

# Epidemiology & Data Science

**PLP6905** Section 4H93 (Gainesville graduate) and 4H95 (REC graduate) / **PLP4905** Section 4H94 (undergraduate)

## Epidem & Data Sci

3 credit hours

Class meetings: MWF Period 5 (11:45 am -12:35 pm US Eastern)

For students outside the US: Note that, in the US, Daylight Saving Time ends Nov 1, 2020, so the time zone of the course will change from Greenwich Mean Time minus four (GMT-4) to GMT-5, and the course will effectively be one hour later if your location doesn't change time – sorry folks in Asia! For participants in the US Eastern time zone, the course will continue to be 11:45-12:35.)

Course link for class meetings will be in zoom: TBA

Course link for class materials: TBA

**Course:** PLP4905 and PLP6905 are taught concurrently. Undergraduate students are expected to enroll in PLP4905 Section 4H94 whereas graduate students should enroll in PLP6905 Section 4H93. Students enrolled in the graduate course will be required to complete journal article presentations and discussions.

## Prerequisites

**Graduate** (PLP6905 Section 4H93) General knowledge of agricultural, ecological, or epidemiological systems, at least two undergraduate or graduate courses applying quantitative concepts and tools (such as statistics or quantitative ecology courses)

**Undergraduate** (PLP4905 Section 4H94) Junior or Senior standing, general knowledge of agricultural, ecological, or epidemiological systems, at least two courses applying quantitative concepts and tools (such as statistics or quantitative ecology courses)

**Instructor:** Dr. Karen A. Garrett ([garrettlab.com](http://garrettlab.com))  
Plant Pathology, Food Systems Institute, Emerging Pathogens Institute  
Email: [karengarrett@ufl.edu](mailto:karengarrett@ufl.edu)

## Office hours via Zoom

By appointment in advance, 12:50-1:40 Monday and Wednesday, or additional times as needed

## Course overview

Plant disease epidemiology addresses how interactions among plants, pathogens, vectors, the abiotic environment, and human decision-making result in the occurrence of plant disease and the spread of plant pathogens. Epidemiology also represents the interface between plant pathology and other disciplines, such as meteorology, social sciences, and ecoinformatics.

This course addresses classical approaches to epidemiology as well as frontiers that make use of new big data opportunities and artificial intelligence. The course provides an introduction to the R programming environment, data science applications in epidemiology and epidemiological analyses using R. The course includes a combination of lectures to provide background information, discussion of current literature, computational analysis workshops to illustrate concepts, and individual projects to allow participants to apply ideas to systems that particularly interest them.

In the individual projects, each participant will select a disease (or disease complex) of particular interest, assemble a portfolio of epidemiological information related to that disease (or similar diseases, if data are sparse), prepare a short proposal including an experimental design to collect important new data related to the disease, analyze (real or simulated) results from that proposal, and evaluate regional management strategies for the disease in an epidemiological synthesis.

The course emphasizes concepts and use of existing tools, while at the same time it will offer a basis for the development of new epidemiological tools for participants interested in further steps.

## Course learning objectives

Participants who have completed this course will be able to...

- ❖ explain and apply general epidemiological concepts, such as disease progress over time, pathogen dispersal, sampling strategies, and spatial analyses
- ❖ broadly understand and discuss journal articles addressing plant disease epidemiology
- ❖ design basic epidemiological studies, in designed experiments and observational studies
- ❖ apply epidemiological concepts to the design of disease management across scales
- ❖ broadly understand and discuss applications of artificial intelligence in plant disease management
- ❖ analyze basic epidemiological studies using R

**Course outline (as of Aug 26, 2020 – subject to change)**

Assignments are indicated in the schedule in bold.

<b>Week of</b>	<b>Monday</b>	<b>Wednesday</b>	<b>Friday</b>
Aug 31	Intro to epidemiology and this course	Individual introductions, intro to data science	Intro to R programming environment I
Sept 7	---- LABOR DAY --	Intro to R programming environment II ( <b>Quiz</b> )	Disease progress over time I
Sept 14	Disease progress over time II, with examples in R ( <b>Quiz</b> )	Pathogen dispersal I	Pathogen dispersal II, with examples in R ( <b>Quiz</b> )
Sept 21	Sampling epidemiological processes	Simulating sampling strategies in R ( <b>Quiz</b> )	Epidemic networks I
Sept 28	Epidemic networks II, with examples in R ( <b>Quiz</b> )	Lessons from COVID-19 for plant disease management I	Lessons from COVID-19 for plant disease management II ( <b>Quiz</b> )
Oct 5	Reproducible epidemiological research	Discussion of project proposal development ( <b>Quiz</b> )	Weather, climate, and disease risk analysis I
Oct 12	Weather, climate, and disease risk analysis II, with examples in R ( <b>Quiz</b> )	Integrating molecular tools in epidemiology	Epidemiological perspectives on microbiomes ( <b>Quiz</b> )
Oct 19	<b>Proposal presentations</b>	<b>Proposal presentations</b>	<b>Proposal presentations</b>
Oct 26	Continental epidemics	Ecoinformatics, integrating GIS and spatial analyses, with examples in R ( <b>Quiz</b> )	Integrating socioeconomics in epidemiology and decision support tools
Nov 2	Artificial intelligence and big data in epidemiology	Machine learning in epidemiology, with examples in R ( <b>Quiz</b> )	<b>Scientific paper discussion</b>
Nov 9	Epidemiology in digital agriculture	---- VETERAN'S DAY --	<b>Scientific paper discussion</b>
Nov 16	Decision support systems for disease management	The value of information (VOI) and research priorities	<b>Scientific paper discussion</b>
Nov 23	Image analysis in epidemiology	-- --THANKSGIVING --	---- THANKSGIVING --
Nov 30	Participant choice topic	Participant choice topic	<b>Scientific paper discussion</b>
Dec 7	Participant choice topic	Participant choice topic	---- READING DAYS --
Dec 14	Final exams week: <b>Final presentations</b>		

