

## PCB3402 Disease Ecology & Evolution (Fall 2024)

### Course Description

Disease Ecology and Evolution is an integrative course that focuses on both sides of the host-pathogen relationships. I built this course based on the One Health approach which considers that human health is closely connected to animal and ecosystem health. Thus, we rely on primary literature to discuss the latest cases of wildlife diseases, changes in host susceptibility, and theoretical approaches to study disease ecology and evolution. Although the course does not have sharp divisions into units, we focus on the first half on evolutionary topics, and then discuss topics related to ecology and the environment. Our topics for the evolution part include: evolution of defense strategies, which includes both host and pathogens; trade-off theory, red-queen dynamics. Then we transition to topics about species interactions such as: sequence and timing of infections, the mathematical concept of superspreaders, disease networks, diversity disease relationships, seasonality and disease dynamics, and microbiomes. We discuss examples from different types of infections and diseases caused by viruses, bacteria, and parasites. We integrate concepts of community ecology to understand changes in the force of infection through time and space. Disease Ecology and Evolution also offers active learning activities using the R statistical language. This course contributes to broadening the perspective of our future health practitioners and scientists studying outbreaks.

### Instructor

Ana V. Longo, PhD  
Department of Biology  
Office Location: 412 Carr Hall  
Office Hours: Thursdays 9:30 AM – 10:30 AM (see below).  
Phone: 352.273.4982  
Email: [ana.longo@ufl.edu](mailto:ana.longo@ufl.edu)

### Preferred Methods for Public and Private Communications

*Canvas mail should be used for all course-related communications. I will **NOT** answer emails from external accounts (e.g., GMAIL).*

Note: Participation in Canvas Discussions is considered a public conversation within the class.

### Course Meeting Times (Periods 2 and 3)

**Location: CRR 0521**  
Tuesdays: 8:30 AM – 10:25 AM  
Thursdays: 8:30 AM – 9:20 AM

### Office Hour Policies

Drop-in Office Hours will be on Thursdays 9:30 AM – 10:30 AM. I understand that these times might not work for everyone, therefore contact me to explore other options. Please use this website to schedule your meeting:

<https://outlook.office365.com/owa/calendar/bookings-AnaLongoSpring2024@uflorida.onmicrosoft.com/bookings/>

### Course Objectives

After successfully completing this course, students will be able to:

1. Compare and contrast major infectious diseases in plants, animals, and humans.
2. Understand how species can persist with pathogens/parasites.
3. Analyze case studies and identify the ecological and evolutionary factors promoting disease emergence.
4. Apply concepts from ecology and evolution to mitigate disease emergence or control spread of infectious diseases.
5. Communicate infectious disease information to broad audiences.
6. Find reliable sources of information about infectious diseases.

### Course Textbook (s) and/or Assigned Readings

This course does not have an assigned textbook. Reading material will be available on Canvas, under Files.

### Grading

**Class engagement:** 20 points total (see rubric below)

**Learning Activities:** 25 points each x 3 = 50 points (includes option to drop 1 activity)

**Quizzes:** 25 points each x 3 = 50 points (includes option to drop 1 quiz)

**Short Presentations (2):** 30 points

**Final Presentation and Written Review:** 50 points

**Total:** 200 points

### Grading Scale

Total points will be rounded (for example: 94.4% = 94% = A-; 94.5 % = 95% = A).

Percent (out of 100)	Grade
≥95-100	A
≥90	A-
≥87	B+
≥85	B
≥80	B-
≥77	C+
≥75	C
≥70	C-
≥67	D+
≥65	D
≥60	D-
<60	E

Information on current UF grading policies for assigning grade points can be found in <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### Class engagement (20 points in total)

Class time provides an extremely valuable opportunity to interact with the instructor and your classmates. Your level of engagement, showing up to class, and mastering the activities will

directly contribute to success in the course. I will evaluate your engagement according to the following rubric:

Action	Points
Absent	0
Present	
-but not contributing during class time	0.5
-participates by giving their opinion, expands discussion with additional examples, asks relevant questions, and/or writes thoughtful statements on journal	1

During the semester, students will have the opportunity to earn a total of 25 points (including extra points in several sessions). However, the final grade for class engagement will be calculated based on a total of **20 points**. Because we have a buffer of 5 points, in-class engagement points will **not** be subjected to make-ups.

