* Revised syllabus * 1-15-15

101

ORIGINAL

RECEIVED SEP 29 2014 WSU Registrar

Washington State University
MAJOR CURRICULAR CHANGE FORM - - NEW/RESTORE COURSE

- ☐ **Please attach rationale for your request, a complete syllabus**, and explain how this impacts other units in Pullman and other campuses (if applicable).
- ☐ **Obtain all required signatures with dates.**
- ☐ **Provide original stapled packet of signed form/rationale statement/syllabus** PLUS **10 stapled copies of complete packet to the Registrar's Office**, campus mail code 1035.
- ☐ **Submit one electronic copy of complete packet** to wsu.curriculum@wsu.edu.

Requested **Future** Effective Date: Fall 2015 (term/year) Course Typically Offered: As needed

DEADLINES: For fall term effective date: **October 1st**; for spring or summer term effective date: **March 1st**. See instructions.

NOTE: Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

☒ **New Course** ☐ Temporary Course ☐ **Restore Course**

PLP	512	Topics in Plant Pathology
course subject/crosslist	course no.	title

Variable 1-3	(-)	Graduate status
Credit hrs	lecture hrs per week / lab or studio hrs per week	prerequisite

Description for catalog: 512 Topics in Plant Pathology V 1-3 May be repeated for credit; cumulative maximum 6 hours. Concepts of plant pathogen interactions and disease management.

Additional Attributes: Check all that apply.

☐ Crosslisting (between WSU departments)* ☐ Conjoint listing (400/500): _____

☑ Variable credit: 1-3 ☑ Repeat credit (cum. max. hrs): 6

Special Grading: ☐ S, F; ☐ A, S, F (PEACT only); ☐ S, M, F (VET MED only); ☐ H, S, F (PHARMACY, PHARDSCI only)

☐ Cooperative with UI ☐ Other (please list request): _____

The following items require prior submission to other committees/depts. (SEE INSTRUCTIONS.)

☐ Request to meet Writing in the Major [M] requirement **(Must have All-University Writing Committee Approval.)**

☐ Request to meet UCORE in _____ **(Must have UCORE Committee Approval › › See instructions.)**

☐ Special Course Fee_____ **(Must submit request to University Receivables.)**

Contact: Scot Hulbert Phone number: 335-4504 Campus mail code: 6430

Email: scot_hulbert@wsu.edu Instructor, if different: Instructor will vary with topic

Scott Hulbert 9/26/14	Kimberly Kirkwood 9/26/14	
Chair/date	**Dean/date**	**All-University Writing Com Date**
Chair (if crosslisted/interdisciplinary)*	**Dean (if crosslisted/interdisciplinary)***	**UCORE Committee Approval Date**
Catalog Subcommittee Approval Date	**GSC or AAC Approval Date**	**Faculty Senate Approval Date**

***If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.**

Potential topics for "Topics in Plant Pathology" courses.
Three examples of topics that might be covered in PLP512 courses in the near future are included below. Syllabi will be developed for Topics courses by the faculty members teaching the course before it is advertised.

1) RNA Interference Technology and Use in Disease Control.
Biological research in the last decade has demonstrated that gene expression in higher organisms is controlled by RNA interactions almost to the same extent as the classical view of transcriptional regulation of genes by proteins. The fact that RNA interactions are ubiquitous in animals, plants and eukaryotic microbes indicates a very ancient gene expression control strategy that may have originated as a mechanism of resistance to RNA viruses, including most of the viruses that attack plants. A report published in *Science* in 2014 revealed that fungal plant pathogens also can use RNA molecules as effectors to regulate gene expression in their plant hosts. Other recent experiments have demonstrated that RNA interactions can be engineered in plants to control viruses as well as fungi and other plant pests like insects.

