological Organization 4 (3-3)** Methods and theory of lithic technology.
- 514 Ceramic Analysis 4 (3-3)** Basic concepts, methods, and approaches used in the analysis of archaeological pottery.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 521 Psychological Anthropology 3** Psychological and anthropological aspects of personhood, self, human development, gender, sexuality, emotion and cognition in various cultures.
- 528 Historical Ethnography 3** May be repeated for credit; cumulative maximum 9 hours. Culture history, ethnography, theoretical, and contemporary problems of selected culture areas.
- 529 Seminar in Ethnography 3** Methodological, stylistic and craft issues in the process and product of ethnography.
- 530 Archaeological Method and Theory 3** History of archaeological method and theory; analysis of current literature.
- 535 Cultural Resource Management 3** Role of archaeology in historic preservation and resource conservation; legal and institutional frameworks; research and interpretation in a CRM context.
- 537 Quantitative Methods in Anthropology 4 (3-3)** May be repeated for credit; cumulative maximum 8 hours. Sampling, exploratory data analysis, inferential statistics, and use of SAS in anthropological research with emphasis on archaeology.
- 539 Prehistory of the Southwest 3** Prehistory of the American Southwest; emphasis on Pueblo, Mogollon and Hohokam traditions and relationships to historic native groups.
- 540 Prehistory of the Northwest Coast 3** Prehistoric cultures, chronologies, and interrelationships on the northwest coast of North America.
- 543 Prehistory of the Plateau and Basin 3** Archaeology of the interior Northwest and Great Basin.
- 546 Complexity in Small Scale Societies 3** Seminar focused on classic literature and current issues relevant to complexity in small scale societies, predominately covering hunter-gatherer systems. Recommended preparation: ANTH 530.
- 547 Models and Simulation 3** Models and model-building as an anthropological approach to present and past cultures.
- 548 Hunters and Gatherers: Past and Present 3** Introduction to hunter-gatherer studies in anthropology and archaeology exploring uses of evolutionary approaches to modeling and reconstructing hunter-gatherer behavior in contemporary and prehistoric contexts.
- 549 Settlement and Agro-Pastoralism 3** Development of settled communities and food production through evaluation of their social, economic and spatial configurations. Recommended preparation: ANTH 530.

- 550 Descriptive Linguistics 3** Introduction to analysis and description of natural languages; phonological, syntactic, and semantic analysis of data from a variety of languages. (Cross-listed course offered as ANTH 450, FOR LANG 450).
- 554 Anthropological Field Methods Seminar 3** Elicitation, recording techniques and analysis of sociocultural and linguistic field data. Recommended preparation: ANTH 450 or 550.
- 561 Current Trends in Physical Anthropology 3** May be repeated for credit. Intensive review of major current trends in physical anthropology. Recommended preparation: ANTH 465.
- 562 Evolutionary Method and Theory in Anthropology and Archaeology 3** A graduate-level seminar-based course focusing on the evolutionary analysis of past and present human behavior.
- 563 Anthropology of Life and Death 3** Demography, dynamics of evolution, human ecology, and their relationships to the biology of living, historical, and archaeological populations. Credit not granted for both ANTH 463 and ANTH 563. Recommended preparation: ANTH 260.
- 564 Advances in Evolution and Human Behavior 3** Recent trends in the study of evolution and human behavior.
- 565 Human Evolution 3** Human origins in the light of the fossil record and evolutionary theory. Credit not granted for both ANTH 465 and ANTH 565. Recommended preparation: ANTH 260.
- 567 Primate Behavioral Ecology 3** Seminar-based course focusing on evolutionary analysis of primate behavior, morphology and ecology.
- 569 Evolutionary Cultural Anthropology 3** Evolutionary nature of culture and its interactions with human biology (genes) and ecology.
- 570 Sediments in Geoarchaeology 4 (3-3)** Sediment-forming processes, sedimentological techniques, reconstruction of Quaternary environments, and sedimentology of site-forming processes.
- 573 Zooarchaeology 4 (2-6)** Identification of animal bones from archaeological sites, methodological and theoretical techniques for interpreting faunal remains.
- 576 Palynology 4 (3-3)** Pollen and spore morphology, evolution, production, dispersal, and preservation; index fossils, dating, archaeology, and vegetational history. Field trip required.
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 591 Special Topics in Anthropology 3** May be repeated for credit; cumulative maximum 9 hours. Examination of current areas of anthropological theory and research.
- 593 Publishing and Professional Communication 3** Preparation of original research reports; survey of types of professional communication, and of standards and techniques.
- 596 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 598 Advanced Anthropology Internship V 1-15** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: By instructor permission. Participation as archaeological or cultural anthropological intern in public or private sectors; requires special arrangement with faculty advisor.
- 599 Archaeological Field School V 2-8** Course Prerequisite: By instructor permission. Training in methods of archaeological data recovery and analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Animal Sciences**
- BIOL**
- 500 Seminar 1** May be repeated for credit.
- 501 Proposal Defense Seminar 2** Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.
- 504 Experimental Methods in Plant Physiology 3 (2-3)** Advanced techniques and instrumental methods applicable to research in plant physiology.
- 509 Plant Anatomy 4 (2-6)** Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.
- 512 Molecular Mechanisms of Plant Development 3** Physiology of growth; metabolism during development and reproduction.
- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.

- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.
- 533 Modern Methods in Phylogenetics 4 (2-6)** Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3 (2-3)** Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2 (0-6)** Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)** Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.
- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.
- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.

- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.
- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Animal Sciences

E MIC

- 586 Special Projects in Electron Microscopy V 2 (0-6) to 3 (0-9)** May be repeated for credit. Practical training in one or more areas of electron microscopy; TEM, SEM, ultramicrotomy, specimen processing; confocal fluorescent microscopy.
- 587 Special Topics in Electron Microscopy 1** May be repeated for credit; cumulative maximum 4 hours.

Natural Resource Sciences

NATRS

- 519 Advanced Topics V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 535 Wildlife Ecology 4 (3-3)** The ecology of wildlife species and the contributing biological processes. Overnight field trip required.
- 550 Conservation Biology 3** Patterns of biological diversity, factors producing changes in diversity, values of diversity, management principles applied to small populations, protected areas, landscape linkages, biotic integrity, restoration, legal issues and funding sources. Credit not granted for both NATRS 450 and NATRS 550.
- 554 Restoration Ecology 3 (2-3)** Ecological principles used to restore biological communities; ecological processes and species on degraded landscapes. Credit not granted for both NATRS 454 and NATRS 554.
- 556 Foraging Ecology of Herbivores 2** Synthesis of foraging behavior concepts including nutritive quality of forages, digestive and metabolic constraints, and diet and habitat selection.
- 560 Watershed Management 3** Principles and practices of management of forest and rangelands for protection, maintenance, and improvement of water resource values. Field trip required. Recommended preparation: NATRS 204 or sufficient background in spreadsheets.
- 564 Landscape Ecology 3 (2-3)** Linkages between spatial patterns and processes in a variety of landscapes and the qualitative tools used in the investigation of these linkages. Credit not granted for both NATRS 464 and NATRS 564.
- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 595 Seminar in Natural Resource Sciences 1** May be repeated for credit. Literature review; preparation and presentation of reports in natural resource sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Natural Resource Sciences

SOILS

- 501 Seminar 1** May be repeated for credit. Presentation of research information.

- 502 Advanced Topics in Soils V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V** 1-3 May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum** 1 May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics** 3 Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development** 2 Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics** 3 (2-3) Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics** 2 Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory** 1 (0-3) Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils** 3 Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology** 3 (2-3) Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes** 2 Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions** 3 Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems** 3 Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management** 3 Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis** 4 (2-6) Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis** 3 (1-4) Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V** 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

STAT

- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.
- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

702 Master's Special Problems, Directed Study, and/or Examination V 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Natural Resource Sciences

V PH

505 Design and Analysis of Biomedical Experiments 4 Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.

555 General and Cellular Physiology 4 (3-3) Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.

600 Special Projects or Independent Study V 1-18 May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Zoology

Degree offered: Master of Science in Zoology

Faculty working with graduate students: 24

Graduate students: 9

Graduate students receiving assistantships or scholarships: 100%

Tests required: GRE (Combined), TOEFL

Deadline: Fall: January 10

Spring: September 1

Requirements

Exit seminar

Program Description

The School of Biological Sciences offers a rigorous and

competitive degree in Zoology. Students who complete this degree are successful in a broad variety of careers, including those in: research universities, teaching colleges, federal and state government and the private sector.

Degree Description

Our zoology students generally focus on research in the broad areas of ecology, evolution, systematics, molecular biology, and animal physiology.

Training and Professional Development Opportunities

Our program offers college teaching training, as well as a grant writing seminar. Training opportunities also exist through numerous reading groups, a biology graduate research symposium, an ecolunch and frequent seminars.

Post-Graduate Employment Opportunities

Many students that complete MS degrees in Zoology go on to PhD programs at competitive universities. Others teach at community colleges or private schools. Some also work for federal and state agencies, as well as in the private sector.

Post-Graduate Career Placements

Former MS students in Zoology are now in careers with the US Forest Service, NOAA and the US Geological Survey. Other recent graduates are private consultants, professional writers and some work at zoos.

