

## SYLLABUS SPRING, 2019

### PHC 6937: Environmental Ecology of Human Pathogens (3 credits)

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**Prerequisites:** None

**Time:** Tuesday and Thursdays

**Class Setting:** *Online*

**Office Hours:** Discussion via web mail

#### PURPOSE AND OUTCOME

##### Course Overview

This course covers major topic areas concerning the ecological relationships of environmental pathogens that cause diseases in humans. The course will discuss environmental reservoirs of human pathogens and introduces microbiological techniques necessary to detect and identify the variety of pathogens present and/or emerge in the environment including, viruses, bacteria, and parasites. It will also examine the more complex ecological relationships of pathogens associated with different environments including water, soil, air, food, and animals. The course will also discuss how physical, chemical and biological components of an environmental niche can change pathogen dynamics in that niche, influencing human health surrounding that environment and beyond. The objective of this course is to complement other subjects in the curriculum such as epidemiology, environmental health, one health, and to provide knowledge for students seeking undergraduate, MPH and PhD. This course is different from other infectious disease courses in that the primary focus is on pathogens in the natural environment and the potential spillover of these pathogens in humans. Therefore, the course materials do not cover in detail the epidemiology of infectious diseases, biological mechanisms of human illness, or broader public health impacts of infectious diseases.

##### Relation to Program Outcomes

Competencies primarily gained in this course

1. Understand the role of environment in human infectious disease
2. Complex and dynamic relationship and interplay among pathogen, environment and human host
3. Identify causative agents of infectious diseases in individuals and the community
4. Evaluate the environmental factors that affect pathogen survival and virulence
5. Interpret the role of the environment on emerging infectious diseases
6. Determine ways to prevent the spread of infectious diseases
7. Communicate effectively with other health professionals in oral and written forms

##### Course Objectives and/or Goals

Upon completion of this course, students will be able to:

1. Distinguish characteristics of bacteria, viruses, and parasites found in the environment

2. Classify the major pathogens present in water, air, soil, and food, and animals.
3. Evaluate pathogen routes of exposure, mechanisms of infection, and health impacts of environmental pathogens
4. Explain the basic microbiological principles of host-pathogen interactions from environmental sources
5. Determine interactions between pathogens and environmental factors driving pathogens' evolution and adaptation
6. Discuss current issues in emerging infectious agents such as drug resistance and relation to climate-change
7. Propose ways to prevent transmission through the study of routes of exposures and critical control points

**Laboratory:** None

**Guest Speakers:**

Guest experts in some topics covered in the course may be invited to offer lectures in their areas of expertise.

**COURSE MATERIALS:**

**PRIMARY TEXTBOOK:**

Microbiology of Waterborne Disease, 2nd edition (2014), ELSEVIER, ISBN-13: 978-0124158467. Steven L. Percival, Marylynn V. Yates, David W. Williams, Rachel M. Chalmers, and Nicholas F. Gray.

Other course materials will include current literature dealing with waterborne infectious diseases and preventative measures

**METHOD OF PRESENTATION:**

The course will consist of lectures by the instructor combined with occasional guest lectures by invited experts in particular topics. In addition to lectures and online discussion, appropriate film and visual aids may be utilized.

**METHOD OF EVALUATION:**

Each student will be evaluated on their performance on 2 closed-book examinations (worth 35% each) including multiple choice, matching, yes/no, and short answer. Each student will require to present a selected topic (relevant to the course) worth (15%), and a written report (topic other than presentation one) worth 15%. Undergraduate students will be evaluated based on two closed-door exams each worth of 50% of the grade point. Issues arising over make-up tests will be dealt with on a case by case basis.

**A: 93-100%**  
**A-: 90-92%**  
**B+:86-89%**  
**B: 82-85%**

**B-: 80-81%**  
**C+: 75-79%**  
**C: 72-74%**  
**C-: 70-71%**

**D+: 67-69%**  
**D: 63-66%**  
**D-: 60-62%**  
**E: <60%**

<b>Letter</b>	<b>A</b>	<b>A-</b>	<b>B+</b>	<b>B</b>	<b>B-</b>	<b>C+</b>	<b>C</b>	<b>C-</b>	<b>D+</b>	<b>D</b>	<b>D-</b>	<b>E</b>	<b>WF</b>	<b>I</b>	<b>NG</b>	<b>S-U</b>
<b>Grade Points</b>	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0	0.0	0.0	0.0	0.0

### ATTENDANCE/PARTICIPATION:

Valid excuses for missed classes must be submitted in writing, along with pertinent documentation. Acceptable reasons for absence from class include serious illness, family emergencies, special curricular requirements (e.g., judging trips, field trips, and professional conferences), military obligation, severe weather conditions, religious holidays, court-imposed legal obligations and participation in official university activities such as athletic competitions. For more on the university's attendance policies see the Graduate Catalogue.