Lecture/discussion topics:

- Mechanisms of RNA interactions in Eukaryotes
- Methods of structural and functional analysis of small RNAs
- Classes of small RNAs in plants, animals and fungi
- miRNAs: non-coding genes that regulate gene expression
- Viral genes that suppress RNA interactions
- Production and movement of small RNAs
- Engineering RNAi in plants to control pests and diseases
- Microbial small RNAs as effectors for pathogenicity
- Potential use of synthetic RNA molecules as potential pesticides
- Food and environmental safety issues associated with small RNA use.

2) Seed Pathology. Seed borne diseases are extremely important in agriculture and their control is essential to the survival of certain agricultural enterprises in specific areas. Survival on seed provides both a mechanism for disease inoculum to survive through cropping seasons and a means for diseases to spread to new regions. They also have very large impacts on plant quarantines and trade of agricultural products. Several seed borne diseases have spread to the Pacific Northwest in recent years.

Lecture/discussion topics:

- Overview of the world' seed industry
- Seed production in the Pacific Northwest: coexistence issues with Brassica crops

- Microbes and pathogens associated with seed
- Detection and quantification methods
- Preharvest control of seed contamination in seed crops
- Methods of decontamination
- Overview of the seed industry
- Regulatory measures: plant quarantines, phytosanitary certificates, seed crop field inspections.

3) Phytobiomes. Until recently, the study of plant pathology has focused mainly on disease causing microbes and their interactions with host plants. An initiative has been launched by the American Phytopathological Society, with goals similar to new initiatives in animal and human health, aimed at understanding the role of beneficial communities of microbes that live in close association with higher organisms. These organisms include many that are beneficial rather than pathogenic to their hosts providing services such as nutrient acquisition, pathogen defense and yield promotion. This course will cover what is currently known about important but non-pathogenic microbes associated with plants, the potential benefits, and the many new analytical methods that are being used to characterize microbial populations.

Lecture/discussion topics:

- Types of associations between plants and microbes, rhizosphere, phyllosphere and endophytic
- Culturable and unculturable members of plant-associated communities
- Methods of analyzing microbial assemblages associated with plant-related environments
- Utilizing next generation sequencing technologies and advanced computational biology for assessing phytobiome composition and function
- Methods of analyzing nutritional status in rhizosphere, phyllosphere, and other environments
- Mechanisms of phytobiome suppression of plant pathogenic diseases
- Cultivar specificity as a driver in altering microbial populations
- Using phytobiomes to increase agricultural production

MEMORANDUM

DATE: **September 24, 2014**

TO: **Kim Kidwell, Executive Associate Dean, Academic Programs**

FROM: **Scot Hulbert, Interim Chair, Plant Pathology**

SUBJECT: **PLP 512, Topics in Plant Pathology**

We are proposing a new graduate level course entitled 'Topics in Plant Pathology" listed as PLP 512. It would be offered for variable credit, from one to three credits. It will be taught in Pullman, or possibly one of the Research and Extension Centers, with simultaneous delivery to all enrolled students on and off-campus using AMS services. It is designed to be an elective course for graduate students in Plant Pathology or other biological science programs with students interested in the specific topics. The format will be one hour of lecture and discussion each week for each credit offered.

A "Topics in Plant Pathology" course would enable the department to organize lectures and discussion on new topics that are not being covered in regular classes on a one-time basis. Examples of topics might include emerging issues such as recent advances in technical areas like RNAi-based disease resistance, agricultural problems caused by novel disease outbreaks or epidemics or new scientific initiatives like the proposed Phytobiome projects. These topics may represent areas where we think new courses should be offered and provide a means to test the popularity of the topic for Plant Pathology graduate students and other graduate students across campus. Literature often increases rapidly on new scientific breakthroughs and is sometimes not covered in existing classes. A course with flexible topics would allow faculty, sometimes with the assistance of adjunct faculty or research associates, to cover these topics in the classroom.