Contact Information

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Faculty

Jesse Brunner, Patrick Carter, Erica Crespi, Mark Dybdahl, Richard Gomulkiewicz, Donna Holmes, Brian Kemp, Raymond Lee, Jon Mallatt, Michelle McGuire, David Moffett, Ruth Newberry, Jeb Owen, Christine Portfors, Charles Robbins, Buel Rodgers, Hubertus Schwabl, Elissa Schwartz, Lisa Shipley, Michael Skinner, William Snyder, Andrew Storfer, Gary Thorgaard and Paul Verrell.

Animal Sciences

A S

500 Seminar in Animal Sciences 1 May be repeated for credit. Current developments in animal sciences.

501 Milk, Meat, and Methane: Contemporary Animal Production Issues 3 Provides knowledge and understanding of live-stock issues that affect contemporary livestock production.

- 504 Special Topics V 1-4** May be repeated for credit; cumulative maximum 12 hours.
- 507 Advanced Nutrient Metabolism 3** Advanced topics in metabolic regulation of carbohydrate, fat and amino acid use by animals.
- 510 Digestion and Nutrient Utilization in Animals 3 (2-3)** Gastrointestinal physiology, rate of passage, feed intake regulation, measures of digestibility, starch, fat and nonstarch polysaccharide, and digestion and utilization of nutrients.
- 513 Mineral and Vitamin Metabolism 4** Absorption, excretion, metabolism, dietary requirements and interactions of minerals and vitamins in animals and humans.
- 520 Preparation of Scientific Literature in Animal Sciences 2** Preparation of grant proposals, manuscripts, and literature reviews on research topics.
- 528 Topics in Animal Breeding 2** May be repeated for credit; cumulative maximum 4 hours. Systems of selection and mating for genetic improvement in farm animals.
- 551 Endocrine Physiology 3** Anatomy, physiology, and biochemistry of endocrine systems and hormone action; emphasis on comparative, veterinary, and biomedical models. Credit not granted for both ANIM SCI 451 and ANIM SCI 551.
- 558 Molecular and Cellular Reproduction 3 (2-2)** State of the art concepts of the molecular, cellular, and physiological aspects of mammalian reproduction. (Cross-listed course offered as MBIOS 528, ANIM SCI 558).
- 581 Stem Cell Biology, Therapeutics and Regenerative Medicine 3** Provides information on the latest cutting edge research in the areas of stem cell biology and tissue regeneration; covers stem cell therapeutics, gene transfer vectors and methods for isolating, characterizing, and generating stem cells. (Course offered as PHARMSCI 581, ANIM SCI 581).
- 582 Seminar in Reproductive Biology 1** Current developments in reproductive biology.
- 588 Perspectives in Biotechnology 3** Theory and application of biotechnology in agriculture, industry, and medicine; methodological, environmental, social, and economic concerns. Credit not granted for both ANIM SCI 488 and ANIM SCI 588.
- 598 Advanced Topics in Animal Sciences V 1-2** May be repeated for credit. Recent research in various disciplines of animal sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Animal Sciences

ANTH

- 500 Field Methods V 2 (0-6) to 8 (0-24)** Course Prerequisite: By instructor permission. Training in gathering and analyzing field data.
- 501 Verification of Catalog Number 3** Verification of Catalog Number
- 504 Tribal Peoples and Development 3** Global and historic perspectives on the complex issues surrounding the problem of tribal peoples and development.
- 507 Advanced Studies in Culture Theory 3** May be repeated for credit; cumulative maximum 6 hours. Evaluation of major theories and methods and their relationship to problems in cultural-social analysis.
- 510 Fundamentals of Cultural Anthropology 3** Overview of basic concepts and theory in cultural anthropology based on in-depth analysis of selected theoretical and ethnographic materials.
- 513 Lithic Technological Organization 4 (3-3)** Methods and theory of lithic technology.
- 514 Ceramic Analysis 4 (3-3)** Basic concepts, methods, and approaches used in the analysis of archaeological pottery.
- 519 International Development and Human Resources 3** History of and recent changes in international development emphasizing anthropological perspectives. (Cross-listed course offered as ANTH 519, POL S 538, SOC 519).
- 521 Psychological Anthropology 3** Psychological and anthropological aspects of personhood, self, human development, gender, sexuality, emotion and cognition in various cultures.
- 528 Historical Ethnography 3** May be repeated for credit; cumulative maximum 9 hours. Culture history, ethnography, theoretical, and contemporary problems of selected culture areas.
- 529 Seminar in Ethnography 3** Methodological, stylistic and craft issues in the process and product of ethnography.
- 530 Archaeological Method and Theory 3** History of archaeological method and theory; analysis of current literature.
- 535 Cultural Resource Management 3** Role of archaeology in historic preservation and resource conservation; legal and institutional frameworks; research and interpretation in a CRM context.
- 537 Quantitative Methods in Anthropology 4 (3-3)** May be repeated for credit; cumulative maximum 8 hours. Sampling, exploratory data analysis, inferential statistics, and use of SAS in anthropological research with emphasis on archaeology.
- 539 Prehistory of the Southwest 3** Prehistory of the American Southwest; emphasis on Pueblo, Mogollon and Hohokam traditions and relationships to historic native groups.
- 540 Prehistory of the Northwest Coast 3** Prehistoric cultures, chronologies, and interrelationships on the northwest coast of North America.
- 543 Prehistory of the Plateau and Basin 3** Archaeology of the interior Northwest and Great Basin.

