Syllabus
PPATH 542, Epidemiology of Plant Diseases
Spring 2024

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Course contributors and lecturers:
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Class Location: 201 Buckhout Lab
Class meeting times: Friday, 2:30 to 5:30 PM
Credits: 3

Course prerequisites: PPATH 401, MATH 111 or MATH 141, or 3 credits in statistics.

Course objectives.

1. To increase understanding regarding how plant disease epidemics occur and change over time and space.
2. To improve knowledge about the tools and methods applied to monitor and quantify plant pathogens and diseases.
3. To demonstrate the importance of crop losses and the methods used to quantify, predict, and reduce their impact.
4. To improve computational skills related to modeling and analysis of epidemiological data.

By the end of this course, students will (1) have increased their knowledge about the interdisciplinary nature that is needed in plant disease epidemiology, (2) be able to apply that knowledge to their own pathosystems, (3) have improved computational coding skills and how they are applied to plant disease epidemiology, and (4) have strengthened their scientific communication through group project collaboration.

Course organization

Course materials.

- Primary readings from:
    - The Study of Plant Disease Epidemics, L.V. Madden, G. Hughes, and F. van den Bosch (2007) [will be provided via Canvas]

- Various book chapters and journal articles will be provided in Canvas.
- Students should have access to a personal computer and R software. We will also use various examples from R to illustrate specific concepts in epidemiology. Information will be provided at least two weeks before the class if additional software is required.

Course grading.

- Lecture assignments: 25%
- R assignments: 15%
- Individual project: 25% (5% for draft and 20% for final)
- Group project: 30% (5% for draft and 25% for final)
- Class participation: 5%

Course topics and tentative dates. The course is structured using synchronous and asynchronous methods with a semi-flipped classroom approach. We will use a combination of recorded lectures, in-class computational coding, and two projects to integrate the concepts that form plant disease epidemiology.

Recorded lectures. The conceptual and theoretical material will be recorded and provided before each class. You will engage with this material outside of the classroom. For each lecture, there will be at least two questions to provide answers to using Canvas. The lectures are hosted on Teams and can be found at: Plant Pathology 542 Resources | General | Microsoft Teams.

Computational analyses using R. We will use R and RStudio software throughout the course. This material forms most of our in-person activities since my experience shows that students benefit from direct hands-on learning of this material. Knowledge will be tested through three homework assignments where the goal is to take the knowledge learned to that point and apply it to epidemiological data. All material will be provided on Canvas and can also be found at https://www.open-pde.info/ and in the Teams resources for recorded training videos.

Individual projects. The aim of this individual project is to have each student develop a conceptual causal model for their (or one of their) plant pathosystem. For those in the Ph.D. program, this provides an in-depth learning experience that will have direct application to things such as the comprehensive exam. For all students, this provides an approach and template that can be applied when working with graduate student committees, in grant writing, and in scientific presentations.

Group project. The objective of this group project is to research the epidemiology of the tomato brown rugose fruit virus (ToBRFV) and to develop regulatory and phytosanitary protocols to mitigate the ToBRFV pandemic. Completing this project will enable you to successfully perform the end-of-semester activity, which will occur on the last day of class (April 26, 2024).

Date	Topic(s)	Method
Jan. 12	Welcome and introductions Syllabus Project discussion and creation of teams R and RStudio setup Lecture 1. Introduction and history of epidemiology Recorded lecture and questions for Jan. 19: Pathogen detection	Synchronous Asynchronous
Jan. 19	Introduction to causal models (Santosh Sanjel) R: introduction to summary statistics and graphics Recorded lecture and questions for Jan. 26: Disease assessment detection	Synchronous Asynchronous
Jan. 26	Disease assessment exercise R: disease assessment Recorded lecture and questions for Feb. 2: NONE	Synchronous Asynchronous
Feb. 2	NO CLASS PROJECT WORKDAY R assignment: exercise on disease assessment (*due in two weeks*) Recorded lecture and questions for Feb. 9: Sampling	Asynchronous
Feb. 9	Discussion and questions about projects R: sampling Recorded lecture and questions for Feb. 16: Temporal disease progress I	Synchronous Asynchronous
Feb. 16	R: temporal disease progress I Recorded lecture and questions for Feb. 23: Temporal disease progress II	Synchronous Asynchronous
Feb. 23	Group project check-in R: temporal disease progress II Recorded lecture and questions for Mar. 1: NONE	Synchronous Asynchronous
Mar. 1	NO CLASS PROJECT WORKDAY R assignment: exercise on temporal disease project (*due in two weeks*) Recorded lecture and questions for Mar. 15: Spatial analysis I	Asynchronous
Mar. 8	**Spring break – no class**	

Mar. 15	R: spatial analysis I Recorded lecture and questions for Mar. 22: Spatial analysis II	Synchronous Asynchronous
Mar. 22	R: spatial analysis II Recorded lecture and questions for Mar. 22: Crop loss	Synchronous Asynchronous
Mar. 29	Epidemiology class activity – *Sclerotinia sclerotiorum* (Karen Luong) Group project check-in Recorded lecture and questions for Apr. 5: None	Synchronous Asynchronous
Apr. 5	NO CLASS PROJECT WORKDAY R assignment: spatial analysis (*due in two weeks*) Recorded lecture and questions for Apr. 19: Decision theory	Synchronous Asynchronous
Apr. 12	Paul at International Epidemiology Workshop in Brazil Finalize project drafts for review Recorded lecture and questions for Apr. 19: Risk and policy	Asynchronous
Apr. 19	Drafts due for projects (*returned by Tuesday, Apr. 23 at the latest*) R: forecasting R: experimental design Recorded lecture for Apr. 26: Ecosystem services (*no questions to answer*)	Synchronous Asynchronous
Apr. 26	R: experimental design **Game Day!**	Synchronous

Course Policies

Attendance:

Attendance in this class is mandatory without an excused absence[1].
Due to the nature of the course, it is important for students to be in attendance. Information that relates to the content of the course and related assignments that will be critical to student performance on the course objectives will be provided. All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion.

The decision to attend or not attend a class is a decision of the student. University policy does not require that all students attend all class sessions, nor does it permit students to miss any class without an excused absence. Students are expected to be present during the entire class session and to be *active* participants in discussions and activities. When a student is absent from class, he/she must notify the instructor PRIOR TO the absence by either telephone (voice mail) or e-mail.

Disability Access: Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) website provides contact information for every Penn State campus
(http://equity.psu.edu/sdr/disability-coordinator). For further information, please visit Student Disability Resources website (http://equity.psu.edu/sdr/).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines (http://equity.psu.edu/sdr/guidelines). If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

University Statement of Academic Integrity: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with person integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

[1] Note on class attendance: please do not come to class if you are sick. Notify Dr. Esker via email before the class period begins.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Counseling and Psychological Services: Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

Counseling and Psychological Services at University Park (CAPS)
(http://studentaffairs.psu.edu/counseling/): 814-863-0395

Counseling and Psychological Services at Commonwealth Campuses
(https://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/)

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400
Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741