1. Syllabus for the proposed course. Examples of outlines for Topics courses are attached.

2. Justification of how the proposed course or degree program aligns with the intentions of the academic program for the department in which it is housed, and how it aligns with the strategic plan for CAHNRS.
'Topics in Plant Pathology' would align very well with the CAHNRS Strategic Plan. The course would support several aspects of the mission statement including contributing to the development of agricultural production and post-harvest systems as well as contributing to natural resource and environmental sustainability. Additionally, we believe it would support Goals 4, 5, 6, 17 and 18 of the CAHNRS Strategic Plan.

3. A management plan, including name of the program manager, must be provided for degree programs.
Not Applicable

4. *Course delivery schedule: Identify who will teach the course, how often the course be offered and what delivery cycle (semester, odd year/even year) the course will be offered in.*
'Topics in Plant Pathology' would be offered by as yet unidentified faculty with expertise to cover the necessary topics. Efforts would be made to schedule topics classes in semesters where fewer electives for Plant Pathology graduate students exist; for example, fall semesters in even years currently have few electives offered.

5. *A marketing plan for the course/program, including target audience, programs of study it will support, expected student numbers, and methods of advertising the course must be provided.*

Syllabi of new Topics Courses will be distributed to Plant Pathology graduate students and any other graduate students advised or co-advised by Plant Pathology faculty. Many topics will cover an important emerging issue or scientific breakthroughs that impact multiple specialties in the biological sciences so they will be advertised more widely. The Johnson Hall Graduate Center will distribute Syllabi to all graduate students in Horticulture, Crop and Soil Sciences and other graduate student list serves will be used to contact student in Entomology, Molecular Plant Sciences and other departments as appropriate. If there is not sufficient interest in the topic to fill a graduate course, they will not be offered. If numbers are very strong, a new graduate course may later be requested. These popular new topics will not be taught as 'Topics in Plant Pathology' courses more than a single time.

6. *Will the new course/program require redeployment of existing resources? If so, what will be the impact on existing courses and/or programs, teaching loads, research productivity, and service and outreach?*
Existing departmental FTE will be used to teach topics courses. Plant Pathology faculty members sometimes need to teach a course to fulfill the academic obligations of his/her appointment. Alternatively other departmental scientists, such as adjunct faculty with graduate faculty status, may volunteer to teach Topics courses.

7. *Describe the funding model for the course if an instructor on permanent budget is not assigned to the course.*
The course will only be taught without an instructor on permanent budget in cases where a notable deficiency exists in the Plant Pathology graduate degree curriculum. A temporary instructor may then be hired to teach a 'Topics in Plant Pathology' course if sufficient departmental funds from our summer session funding and/or our annual teaching allocation is available. If an adjunct faculty member volunteered to teach a new topic as a 'Topics in Plant Pathology' course this would result in very little cost to the Department or University.

101
Rec'd 1-15-15

PIP 512
Topics in Plant Pathology (1 credit)
Spring 2015

Lecture: M 1:10-2:00 PM, Johnson 346

Instruction

Instructor:	Dr. Scot Hulbert, Professor, Department of Plant Pathology
Office:	345 Johnson Hall
Office hours:	11:00 AM to noon daily
Phone:	(509) 335-4504
Email:	scot_hulbert@wsu.edu
Teaching assistant:	none

Course Description

PLP 512 1 cr. Review of concepts in RNA-mediated regulation of gene expression and interpretation of the recent literature concerning its involvement in plant pathogen interactions and potential for disease control.

Required Text

None.

Assigned Readings

Fahlgren, N., Bollmann, S. R., Kasschau, K. D., Cuperus, J. T., Press, C. M., Sullivan, C. M., ... Carrington, J. C. (2013). Phytophthora have distinct endogenous small RNA populations that include short interfering and microRNAs. PloS One, 8(10), e77181. doi:10.1371/journal.pone.0077181

Fahlgren, N., Howell, M. D., Kasschau, K. D., Chapman, E. J., Sullivan, C. M., Cumbie, J. S., ... Carrington, J. C. (2007). High-throughput sequencing of Arabidopsis microRNAs: evidence for frequent birth and death of MIRNA genes. PloS One, 2(2), e219. doi:10.1371/journal.pone.0000219

