Washington State University

MAJOR CHANGE FORM - - REQUIREMENTS

(Submit original signed form and TEN **copies to the Registrar's Office, zip 1035.)**

See https://www.ronet.wsu.edu/ROPubs/Apps/HomePage.ASP *for this form.*

*Submit an additional copy to the Faculty Senate Office, French Administration 338, zip 1038.

Department Name Mathematics

1. CHECK PROPOSED CHANGES.

*☐ Change department/program name *from* _____ *to* _____
*☐ New degree or program *in* _____
*☐ Change name of degree *from* _____ *to* _____
*☐ Drop degree or program *in* _____
*☐ Extend existing degree or program *to* _____ campus

☐ New Major *in* _____
☐ Change name of Major *from* _____ *to* _____
☐ Revise Major requirements *in* _____
☐ Drop Major *in* _____
☐ Revise certification requirements for the Major *in* _____

☑ New Option *in* PhD in Mathematics (Statistics Option)
☐ Revise requirements for the Option *in* _____
☐ Drop Option *in* _____

☐ New Minor *in* _____
☐ Revise Minor requirements *in* _____
☐ Drop Minor *in* _____

☐ New Undergraduate Certificate *in* _____
☐ Revise Undergraduate Certificate requirements *in* _____
☐ Drop Undergraduate Certificate *in* _____

☐ Other _____

Effective term/year Fall 2013

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Contact Person	Contact Phone No.	Contact email

2. GIVE REASONS FOR EACH REQUEST MARKED ABOVE. *(Attach additional paper if necessary; see reverse side.)* See attached.

4. SIGN AND DATE APPROVALS.

9/5/2012 _____ 9-19-12 _____
Chair Signature/date Dean Signature/date General Education Com/date

_____ _____ _____ _____
Catalog Subcom/date Academic Affairs Com/date Graduate Studies Com/date Senate/Date

Rationale for 'Statistics Option' in the 'PhD in Mathematics' Program

Beginning Fall 2012, the Department of Statistics merged with the Mathematics Department with all its resources fully integrated with Mathematics. The combined research expertise of the two departments has led to an exciting opportunity to add a new Statistics Option to the PhD in Mathematics degree program.

Impact of Change: Statistics is a multidisciplinary subject that is in great demand in academic, corporate as well as government institutions. Well trained statisticians at the advanced level are sought countrywide and it is important that WSU plays a definitive role in providing such an advanced training through the Statistics Option in its PhD in Mathematics degree program. This is particularly important when seen in the context that, apart from the University of Washington, there is no other higher education institution either in Washington or in Idaho that offers such an advanced training in statistics.

Resource implications/New faculty additions: The introduction of 'Statistics Option' in the PhD in Mathematics program does not require any new resources. Specifically, no additional faculty requirements are necessary for introducing this new option. At the time of merger, six faculty members with varied statistical interests merged into the Mathematics Department. These faculty members will form the core group that will take the responsibility of offering the requisite graduate courses and serve as Chairs of potential graduate students that are expected to enroll into this new option. There are also additional faculty members in the Mathematics Department as well as other departments on the WSU campus (two in the College of Business, two in School of Economic Sciences) that can actively support the Statistics Option by offering their services to teach certain specialized graduate courses.

New graduate courses: The proposed Statistics Option does not require the addition of any new graduate courses. A number of statistics graduate courses are already in place to train students in statistical theory and applications at the advanced level.

New Equipment: There is no need for new equipments for the proposed Statistics Option. Graduate students in the department are well served by the existing computer labs.

Rotation of courses: The 'Statistics Option' will not have any effect in the rotation of courses. All graduate and undergraduate courses in the area of statistics will continue to be taught according to current operating schedules.