- 546 Complexity in Small Scale Societies 3** Seminar focused on classic literature and current issues relevant to complexity in small scale societies, predominately covering hunter-gatherer systems. Recommended preparation: ANTH 530.
- 547 Models and Simulation 3** Models and model-building as an anthropological approach to present and past cultures.
- 548 Hunters and Gatherers: Past and Present 3** Introduction to hunter-gatherer studies in anthropology and archaeology exploring uses of evolutionary approaches to modeling and reconstructing hunter-gatherer behavior in contemporary and prehistoric contexts.
- 549 Settlement and Agro-Pastoralism 3** Development of settled communities and food production through evaluation of their social, economic and spatial configurations. Recommended preparation: ANTH 530.
- 550 Descriptive Linguistics 3** Introduction to analysis and description of natural languages; phonological, syntactic, and semantic analysis of data from a variety of languages. (Cross-listed course offered as ANTH 450, FOR LANG 450).
- 554 Anthropological Field Methods Seminar 3** Elicitation, recording techniques and analysis of sociocultural and linguistic field data. Recommended preparation: ANTH 450 or 550.
- 561 Current Trends in Physical Anthropology 3** May be repeated for credit. Intensive review of major current trends in physical anthropology. Recommended preparation: ANTH 465.
- 562 Evolutionary Method and Theory in Anthropology and Archaeology 3** A graduate-level seminar-based course focusing on the evolutionary analysis of past and present human behavior.
- 563 Anthropology of Life and Death 3** Demography, dynamics of evolution, human ecology, and their relationships to the biology of living, historical, and archaeological populations. Credit not granted for both ANTH 463 and ANTH 563. Recommended preparation: ANTH 260.
- 564 Advances in Evolution and Human Behavior 3** Recent trends in the study of evolution and human behavior.
- 565 Human Evolution 3** Human origins in the light of the fossil record and evolutionary theory. Credit not granted for both ANTH 465 and ANTH 565. Recommended preparation: ANTH 260.
- 567 Primate Behavioral Ecology 3** Seminar-based course focusing on evolutionary analysis of primate behavior, morphology and ecology.
- 569 Evolutionary Cultural Anthropology 3** Evolutionary nature of culture and its interactions with human biology (genes) and ecology.
- 570 Sediments in Geoarchaeology 4 (3-3)** Sediment-forming processes, sedimentological techniques, reconstruction of Quaternary environments, and sedimentology of site-forming processes.
- 573 Zooarchaeology 4 (2-6)** Identification of animal bones from archaeological sites, methodological and theoretical techniques for interpreting faunal remains.
- 576 Palynology 4 (3-3)** Pollen and spore morphology, evolution, production, dispersal, and preservation; index fossils, dating, archaeology, and vegetational history. Field trip required.
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 591 Special Topics in Anthropology 3** May be repeated for credit; cumulative maximum 9 hours. Examination of current areas of anthropological theory and research.
- 593 Publishing and Professional Communication 3** Preparation of original research reports; survey of types of professional communication, and of standards and techniques.
- 596 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 598 Advanced Anthropology Internship V 1-15** May be repeated for credit; cumulative maximum 15 hours. Course Prerequisite: By instructor permission. Participation as archaeological or cultural anthropological intern in public or private sectors; requires special arrangement with faculty advisor.
- 599 Archaeological Field School V 2-8** Course Prerequisite: By instructor permission. Training in methods of archaeological data recovery and analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
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- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Animal Sciences**
- BIOL**
- 500 Seminar 1** May be repeated for credit.
- 501 Proposal Defense Seminar 2** Research proposal defense as part of the preliminary examination for candidacy in the Ph.D. program.

