PI P 551 - Course Description
Plant Epidemiology and Disease Management

Credits 3, Prereq PI P 429. Principles and practical implications of plant disease epidemics, disease control, and pathogen ecology. Examples of diseases caused by fungi, prokaryotes, viruses, and nematodes of crops grown in the Pacific Northwest and of international importance will be used to discuss the above topics.

Spring semester, 2018. Tuesday and Thursday, 10:35-11:50 am. Room 343, Johnson Hall. Instructor: Dennis A. Johnson, 317 Johnson Hall. Consultation with students by appointment, Phone: 509 335 3753, email: dajohn@wsu.edu

Course Objective
Aid students to gain a thorough understanding of important principles and concepts of plant epidemiology, plant pathogen ecology and disease management. Lectures, interactive discussions of current and historical literature, and case histories will be used to help meet stated objective.

Course Outline
INTRODUCTION - 2 lectures
What is epidemiology, terminology, historical perspective
The Land-Grant Mission: Agricultural research, Extension, and instruction
Lessons from the past

ECOLOGICAL VIEW of PLANT PATHOGENS – 1 lecture

SAMPLING and STATISTICS IN EPIDEMIOLOGY – 1 lecture

THE GENETIC BASIS of EPIDEMICS – 1 lecture

DISEASE ASSESSMENT and MONITORING – 1.5 lectures
Disease diagnosis, host growth stages, disease severity-incidence relationships, diagram and field keys, field sampling

ENVIRONMENTAL INFLUENCES on DISEASE – 1.5 lectures
Influences on pathogen ecology vs. influences on host;
Foliar diseases, soil borne diseases and post-harvest diseases

TEMPORAL ANALYSIS of EPIDEMICS - 2 lectures
Description and comparison of disease progress curves
Disease models, disease progress and rates
Dispersal gradients of aerially dispersed pathogens and how they affect the spread of disease

EPIDEMIOLOGY and PLANT DISEASE MANAGEMENT – 2.5 lectures
THEORY and PRACTICAL IMPLICATIONS of DISEASE MANAGEMENT - 1 lecture
Economic and threshold considerations

MANAGING HOST GENES – 3.5 lectures
Epidemiologic and genetic concepts, partial resistance, stabilizing selection, aggressiveness, fitness, multilines, and varietal mixtures

FORECASTING and SIMULATION of EPIDEMICS – 1.5 lectures

CROP LOSS ASSESSMENT and MODELING – 0.5 lecture

INOCULUM POTENTIAL - 1 lecture

PATHOGEN DISPERASAL, TRANSPORT – 3 lectures
Microbiology of the atmosphere
Aerial and soil pathogens, disease gradients, dissemination, quantifying inoculum of airborne and soilborne pathogens

VECTORS of PLANT PATHOGENS – 0.5 lecture

SPATIAL ASPECTS of PLANT DISEASE EPIDEMICS - 1 lecture
Methods, experiments, analysis, and interpretation

MANAGEMENT WITH CHEMICALS
Pathogen insensitivity to chemical and coping with fungicide resistance
2.5 lectures

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 visit the Access Center (Washington Building 217) to meet with an Access Advisor. All accommodations MUST be approved through the Access Center. Either drop by the Access Center or call 509-335-3417 to schedule an appointment.

Contact: Meredith Goodwin m.goodwin@wsu.edu
# Grading System

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent of Grade</th>
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</thead>
<tbody>
<tr>
<td>Exams: 3 15% each</td>
<td>45%</td>
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<tr>
<td>Final</td>
<td>20%</td>
</tr>
<tr>
<td>Class Participation &amp; Discussion</td>
<td>25%</td>
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<tr>
<td>Quizzes</td>
<td>10%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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</tbody>
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## Exam Schedule

- **25 January, Thursday.** Exam I
- **1 March, Thursday.** Exam II
- **5 April, Thursday.** Exam III
- **April 30, Monday, 10:10 am – 12:10** Final Exam (Comprehensive)
## Learning Outcomes and Assessment

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Course topics/ dates</th>
<th>Evaluation of Outcome. This outcome will be evaluated primarily by:</th>
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</thead>
<tbody>
<tr>
<td>Define, explain, discuss and give examples of terms, concepts and principles of plant disease epidemics, pathogen ecology and disease management.</td>
<td>All topics and class dates</td>
<td>Written and oral examinations and class discussions</td>
</tr>
<tr>
<td>Apply relevant information from previous plant disease epidemics to current threats from plant pathogens</td>
<td>All topics and class dates</td>
<td>Written and oral examinations and class discussions</td>
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<tr>
<td>Develop disease management strategies for potential and contemporary plant disease epidemics</td>
<td>Epidemiology and plant disease management</td>
<td>Written and oral examinations and class discussions</td>
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<tr>
<td>Quantitatively compare and characterize disease epidemics</td>
<td>Introduction, disease Assessment and monitoring, temporal analysis of epidemics</td>
<td>Written and oral examinations and class discussions</td>
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<tr>
<td>Discuss historical events that relate to plant epidemiology</td>
<td>Epidemics of the past and present</td>
<td>Written and oral examinations and class discussions</td>
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</tbody>
</table>