Math Graduate Handbook Description

12 The Requirements for the PhD in Mathematics (Statistics Option)

The information revolution of the twenty-first century brings a strong need to analyze and interpret large data sets, and provides opportunities for those who wish to pursue their careers at the interface of mathematics, data analysis and computational science. The Statistics Option allows students with interdisciplinary backgrounds and interests in data science to pursue their doctorate degree in statistical methodology and its applications. Entering students need not necessarily have a bachelor's degree in Mathematics or Statistics. 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 Statistics, Mathematics and their areas of application. Departmental requirements and regulations for the Statistics Option are specified below. The regulations of the Graduate School for doctoral programs are available in the Graduate School Policies and Procedures Manual (http://www.gradsch.wsu.edu/policiesprocedures.html). Appeals requesting waiver or modification of any rule of departmental origin may be submitted to the Mathematics Graduate Studies Committee.

12.1 Prerequisites

Students who enter the Statistics Option of the PhD. program in Mathematics are expected to have quantitative backgrounds, including upper division course work in Mathematics and Statistics. Ideally, this would include familiarity with advanced calculus, linear algebra, probability and statistics at the upper division level. Students with a deficient background may take any of Analysis (Math 401 and 402 at WSU), Linear Algebra (Math 420 at WSU), probability (Stat 443 at WSU) or Statistics (Stat 456 at WSU). Students are expected to make up deficiencies at the earliest opportunity.

12.2 Courses and Hours

The course work requirements for the Statistics Option shall be as follows. A candidate must complete 34 semester hours of graded course work. These courses must be numbered 500 or above (except for up to 9 hours of non-graduate level graded course work). Conjoint courses shall count as 400 level courses for these requirements. Of the total 34 hours of required graded course work, a student must take all of the following Core Statistical Theory and Methodology courses that account for 12 hours of course work. In addition to the core group, a student must also take at least 12 hours of graded course work from the Applied Statistics and Computational Mathematics group.

Core Statistical Theory and Methodology: Stat 533, 536, 548, 549

Applied Statistics and Computational Mathematics: Math 516, 548, 563, 575, 576; Stat 512, 514, 516, 519, 520, 522, 530, 535, 544, 555, 565, 572, 573

Exception to these requirements may be recommended by the student's Doctoral Committee and must be approved by the Mathematics Graduate Studies Committee.

All doctoral students are required to take one hour of Math 500, Proseminar, which will include short presentations by faculty on their research areas. Further course work may be required by the Program of Study, which will be assembled in consultation with the student's Doctoral Committee. Students are strongly encouraged to participate in the Probability and Statistics Seminar throughout their graduate studies.

12.3 Transfer Credit

Graduate credit earned elsewhere (excluding extension work, special problems, workshops, etc.) may be applied as part of the program if the work is of \A" or \B" quality. Transfer credit is requested by listing the courses on the Program of Study (see §12.4.2); approval of the Program of Study implies approval of transfer of credit.

12.4 Examinations

The doctoral examination structure consists of four examinations: Graduate Qualifying Examination, Doctoral Qualifying Examination, Preliminary Doctoral Examination, and Final Doctoral Examination. The Graduate School Policy requires that all the students can have 2 (two) attempts to pass each examination. These examinations and the Program of Study are described below.

12.4.1 The Graduate Qualifying Examination (GQE)

The Graduate Qualifying Examination (GQE) is a single four-hour written examination based on undergraduate material covering advanced calculus (including vector calculus) and linear algebra. The GQE will be at the level of difficulty of upper division WSU mathematics courses. It will be 50% advanced calculus, 50% linear algebra. (Appendix A gives the list of topics.) The GQE will be prepared and graded by a committee of four faculty members chosen by the Chair of the Department. Rules concerning the GQE are:

(a) Students will have at most two attempts to pass the GQE.

(b) Students with a previous mathematics degree must pass the GQE by the end of their third semester in the Program (not counting summer semesters). All other students must pass the GQE by the end of their fourth semester in our Program (not counting summer semesters).

(c) The GQE will consist of ten problems and the student will be required to respond to all the problems.

(d) The GQE are typically given on the second day of the Fall and Spring semesters each year. See §2 for specific dates.

12.4.2 The Program of Study

Soon after completion of the GQE a PhD candidate should choose an appropriate faculty member to chair his/her Doctoral Committee. The Doctoral Committee, in consultation with the candidate, will decide upon a Program of Study and tentatively set a time for the Doctoral Qualifying Examination (see §12.4.3).