- 504 Experimental Methods in Plant Physiology 3 (2-3)** Advanced techniques and instrumental methods applicable to research in plant physiology.
- 509 Plant Anatomy 4 (2-6)** Developmental anatomy and morphology of vascular plants; economic forms. Credit not granted for both BIOLOGY 409 and BIOLOGY 509.
- 512 Molecular Mechanisms of Plant Development 3** Physiology of growth; metabolism during development and reproduction.
- 513 Plant Metabolism 3** Metabolic processes unique to plants, including the primary incorporation of nitrogen, sulfur, carbon dioxide and phosphate into bio-molecules.
- 514 Fish Genetics 2** Chromosomal, biochemical, quantitative, and ecological aspects of fish genetics with emphasis on applications to aquaculture and fish management.
- 517 Stress Physiology of Plants 3** Temperature, light, salinity, water effects on physiological processes; mechanistic understanding of stress.
- 519 Introduction to Population Genetics 3** Survey of basic population and quantitative genetics.
- 520 Conservation Genetics 2** Genetic studies and approaches relevant to efforts to conserve threatened and endangered populations of organisms.
- 521 Quantitative Genetics 3** Course Prerequisite: BIOLOGY 519. Fundamentals of quantitative genetics; evolutionary quantitative genetics.
- 531 Principles of Systematic Biology 3** Systematic theory; history and current views; approaches to phylogenetic analysis and classification.
- 533 Modern Methods in Phylogenetics 4 (2-6)** Selecting, gathering, and analyzing morphological, cytological, molecular data for phylogenetic and evolutionary studies.
- 537 Plant Cell Biology 3** Structure and function of plant cells including membrane biology, protein targeting and molecular signaling with emphasis on current research.
- 540 Stable Isotope Theory and Methods 3 (2-3)** Theory and practice of measuring stable isotope ratios of biologically important elements; training in the use of isotope mass spectrometers.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 548 Evolutionary Ecology of Populations 3** Evolutionary dynamics of natural populations and the co-evolution of species.
- 556 Biochemical Adaptation 3** Relationships between enzyme/macromolecule adaptation and animal performance.
- 559 Hormones, Brain and Behavior 3** Classical behavioral endocrinology from molecular to whole organisms, integrating evolutionary ecology, neuroethology and behavioral neuroendocrinology.
- 560 Plant Ecophysiology 3** Relationships of biotic and abiotic environment to plant distribution and evolution through study of physiological processes.
- 561 Environmental Physiology 3** Individual and evolutionary adaptations to changing environments with emphasis on recent literature.
- 562 Community Ecology 3** Assembly, essential properties, levels of interactions, succession, and stability of natural communities; emphasizes an experimental approach to community investigation. Credit not granted for both BIOLOGY 462 and BIOLOGY 562. Recommended preparation: BIOLOGY 372.
- 563 Field Ecology 2 (0-6)** Field implementation of descriptive and experimental techniques to quantify the structure, composition, and interactions within natural communities. Field trips required.
- 564 Molecular Ecology and Phylogeography 3** Use of genetic markers for the study of ecological phenomena, including kinship, population structure, and phylogeography.
- 565 Ecology and Evolution of Disease 3** Disease ecology and evolution with a focus on current literature. Recommended preparation: BIOLOGY 372; BIOLOGY 405.
- 566 Mathematical Genetics 3** Mathematical approaches to population genetics and genome analysis; theories and statistical analyses of genetic parameters. (Cross-listed course offered as MATH 563, BIOLOGY 566). Required preparation must include multivariate calculus, genetics, and statistics.
- 567 Ecological Restoration 3** Introduction to major issues in restoration ecology; major ecological dimensions of restoration.
- 568 Conservation Ecology 3** Prereq Graduate standing. Diagnosis of endangered species, population viability analysis, invasive species ecology, landscape ecology and ecosystem management.
- 569 Ecosystem Ecology and Global Change 3** Historic and current factors controlling the function of ecosystems and their responses to natural and human caused global change. (Cross-listed course offered as BIOLOGY 469, ENVR SCI 469, BIOLOGY 569, ENVR SCI 569). Credit not granted for both BIOLOGY 469 and 569, or ENVR SCI 469 and 569.
- 570 Diversity of Plants 3** Morphological, life history, and ecological diversity of major plant clades; emphasis on principles of homology, character transformation, and macroevolution.
- 572 Quantitative Methods and Statistics in Ecology 4 (3-3)** Course Prerequisite: By permission only. Philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.
- 573 Ancient DNA 3** The prospects and problems associated with the study of ancient DNA are explored through reading and discussing primary literature.
- 575 Systems Biology of Reproduction 3** Current literature based course on systems biology with a molecular/epigenetic to physiological level understanding of cell, development, disease, and evolutionary biology. Credit not granted for both BIOLOGY 475 and 575.