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “Alert, Assess, Act” protocol for all types of emergencies and the “Run, Hide, Fight” response for an active shooter incident. Remain **ALERT** (through direct observation or emergency notification), **ASSESS** your specific situation, and **ACT** in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at [MyWSU](https://mywsu.wsu.edu). For more information on this subject, campus safety, and related topics, please view the [FBI’s Run, Hide, Fight video](https://www.fbi.gov/information/public-safety/run-hide-fight) and visit the [WSU safety portal](https://safety.wsu.edu). Reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodations needed for the course. Late notification may cause the requested accommodations to be unavailable. All accommodations must be approved through the Disability Resource Center (DRC) in Administration Annex 206, 335-6155.
## READING MATERIAL – PL P 551
Selected journal articles are also assigned as required reading

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference No. &amp; Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Historical Perspective</td>
<td>- Handout</td>
</tr>
<tr>
<td>Land-Grant Mission</td>
<td>#6 pgs iii-iv</td>
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<tr>
<td>Ecological perspective of plant pathgens</td>
<td>-</td>
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<tr>
<td>Sampling and Statistics in Epidemiology</td>
<td>-</td>
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<tr>
<td>Genetic Basis of Epidemics</td>
<td>#5 Chapter 13</td>
</tr>
<tr>
<td>Disease Assessment and Monitoring</td>
<td>#7 Chapter 2</td>
</tr>
<tr>
<td>Environmental Influences on Disease</td>
<td>#1 Chapter 4</td>
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<tr>
<td>Temporal Analysis of Epidemics</td>
<td>#10 Chapter 3</td>
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<tr>
<td>Epidemiology and Plant Disease Management</td>
<td>#10 Chapters 10, 11, 12</td>
</tr>
<tr>
<td>Theory and Practical Implication of Disease Management</td>
<td>#8 Chapter 14</td>
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<tr>
<td>Economic and Threshold Considerations</td>
<td>#6 Chapter 4</td>
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<tr>
<td>Managing Host Genes</td>
<td>#4 Chapter 11</td>
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<tr>
<td>Disease Forecasting</td>
<td>-</td>
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<tr>
<td>Crop Loss Assessment and Modeling (supplemental)</td>
<td>#2 Chapter 14</td>
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<tr>
<td>Inoculum Potential</td>
<td>#5 Chapter 7</td>
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<tr>
<td>Microbiology of the Atmosphere</td>
<td>#3 Chapters 3</td>
</tr>
<tr>
<td>Pathogen Dispersal (supplemental)</td>
<td>#9 Chapter 9</td>
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<tr>
<td>Soil Pathogens - Dispersal</td>
<td>#5 Chapter 9</td>
</tr>
<tr>
<td>Spatial Aspects of Plant Disease Epidemics</td>
<td>-</td>
</tr>
</tbody>
</table>
Management with Chemicals #4 Chapters 12
Pathogen Insensitivity to Chemicals #6 Chapters 14

References


2. Campbell, C. L. and Madden, L. V. 1990. Introduction to Plant Disease Epidemiology. John Wiley. N. Y.


Reading Assignments
Familiarity with the literature is of critical importance to graduate education and professional success. Consequently, reading assignments will be given and your understanding of the material will be evaluated in exams and class and lab discussions.
PI P 551 - READING MATERIAL –

Selected Journal Articles. Articles are required reading unless indicated as supplemental.

**Historical perspective**


**Ecological view of plant pathogens**


**Genetic Basis of epidemics**


**Disease assessment, monitoring and diagnosis**


**Environmental influences on plant disease**


**Temporal analysis of epidemics**

Hu, X. et al. 2015. Combining models is more likely to give better predictions than single modes. Phytopathology 105:1174-1182. (supplemental)

**Epidemiology and plant disease control**


**Managing host genes**


Pataky, J.K. and Campana, M.A. 2007. Reduction in common rust severity conferred by the Pr 1D gene in sweet corn hydrids infected by mixtures of Pr 1D-virulent and avirulent *Puccinia sorghi*. Plant Dis. 91:1484-1488 (supplemental)
**Disease forecasting and simulation of epidemics**


**Inoculum potential**

**Pathogen dispersal, transport**


**Spatial aspects of plant disease epidemics**

**Management with chemicals, and pathogen insensitivity to chemicals**

Mallowa, S.O. et al. 2015. Effect of maize hybrid and foliar fungicides on yield under low foliar disease severity conditions. Phytopathology 105:1080-1089. (supplemental)