### Make-Up Policy

Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. Students that will be missing an exam due to a pre-arranged university-approved excused absence should let the instructor know a minimum of **two weeks in advance**. In case of illness or personal emergency, students must submit documentation to the Dean of Students office (<https://care.dso.ufl.edu/instructor-notifications/>) and request an instructor notification to be sent. These notes must be received within **five business days** after the missing assignment, quiz, or class.

**Late assignments will not be accepted.** I will offer 3 learning activities and 3 quizzes, but you will only need to complete 2 of each. If you complete all 3, I will drop the **lowest score**. This policy allows for flexibility and maintains structure. I will ask **no questions** if you miss a quiz or learning activity. No extra assignments will be provided.

### Course Evaluation

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 <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### As a budding disease ecologist and evolutionary biologist, these are our **Best Practices**

Based on latest epidemiological parameters, the COVID-19 pandemic is still going on, mpox was recently declared a global health emergency, H5N1 (avian influenza) cases continue rising, and the flu has caused at least 25,000 deaths from 2023-2024. The following practices are highly

recommended to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones:

**If you are not vaccinated, get vaccinated.** Vaccines are readily available and have been demonstrated to be safe and effective against many of these pathogens.

**If you get sick, stay home and self-quarantine.** Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work.

### Online Privacy

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 is automatically recorded, but not shared. As in all courses, **unauthorized sharing of recorded materials without instructor/student knowledge is prohibited.**

### In-class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal education use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. **All other purposes are prohibited.** Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and deliver by an instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentation such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or guest lecturer during a class session.

**Publication without permission of the instructor is prohibited.** To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless, of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is **posted on or uploaded to, in whole or in part, any media platform**, including but not limited to *social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services*. **A student who publishes a recording without written consent may be subject to a civil cause**

## **of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.**

### **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### **Class Demeanor**

Students are expected to arrive to class **on time** and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones. Opinions held by other students should be respected in discussions.

### **University Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the [possible sanctions](#). Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

### **Basic Needs, Counseling and Wellness Center, and Academic Support**

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact UF food pantry: <https://pantry.fieldandfork.ufl.edu> or the Dean of Students for support. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352-392-1575 so that a team member can reach out to the student (<https://counseling.ufl.edu/>). Sexual Assault Recovery Services (SARS) available at Student Health Care Center 352-392-1161; University Police Department: 392-1111 or 9-1-1 for emergencies.

Other resources available at UF:

*UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website.](#)

*GatorWell Health Promotion Services:* For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, [visit the GatorWell website](#) or call 352-273-4450.

*E-learning technical support:* Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).

*Career Connections Center:* Reitz Union Suite 1300, 352-392-1601. [Career assistance and counseling services.](#)

*Library Support:* Various ways to receive assistance with respect to using the libraries or finding resources. Call 866-281-6309 or email [ask@ufl.libanswers.com](mailto:ask@ufl.libanswers.com) for more information.

*Teaching Center:* 1317 Turlington Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.

*Writing Studio:* Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.

*Academic Complaints:* Office of the Ombuds; Visit the Complaint Portal webpage for more information.