- 576 Epigenetics and Systems Biology 3** Current literature based course on epigenetics and systems biology with topics in environmental epigenetics, disease etiology, and role epigenetics in evolutionary biology. Credit not granted for both BIOLOGY 476 and 576.
- 579 Mathematical Modeling in the Biological and Health Sciences 3** Techniques, theory, and current literature in mathematical modeling in the biological and health sciences, including computational simulation. (Course offered as BIOLOGY 579, MATH 579).
- 581 Comparative Biology of Social Traditions 3** Phylogenetic and modeling perspectives used to examine the evolution of social learning and cultural transmission in humans and other animals. (Cross-listed course offered as ANTH 581, BIOLOGY 581).
- 582 Professional Communication in Biology - Grant Writing 2** Mechanics and style of publishing biological research and findings; adaptation of writing to various venues and audiences with emphasis on grant writing.
- 585 Professional Development and Training for College and University Teaching 2** Preparation for roles as teaching assistants and as instructors of undergraduate classroom education.
- 589 Advanced Topics in Biology V 1-3** May be repeated for credit; cumulative maximum 6 hours. Recent advances in biology.
- 591 Seminar in Molecular Plant Sciences 1** May be repeated for credit; cumulative maximum 4 hours. A cross-discipline seminar, including botany, crop and soils sciences, horticulture, plant pathology, and molecular plant sciences.
- 593 Seminar I 1** May be repeated for credit. Literature and problems.
- 597 Teaching Practicum V 1-4** May be repeated for credit; cumulative maximum 4 hours. Zoology laboratory teaching internship.
- 598 IPEM Seminar 1** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Symposia and project work sessions for the WSU/UW IGERT: Program in Evolutionary Modeling. (Cross-listed course offered as ANTH 596, BIOLOGY 598).
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Animal Sciences**
- E MIC**
- 586 Special Projects in Electron Microscopy V 2 (0-6) to 3 (0-9)** May be repeated for credit. Practical training in one or more areas of electron microscopy; TEM, SEM, ultramicrotomy, specimen processing; confocal fluorescent microscopy.
- 587 Special Topics in Electron Microscopy 1** May be repeated for credit; cumulative maximum 4 hours.
- Natural Resource Sciences**
- NATRS**
- 519 Advanced Topics V 1-3** May be repeated for credit; cumulative maximum 6 hours.
- 535 Wildlife Ecology 4 (3-3)** The ecology of wildlife species and the contributing biological processes. Overnight field trip required.
- 550 Conservation Biology 3** Patterns of biological diversity, factors producing changes in diversity, values of diversity, management principles applied to small populations, protected areas, landscape linkages, biotic integrity, restoration, legal issues and funding sources. Credit not granted for both NATRS 450 and NATRS 550.
- 554 Restoration Ecology 3 (2-3)** Ecological principles used to restore biological communities; ecological processes and species on degraded landscapes. Credit not granted for both NATRS 454 and NATRS 554.
- 556 Foraging Ecology of Herbivores 2** Synthesis of foraging behavior concepts including nutritive quality of forages, digestive and metabolic constraints, and diet and habitat selection.
- 560 Watershed Management 3** Principles and practices of management of forest and rangelands for protection, maintenance, and improvement of water resource values. Field trip required. Recommended preparation: NATRS 204 or sufficient background in spreadsheets.
- 564 Landscape Ecology 3 (2-3)** Linkages between spatial patterns and processes in a variety of landscapes and the qualitative tools used in the investigation of these linkages. Credit not granted for both NATRS 464 and NATRS 564.