12.4.3 The Doctoral Qualifying Examination (DQE)

The Doctoral Qualifying Examination (DQE) is a written examination of approximately two hours in length and covers the candidate's area of specialization with the focus on appropriate mathematics graduate course work. The student's Doctoral Committee will define the material to be covered on the DQE, compose and grade this examination. Rules concerning the DQE are:

(a) Students will have at most two attempts to pass the DQE.

(b) Students are expected to pass the DQE by the end of their third semester (excluding summer sessions) after passing the GQE.

(c) The DQE will be given at a time suitable for the student and the committee.

12.4.4 The Preliminary Doctoral Examination (PDE)

The Preliminary Doctoral Examination (PDE) is an oral examination which follows the Graduate School rules for Preliminary Doctoral Examinations except for the following procedures. The PDE will begin with a presentation by the student to his/her doctoral committee on a thesis research problem and a plan of research to be followed toward its solution. The examination will include questions and feedback from members of the doctoral committee on the student's presentation.

Rules concerning the PDE are:

(a) Students will have at most two attempts to pass the PDE.

(b) Students must pass the PDE by the end of their second semester after passing the DQE.

(c) The PDE will be given at a time suitable for the student and the committee.

12.4.5 The Final Doctoral Examination

The Final Doctoral Examination (FDE) will occur after the student has completed the thesis (see §11.5 or x13.5 as appropriate), and the thesis has been approved by the student's Doctoral Committee. It will be an oral examination following the rules of the Graduate School. The FDE is devoted mainly to a presentation of the content of the thesis by the student and includes questions from members of the doctoral committee.

12.5 The Thesis

Once one has passed the Preliminary Examination (see §11.4.4), one becomes technically a candidate for the PhD. This means that most of one's time should be given to specific preparation for, and writing of a doctoral thesis. The manner in which this is done must be left up to the student and the Doctoral Committee, especially the thesis advisor. In general, however, the thesis should include work, which, in originality, importance, and correctness, is good enough to appear in a research journal.

A paper will be prepared by the PhD candidate and submitted to a refereed journal, approved by the student's Doctoral Committee. The paper should ordinarily be based on portions of the candidate's PhD thesis. Acceptance of the paper is not a precondition for the completion of the degree work. A 2/3 majority of the candidate's Doctoral Committee can waive the requirement of a journal submission of a paper based on the thesis.

12.6 Teaching Experience

Most holders of graduate degrees in mathematics eventually teach in one way or another. Moreover, some experience with classroom teaching is useful in almost any mathematical career. The Department accordingly requires that each PhD student be responsible, under supervision, for teaching at least one undergraduate class for a semester. Since this responsibility may be preceded by teaching experience of a less autonomous kind (grading papers, assisting teachers in other ways, conducting help sessions, etc.), every graduate student should have at least one year of teaching experience in the broad sense. The total experience may be considered an apprenticeship in teaching and should be treated as seriously and responsibly as any other part of the student's program.

The terms of many fellowships, traineeships, and other forms of graduate student support permit participation in teaching programs where required. If a student holds a grant which does not permit such participation, then

the student will need to combine the period of the grant with at least a year on terms permitting teaching, e.g., as a teaching assistant. This may mean holding the grant for less than the normal period.

The week before the student's first Fall semester in the graduate program, the student should enroll for one hour of Math 500. This will represent participation in a pro-seminar, meeting under the direction of an experienced faculty member and devoted to the teaching of mathematics.

12.7 Minor

There is no minor requirement.

12.8 Residence

The period of study for doctoral degrees is at least three years (six semesters) beyond the baccalaureate degree. For students entering a doctoral program without a master's degree, at least two of these three years must be in residence at WSU (enrolled full time and present on campus). For students entering a doctoral program with a master's degree, at least one of these three years must be in residence at WSU (enrolled full time and present on campus).

12.9 The Application for Degree

An Application for Degree must be filed with the Graduate School by the deadlines in §3. An approved Program of Study must be on file in the Graduate School before the Application for Degree may be filed. Candidates may not schedule a final examination until an Application for Degree has been filed.