Enrollment Management Complaints (Registrar, Financial Aid, Admissions): [View the Student Complaint Procedure webpage for more information.](#)

## Class Schedule

Week	Date	Class	Topic	Instructions	Reading Material (available under Files in Canvas)	Participation Points
1	Thurs Aug 22	1	Welcome and Class Introduction	Please register for symposium: <a href="https://snrc.ifas.ufl.edu/news-and-events/research-symposium/">https://snrc.ifas.ufl.edu/news-and-events/research-symposium/</a> Upload screenshot in Canvas assignment.		0 (+1 bonus)
2	Tues Aug 27	2	Basic concepts about host-pathogen interactions		Owen, J.C., Adelman, J.S. & Henschen, A.E. (2021). 2 The Nature of Host-Pathogen Interactions. In: <i>Infectious Disease Ecology of Wild Birds</i> (eds. Owen, J.C, Hawley, DM & Huyvaert, KP). Oxford University Press, p. 7-24.  Casadevall, A., and L. A. Pirofski. 2000. Host-pathogen interactions: basic concepts of microbial commensalism, colonization, infection, and disease. <i>Infection and Immunity</i> 68: 6511-6518.	1
	Thurs Aug 29	3	Immunity and Disease Ecology		Hedrick, S. M. 2017. Understanding Immunity through the Lens of Disease Ecology. <i>Trends in Immunology</i> 38:888-903.	1
3	Tues Sept 3	4	<b>Learning Activity 1:</b> Working with infection data in R	Make account in Posit Cloud (R Studio)  Upload answers before Tues Sept 10, 12:00pm (25 points)		1
	Thurs Sept 5	5	Evolution of defense strategies: Resistance and Tolerance	Instructions for short presentations will be posted (Presentations due Oct 8).	Schneider, D. S., and J. S. Ayres. 2008. Two ways to survive infection: what resistance and tolerance can teach us about treating infectious diseases. <i>Nature Reviews Immunology</i> 8:889-895.	1
4	Tues Sept 10	6	<b>Learning Activity 2:</b> Red-Queen Dynamics Card Game	Upload answers before Tues Sept 17, 12:00pm (25 points)	Schmid-Hempel, P. & Ebert, D. 2003 On the evolutionary ecology of specific immune defence. <i>Trends in Ecology &amp; Evolution</i> 18, 27-32. <a href="https://doi.org/10.1016/S0169-5347(02)00013-7">doi:https://doi.org/10.1016/S0169-5347(02)00013-7</a> .	1
	Thurs Sept 12	7	Measuring Host Specificity		Poulin, R. 2007. Chapter 3. Evolutionary Ecology of Parasites. Pages: 41-47.	1
5	Tues Sept 17	8	Sequence and Timing of Infections		Karvonen, A., J. Jokela, and A.-L. Laine. 2019. Importance of Sequence and Timing in Parasite Coinfections. <i>Trends in Parasitology</i> 35:109-118.	1
	Thurs Sept 19	9	Disease Superspreaders		Martin, L. B., B. Addison, A. G. D. Bean, K. L. Buchanan, O. L. Crino, J. R. Eastwood, A. S. Flies et al. 2019. Extreme Competence: Keystone Hosts of Infections. <i>Trends in Ecology &amp; Evolution</i> 34:303-314.	1
6	Tues Sept 24	10	Macroecological Patterns of Host Competence		Downs, C.J., L.A. Schoenle, B.A. Han, J.F. Harrison, and L.B. Martin, Scaling of host competence. <i>Trends in parasitology</i> , 2019. 35(3): p. 182-192.	1
	Thurs Sept 26	11	Brief recap and Quiz	<b>Quiz #1</b> (25 points)		0
7	Tues Oct 1	12	<b>Learning Activity 3:</b> <b>Networks in Disease Ecology</b>	Upload answers before Tues Oct 8, 12:00pm (25 points)	Albery, G.F., Kirkpatrick, L., Firth, J.A. & Bansal, S. 2021 Unifying spatial and social network analysis in disease ecology. <i>Journal of Animal Ecology</i> 90, 45-61. <a href="https://doi.org/10.1111/1365-2656.13356">doi:https://doi.org/10.1111/1365-2656.13356</a> .	1
	Thurs Oct 3	13	Landscape Genetics and Disease Risk		Archie, E. A., G. Luikart, and V. O. Ezenwa. 2009. Infecting epidemiology with genetics: a new frontier in disease ecology. <i>Trends in Ecology &amp; Evolution</i> 24:21-30.	1
8	Tues Oct 8	14	<b>Student-led Lightning Presentations</b>			1