- 594 Environmental and Natural Resources Issues and Ethics 3** Ethical systems applied to natural resources; issues of professionalism and ethics in natural resource management. (Cross-listed course offered as NATRS 594, ENVR SCI 594).
- 595 Seminar in Natural Resource Sciences 1** May be repeated for credit. Literature review; preparation and presentation of reports in natural resource sciences.
- 700 Master's Research, Thesis, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V 1-18** May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Natural Resource Sciences**
- SOILS**
- 501 Seminar 1** May be repeated for credit. Presentation of research information.
- 502 Advanced Topics in Soils V 1-3** May be repeated for credit; cumulative maximum 6 hours. Interpretation, presentation, and discussion of current research on soils, uses, and management.
- 503 Advanced Soil Analysis V 1-3** May be repeated for credit; cumulative maximum 6 hours. Course Prerequisite: By permission only. Soil research techniques; application of modern instrumentation to soil analysis.
- 505 Teaching Practicum 1** May be repeated for credit; cumulative maximum 4 hours. Supervised experience in classroom teaching; classroom preparation for lectures, discussions, laboratories; preparation and grading of exams.
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 511 Research Proposal and Development 2** Develop research proposal and give oral presentation to demonstrate ability to employ strategy and procedures to address objectives. (Cross-listed course offered as CROP SCI 511, SOIL SCI 511).
- 513 Environmental Soil Physics 3 (2-3)** Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Recommended preparation: SOIL SCI 201 and general physics.
- 514 Environmental Biophysics 2** Physical environment of living organisms (temperature, humidity, radiation, wind); heat and mass exchange and balance in plant and animal systems. Recommended preparation: Introductory biology, physics, and calculus.
- 515 Environmental Biophysics Laboratory 1 (0-3)** Course Prerequisite: Soil Sci 514 or concurrent enrollment. Experimental methods and procedures in environmental measurements; temperature, wind, radiation, and humidity measurements in biological environments.
- 521 Physical Chemistry of Soils 3** Chemical equilibrium and kinetics of soil solution speciation, mineral precipitation and dissolution, adsorption and partitioning reactions, and ion exchange. Soil constituents; soil solutions: mineral equilibria; absorption reactions; acid/base reactions; oxidation-reduction; soil contaminants.
- 531 Soil Microbiology 3 (2-3)** Biology and significance of organisms inhabiting soil and their role in nutrient cycling, ecosystem function, agriculture, and bioremediation.
- 533 Advanced Vadose Processes 2** Methods and models for water, heat, vapor and solute transport in the vadose zone; transfer functions to describe solute transport; non-linear parameter estimation; fate and transport of water, heat, and solutes in the vadose zone; hydrological and geochemical processes in unsaturated subsurface materials. Recommended preparation: upper division or graduate course in soil physics or chemistry.
- 541 Soil-Plant-Microbial Interactions 3** Soil-plant-microbial relationships to plant nutrition, plant health, and environmental cleanup; rhizosphere chemistry and microbial ecology. Required preparation must include two upper-division courses in biology, microbiology or soils.
- 544 Nitrogen Cycling in the Earth's Systems 3** Nitrogen dynamics in terrestrial, aquatic, and atmospheric systems; nitrogen transformations in natural and managed systems and responses to human activities. (Cross-listed course offered as BIOLOGY 544, SOIL SCI 544).
- 547 Soil Fertility Management 3** Philosophy of fertilizer recommendations based on soil and plant tissue testing; principles of fertilizer manufacture, placement and use. Required preparation must include introductory soils and upper-division soil fertility courses.
- 568 ArcGIS and Geospatial Analysis 4 (2-6)** Geographic information systems applied to analysis of landscape data; maps, geographic coordinate systems and projections, geodatabases. (Cross-listed course offered as SOIL SCI 468, ENVR SCI 486, ENVR SCI 586).
- 574 Remote Sensing and Geospatial Analysis 3 (1-4)** Digital image processing theory and geographic information systems applied to landscape analysis.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

- 700 Master's Research, Thesis, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.
- 702 Master's Special Problems, Directed Study, and/or Examination V** 1-18 May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.
- 800 Doctoral Research, Dissertation, and/or Examination V** 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.
- Natural Resource Sciences**
- STAT**
- 508 Environmental Spatial Statistics 3** Theoretical introduction and practical training in spatial data analysis for graduate students in the environmental sciences. (Cross-listed course offered as SOIL SCI 508, STAT 508). Required preparation must include undergraduate statistics through applied multiple regression.
- 510 Topics in Probability and Statistics 3** May be repeated for credit; cumulative maximum 6 hours. Current topics in probability and statistics of mutual interest to faculty and students. Credit not granted for both STAT 410 and STAT 510. Recommended preparation: One 3-hour 300-level STAT course.
- 512 Analysis of Variance of Designed Experiments 3 (2-2)** Principles of experimental design and analysis and interpretation of data. Recommended preparation: One 3-hour 300-level STAT course.
- 516 Time Series 3** ARIMA models; identification, estimation, diagnostics, and forecasting; seasonal adjustments, outlier detection, intervention analysis and transfer function modeling. (Cross-listed course offered as MGTOP 516, STAT 516). Recommended preparation: STAT 443.
- 519 Applied Multivariate Analysis 3** Multivariate normal distribution, principal components, factor analysis, discriminant function, cluster analysis, Hotelling's T^2 and MANOVA. (Cross-listed course offered as MGTOP 519, STAT 519). Recommended preparation: STAT 443.
- 520 Statistical Analysis of Qualitative Data 3** Binomial, Poisson, multinomial distribution; contingency tables, Fisher's tests, log-linear models; ordinal data; applications in biology, business, psychology, and sociology. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 522 Biostatistics and Statistical Epidemiology 3** Rigorous approach to biostatistical and epidemiological methods including relative risk, odds ratio, cross-over designs, survival analysis and generalized linear models. Recommended preparation: Linear Algebra or Calculus I and one 3-hour 300-level STAT course.
- 523 Statistical Methods for Engineers and Scientists 3** Hypothesis testing; linear, multilinear, and nonlinear regression; analysis of variance for designed experiments; quality control; statistical computing. Credit not normally granted for both STAT 423 and 430. (Cross-listed course offered as STAT 423, MATH 423). Recommended preparation: One 3-hour 300-level STAT course.
- 530 Applied Linear Models 3 (2-2)** The design and analysis of experiments by linear models. Recommended preparation: One 3-hour 300-level STAT course.
- 533 Theory of Linear Models 3** Theoretical basis of linear regression and analysis of variance models; a unified approach based upon the generalized inverse. Recommended preparation: Linear Algebra and one 3-hour 400-level STAT theory course.
- 535 Regression Analysis 3** Conceptual development of regression; estimation, prediction, tests of hypotheses, variable selection, diagnostics, model validation, correlation, and nonlinear regression. Recommended preparation: One 3-hour 400-level STAT course.
- 536 Statistical Computing 3 (2-3)** Generation of random variables, Monte Carlo simulation, bootstrap and jackknife methods, EM algorithm, Markov chain Monte Carlo methods. (Cross-listed course offered as STAT 536, MATH 536). Recommended preparation: One 3-hour 400-level probability or STAT course.
- 544 Applied Stochastic Processes 3** Poisson and Markov processes; queuing theory; auto-covariance; stationarity; power spectra; harmonic analysis; linear mean-square predictions. Recommended preparation: One 3-hour 400-level STAT or Applied Probability course.
- 548 Statistical Theory I 3** Probability spaces, combinatorics, multidimensional random variables, characteristic function, special distributions, limit theorems, stochastic processes, order statistics. (Cross-listed course offered as STAT 548, MATH 568). Recommended preparation: Calculus III and one 3-hour 400-level probability course.
- 549 Statistical Theory II 3** Continuation of STAT 548. Statistical inferences; estimation and testing hypotheses; regression analysis; sequential analysis and nonparametric methods. (Cross-listed course offered as STAT 549, MATH 569). Recommended preparation: STAT 548.
- 556 Introduction to Statistical Theory 3** Sampling distributions; hypothesis testing and estimation; maximum likelihood; likelihood ratio tests; theory of least squares; nonparametrics. (Cross-listed course offered as STAT 456, MATH 456). Recommended preparation: One 3-hour 400-level STAT or probability course.
- 565 Analyzing Microarray and Other Genomic Data 3** Statistical issues from pre-processing (transforming, normalizing) and analyzing genomic data (differential expression, pattern discovery and predictions). Recommended preparation: Linear Algebra and one 3-hour 300-level STAT course.