## Grading

### ***Graduate students (PLP6905)***

- 20% Class discussions
- 20% Quizzes
- 20% Project proposal
- 10% Journal article presentation and discussion
- 30% Final project

### ***Undergraduate students (PLP4905)***

- 20% Class discussions
- 20% Quizzes
- 25% Project proposal
- 35% Final project

Short quizzes over the previous days' topics are given most weeks, for a total of 11 quizzes, to help participants keep up with the course material. The lowest 3 quiz scores will be dropped from the grade, so there is no option to make up quizzes.

The project proposal will give students an opportunity to show how they can apply the course concepts and tools to a disease of particular interest to them.

Each participant in PLP6905 (graduate students) will lead or co-lead a journal article discussion for the group, and other graduate student participants will be expected to contribute to the discussion.

Final projects will be presented and discussed in the class during finals week.

If the grade on an assignment appears incorrect, the process for requesting reconsideration of the grade is to prepare a written statement describing where the error lies, to be turned into the instructor within three days of receiving the grade.

Grades and Grade Points: For information on current UF policies for assigning grade points, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Grading scale:** 94-100 A; 90-93 A-; 87-89 B+; 84-86 B; 80-83 B-; 77-79 C+; 74-76 C; 70-73 C-; 67-69 D+; 64-66 D; 60-63 D-

### **Required course materials**

There is no required textbook for this course. Review articles and journal articles for discussion will be provided to the class. The journal articles for which participants will

lead discussions will be chosen in discussion with the participants, to represent the general topics in the schedule above.

Good general references for plant disease epidemiology include:

Madden, Hughes, & van den Bosch. 2007. The Study of Plant Disease Epidemics. APS Press.

Cooke, Jones, & Kaye, eds. 2006. The Epidemiology of Plant Diseases. Springer

A good reference for data science in R is the following, with a lot of good information available at <http://r4ds.had.co.nz/>

Wickham & Grolemund. 2017. R for Data Science. O'Reilly.

A good general reference for R:

Crawley. 2012. The R Book. Wiley.

A set of useful “cheat sheets” for R:  
<https://www.rstudio.com/resources/cheatsheets/>

A series of modules with examples of the use of R in plant disease ecology and epidemiology is available through the following link. (Note that as of July 2018 we are in the process of updating these modules.)

<http://www.apsnet.org/edcenter/advanced/topics/EcologyAndEpidemiologyInR/Pages/default.aspx>

### **Garrett's teaching philosophy**

I think of teaching as a process that occurs in a network of people. An individual could create a pretty good learning experience by finding a good set of books and papers on a topic, and trying out some R code on their own. However, this course is designed to offer a fuller experience and more efficient learning by linking participants to key literature, to relevant R packages, and to each other and the instructors through discussions and feedback. Engaging with a group of people interested in a topic can also be a lot of fun and boost creativity.

The course is designed to support participants in engaging with projects, rather than emphasizing testing. The quizzes are intended to provide some structure to help keep people up to date and engaged in the discussions. Most of the course activities will engage knowledge and creativity in developing projects. I will work to help each student develop a project relevant to their current and/or future research.

### **Attendance and make-up policies**

This is a synchronous course, to make the most of interactions among participants. Discussion among course participants is an important part of the learning experience, so attendance is required. Three course meetings can be missed without explanation (with the exception of dates when the participant has a particular responsibility, such as leading discussions or presenting). Please alert the instructor if there is a serious health problem or other emergency.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:  
<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

### **Recorded class sessions**

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

### **Accommodations for Students with Disabilities**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students should first register with the Disability Resource Center at 0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/) and provide appropriate documentation.

### **On-line course evaluation**

For this course, we will also ask students to anonymously provide some more specific recommendations for making the course as useful and interesting as possible, in both a mid-term survey and a final survey. This will be in addition to the general UF course assessment.

UF Policy: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the

evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>

## **Materials and supplies fees**

None

## **UF Policy on Academic Honesty**

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

## **UF Policy on Software Use**

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

## **Campus helping resources**

The university's counseling resources are available for students experiencing personal problems that interfere with their general well-being and/or academic performance. The Counseling & Wellness Center provides confidential counseling services at no cost for students that are currently enrolled with the university.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)

- Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Training Programs
  - Community Provider Database
- Career Resource Center, First Floor JWRU, 352-392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)

### **Student complaints**

If there is an issue in the course, please bring it to the instructor's attention. UF policies about more serious complaints are described in these documents.

- Residential Course: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)
- Online Course: <http://www.distance.ufl.edu/student-complaint-process>