Katiyar-Agarwal, S., & Jin, H. (2010). Role of small RNAs in host-microbe interactions. Annual Review of Phytopathology, 48, 225–46. doi:10.1146/annurev-phyto-073009-114457

Li, Y., Lu, Y.-G., Shi, Y., Wu, L., Xu, Y.-J., Huang, F., ... Wang, W.-M. (2013). Multiple Rice MicroRNAs Are Involved in Immunity against the Blast Fungus Magnaporthe oryzae. Plant Physiology, 164(2), 1077–1092. doi:10.1104/pp.113.230052

Navarro, L., Dunoyer, P., Jay, F., Arnold, B., Dharmasiri, N., Estelle, M., ... Jones, J. D. G. (2006). A plant miRNA contributes to antibacterial resistance by repressing auxin signaling. Science (New York, N.Y.), 312(5772), 436–9. doi:10.1126/science.1126088

Nowara, D., Gay, A., Lacomme, C., Shaw, J., Ridout, C., Douchkov, D., ... Schweizer, P. (2010). HIGS: host-induced gene silencing in the obligate biotrophic fungal pathogen Blumeria graminis. The Plant Cell, 22(9), 3130–41. doi:10.1105/tpc.110.077040

Nunes, C. C., & Dean, R. A. (2012). Host-induced gene silencing : a tool for understanding fungal host interaction and for developing novel disease control strategies. Molecular Plant Pathology, 13, 519–529. doi:10.1111/J.1364-3703.2011.00766.X

Nunes, C. C., Gowda, M., Sailsbery, J., Xue, M., Chen, F., Brown, D. E., ... Dean, R. a. (2011). Diverse and tissue-enriched small RNAs in the plant pathogenic fungus, Magnaporthe oryzae. BMC Genomics, 12, 288. doi:10.1186/1471-2164-12-288

Panwar, V., McCallum, B., & Bakkeren, G. (2013). Endogenous silencing of Puccinia triticina pathogenicity genes through *in planta*-expressed sequences leads to the suppression of rust diseases on wheat. The Plant Journal: For Cell and Molecular Biology, 73(3), 521–32. doi:10.1111/tpj.12047

Weiberg, A., Wang, M., Lin, F.-M., Zhao, H., Zhang, Z., Kaloshian, I., ... Jin, H. (2013). Fungal Small RNAs Suppress Plant Immunity by Hijacking Host RNA Interference Pathways. Science, 342(6154), 118–123. doi:10.1126/science.1239705

Yin, C., Jurgenson, J. E., & Hulbert, S. H. (2011). Development of a host-induced RNAi system in the wheat stripe rust fungus Puccinia striiformis f. sp. tritici. Molecular Plant-Microbe Interactions : MPMI, 24(5), 554–61. doi:10.1094/MPMI-10-10-0229

Student Learning Objectives and Evaluation

Student Learning Outcomes At the end of this course, students will:	Course Topics/Dates The following topic(s)/dates(s) will address this outcome:	Evaluation of Outcome: This outcome will be evaluated primarily by:
1. Have a general understanding of how small RNA molecules affect plant-pathogen interactions.	*All sessions*	*Two exams, one paper presentation and participation in paper discussions*
a. Understand how small RNAs affect gene expression.	*First 5 sessions (first 5 weeks of semester)*	*One exam over first five lecture/discussions*
b. Recognize different plant defense gene	*All sessions*	*Two exams, one paper presentation and participation*

networks.		*in paper discussions*
c. Understand the types of experiments that can be used to examine gene expression.	*All sessions*	*Two exams, one paper presentation and participation in paper discussions*
d. Understand how small RNAs made in one organism can control gene expression in another.	*All sessions*	*Two exams, one paper presentation and participation in paper discussions*
e. Understand how small RNAs can be engineered in plants to affect pathogens.	*Final sessions*	*Participation in final sessions (last 3-4 sessions) and second exam*
2. Be able to understand and interpret scientific literature pertaining to plant pathology.	*All sessions*	*Two exams, one paper presentation and participation in paper discussions*
3. Be able to interpret and present research results.	*All sessions*	*Two exams, one paper presentation and participation in paper discussions*
4. Be able to formulate hypotheses and develop experimental designs to test these hypotheses.	*All sessions*	*Two exams, one paper presentation and participation in paper discussions*

Grading

Course outcomes will be assessed by performance on two exams, participation in paper discussions and presenting an overview and leading a discussion of one paper.