- 572 Quality Control 3** Simple quality assurance tools; process monitoring; Shewhart control charts; process characterization and capability; sampling inspection; factorial experiments. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 573 Reliability 3** Probabilistic modeling and inference; product-limit estimator; probability plotting; maximum likelihood estimation with censored data; regression models for accelerated life testing. Recommended preparation: One 3-hour 300-level STAT or probability course.
- 590 Statistical Consulting Practicum V 1-2** May be repeated for credit; cumulative maximum 6 hours. Theory and practice of statistical consulting, participation in consulting session. Recommended preparation: STAT 512 and STAT 530.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.
- 702 Master's Special Problems, Directed Study, and/or Examination V 1-18** May be repeated for credit. Independent research in special problems, directed study, and/or examination credit for students in a non-thesis master's degree program. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 702 credit.

Natural Resource Sciences

V PH

- 505 Design and Analysis of Biomedical Experiments 4** Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.
- 555 General and Cellular Physiology 4 (3-3)** Physiochemical mechanisms of cellular function. (Cross-listed course offered as VET PH 555, PHARMSCI 555). Recommended preparation: Concurrent enrollment in MBIOS 513.
- 600 Special Projects or Independent Study V 1-18** May be repeated for credit. Independent study, special projects, and/or internships. Students must have graduate degree-seeking status and should check with their major advisor before enrolling in 600 credit, which cannot be used toward the core graded credits required for a graduate degree.

700 Master's Research, Thesis, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their master's research, thesis and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 700 credit.

800 Doctoral Research, Dissertation, and/or Examination V 1-18 May be repeated for credit. Independent research and advanced study for students working on their doctoral research, dissertation and/or final examination. Students must have graduate degree-seeking status and should check with their major advisor/committee chair before enrolling for 800 credit.

Zoology

Degree offered: Master of Science in Zoology – Non Thesis

Faculty working with graduate students: 17

Tests required: IELTS, TOEFL

Deadline: Fall: January 10
Spring: July 1

Program Description

The School of Biological Sciences offers a rigorous and competitive degree in Zoology. Students who complete this degree are successful in a broad variety of careers, including those in: research universities, teaching colleges, federal and state government and the private sector.

Degree Description

Our zoology students generally focus on research in the broad areas of ecology, evolution, systematics, molecular biology, and animal physiology.

Faculty

Jesse Brunner, Patrick Carter, Erica Crespi, Mark Dybdahl, Richard Gomulkiewicz, Brian Kemp, Raymond Lee, Jon Mallatt, Michelle McGuire, Christine Portfors, Charles Robbins, Hubertus Schwabl, Elissa Schwartz, Michael Skinner, Andrew Storfer, Gary Thorgaard and Paul Verrell.

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