Week	Date	Class	Topic	Instructions	Reading Material (available under Files in Canvas)	Participation Points
	Thurs Oct 10		<b>NO CLASS</b>	<b>Dr. Longo out of town @ invited seminar Penn State Univ</b>		0
9	Tues Oct 15	15	<b>SNRE Symposium</b> Dr. Sonia Altizer keynote speaker	Meet at Reitz Union Grand Ballroom at 8:40am SHARP (register and find seat); keynote is until 10:30AM		1 (+1 bonus, if present until end of keynote)
	Thurs Oct 17	16	Climate Change and Infectious Diseases		Lafferty, K.D., The ecology of climate change and infectious diseases. <i>Ecology</i> , 2009. 90(4): p. 888-900.	1
10	Tues Oct 22	17	Seasonality and Disease Dynamics		Altizer, S., A. Dobson, P. Hosseini, P. Hudson, M. Pascual, and P. Rohani. 2006. Seasonality and the dynamics of infectious diseases. <i>Ecology Letters</i> 9:467-484.	1
	Thurs Oct 24	18	Overview of Amphibian Diseases		Fisher, M.C. and T.W.J. Garner, Chytrid fungi and global amphibian declines. <i>Nature Reviews Microbiology</i> , 2020. 18(6): p. 332-343.	1
11	Tues Oct 29	19	Symbiont-mediated Immunity		Daisley, B.A., J.A. Chmiel, A.P. Pitek, G.J. Thompson, and G. Reid, Missing Microbes in Bees: How Systematic Depletion of Key Symbionts Erodes Immunity. <i>Trends in Microbiology</i> , 2020. 28(12): p. 1010-1021.	1
	Thurs Oct 31	20	Brief recap and Quiz	<b>Quiz #2</b> (25 points)		0
12	Tues Nov 5	21	Sexual selection and parasitism		Jacobs, A.C., Zuk, M., Demas, G.E. and Nelson, R.J., 2012. Sexual selection and parasites. <i>Ecoimmunology</i> , pp.468-496.	1
	Thurs Nov 7	22	Immunopathology		Rhannon Pursall, E., Rolf, J., Demas, G.E. and Nelson, R.J., 2012. Immunopathology in <i>Ecological Immunology</i> , pp.530-547.	1
13	Tues Nov 12	23	Effects of Disease on Ecosystems		TBD	1
	Thurs Nov 14	24	One Health Concept and Eradication of Infectious Diseases		Klepac, P., S. Funk, T.D. Hollingsworth, C.J.E. Metcalfe, and K. Hampson, Six challenges in the eradication of infectious diseases. <i>Epidemics</i> , 2015. 10: p. 97-101.  <a href="https://www.cdc.gov/onehealth/basics/index.html">https://www.cdc.gov/onehealth/basics/index.html</a>	1
14	Tues Nov 19	25	Open questions in Disease Ecology and Evolution		Lively, C.M., Roode, J.C.d., Duffy, M.A., Graham, A.L. & Koskella, B. 2014 Interesting open questions in Disease Ecology and Evolution. <i>The American Naturalist</i> 184, S1-S8. (doi:10.1086/677032).	1
	Thurs Nov 21	26	Brief Recap and Quiz	<b>Quiz #3</b> (25 points)		0
15	Tues Nov 26		<b>Independent study time. Work on final project. NO CLASS</b>			0
	Thurs Nov 28		<b>THANKSGIVING BREAK: NO CLASS</b>			0
16	Tuesday Dec 3	27	<b>Final presentations</b>	Upload presentations through Canvas before Mon Dec 2 8:00 PM		1