Exams (2 @ 50 points each)	100
Participation in class discussions	50
Class presentation/ lead discussion	50
Total points possible	200

Grade	% Points
A	>93.0
A-	90.0 – 92.9
B+	87.0 – 89.9
B	83.0 – 86.9

B-	80.0 – 82.9
C+	77.0 – 79.9
C	73.0 – 76.9
C-	70.0 – 72.9
D+	67.0 – 69.9
D	60.0 – 66.9
F	<59.9

Class Presentation Assignment

Each student will select a paper from a list of papers assigned during the first week of class. The student will present a brief (15-20 minute) overview of the paper to the class and then lead a discussion of the paper for the rest of the class period. The student will provide a list of study questions to the rest of the class before their paper is presented to facilitate the discussion of the paper. Depending on enrollment numbers, groups of two or more students may be assigned the same paper, in which case they will present and lead the discussion of the paper together.

Topic Outline

Class will meet once a week for one-hour lectures and discussions. The first three sessions will be lectures by the instructor to give an overview of the field and provide the necessary background for the remainder of the subjects. Sessions four and five will consist of discussions of review articles and will also be led by the instructor. The remaining 10 sessions will consist of brief presentations of specific research articles followed by discussions of the papers. Most of these will be led by individual students or groups of students, depending on enrollment numbers. Also depending on enrollment levels, some of the research articles may be presented by the instructor. All of the students will present one research article, either individually or as part of a group. Since the field is new and moving very rapidly, several of the research articles covered will be very recently published. The final list of research articles will be selected immediately before the start of the semester.

Week/Session	topic
1	Lecture: Review of gene expression control and analysis
2	Lecture: Mechanisms of RNA interference with gene expression
3	Lecture: Types and classifications of small RNAs
4	Review Article discussion led by instructor
5	Review Article discussion led by instructor
6	Exam 1
7	Research article presentation/discussion led by students
8	Research article presentation/discussion led by students
9	Research article presentation/discussion led by students
10	Research article presentation/discussion led by students
11	Research article presentation/discussion led by students
12	Research article presentation/discussion led by students
13	Research article presentation/discussion led by students

14	Research article presentation/discussion led by students
15	Research article presentation/discussion led by students

All students will be expected to read and the articles presented before the class period in which they are covered. A list of study questions will be presented the week before the article is presented. These will be used to guide the discussion of the article.

Participation in Discussions

Graduate students enrolled in the course will likely come from a variety of different backgrounds and will vary in their exposure to concepts and techniques in molecular biology. All students will be expected to be respectful of those who are struggling with concepts. All students are expected to participate in the discussions, even those who are struggling to understand certain experiments or concepts. Asking for clarification or explanations of techniques or concepts is considered *participation* in the discussion. The best participants in discussions of research articles are those who can explain techniques and concepts in a manner that helps those students who are struggling to understand. Unexcused absences from class will result in a loss of five points from the student's participation score. Excused absences will not result in a loss of points if written answers to the study questions for the paper covered are provided to the instructor.

Students with Disabilities

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

Academic Integrity

Academic integrity is the cornerstone of the university. Any student who attempts to gain an unfair advantage over other students by cheating, will fail the exam and be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3).

Safety

Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors. It is highly recommended that you review the Campus Safety Plan (http://safetyplan.wsu.edu/) and visit the Office of Emergency Management web site (http://oem.wsu.edu/) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.