### COURSE OUTLINE:

<b>Week</b>	<b>Topic</b>	<b>Material Covered</b>	<b>Readings/Comments</b>
<b><u>Week 1:</u></b> (January 8 & 10)	History of pathogens in the environment	-Syllabus, course descriptions and goals and expectation from students -Brief history of Microorganism -Biosphere, ecology, ecosystem and environment -Water-borne enteric <i>virus</i>	Suggested materials
<b><u>Week 2:</u></b> (January 15 & 17)	Microbiology of environmental pathogens	- Water-borne enteric <i>virus</i> (Cont'd) -Water-borne bacterial pathogens ( <i>Salmonella</i> , <i>Shigella</i> and <i>Campylobacter</i> ) - <i>Salmonella</i> and eggs	Suggested materials
<b><u>Week 3:</u></b> (January 22 & 24)	Water-borne pathogen	-cholera and <i>Vibrio cholerae</i> in aquatic reservoirs -seasonality and cholera - <i>V. cholerae</i> evolution	Suggested materials
<b><u>Week 4:</u></b> (January 29 & 31)	-Soil-borne pathogens -air-borne pathogens	-description of soil - <i>Cryptosporidia</i> , <i>Giardia</i> , <i>Toxoplasma</i> - <i>Clostridium</i> , <i>Anthrax</i> , <i>norovirus</i>	Suggested materials
<b><u>Week 5:</u></b> (February 5 & 7)	Host Pathogens interactions	-host factors -pathogen's factors -environmental/ecological factors	TBD supplementary reading materials from the literature

		-ideal disease conditions or asymptomatic carrier stage formation -overall implications to disease fate	
<b>Week 6:</b> (February 12 & 14)	Molecular mechanism of pathogens	- <i>Vibrio cholerae</i> , a water-borne pathogen will be discussed as a model pathogen -Intracellular pathogens and extracellular pathogens	Suggested materials
<b>Week 7:</b> (February 19 & 21)	Environmental factors driving pathogen's persistence and evolution	-Physical, chemical and biological factors influencing pathogens' diversity and distribution in a given time and space in an ecological niche -Climate change and human pathogens	Suggested reading materials
<b>Week 8:</b> (February 27 & March 1)	<b>-Exam 1:</b> February 27 -Water sources	-source of water -purification of water and waste water treatment -Eutrophication and water quality (Phosphate and nitrate)	Suggested materials
<b>Week 9:</b> (February 26 & 28)	<b>Exam 1: 27</b> -Water sources (Cont'd) -Emerging microbes and infections	- purification of water and waste water treatment -where, why and how pathogens emerge? -antibiotics and resistance to antibiotics	*Guest Lecture
<b>Spring Break March 4<sup>th</sup> thru March 8</b>			
<b>Week 10:</b> (March 5 & 7)	Genome change for adaptations to changing environments	-Gene swap methods -mutations, transposable elements,	<b>*Select a "topic" on</b> which you need to write a 10-page report on (student may wish to choose a topic of their own as long as it reflects course objectives/areas (need approval from Instructor)

<b>Week 11:</b> (March 12 & 14)	Mechanism of Persistence of pathogens in environment	-biofilm communities -simple biofilm -complex biofilm	TBD Supplementary literature
<b>Week 12:</b> (March 19 & 21)	Bacterial stress adaptations	- <i>V. cholerae</i> persister cells -mechanism of persister cells -viable but non-culturable state	TBB Supplementary literature *Assign student topics for presentations
<b>Week 13:</b> (March 26 & 28)	The complex life styles of environmental pathogens	-Quorum sensing and intra- and-inter pathogen communication -Outer membrane vesicles (OMVs)	Supplementary materials
<b>Week 14:</b> (April 2 & 4)	Special concerns for zoonotic pathogens	mostly emerging viruses	Suggested materials
<b>Week 15:</b> (April 9 & 11)	Humans, Pathogens, and Environment, one Health approach	-Modelling on infectious diseases	*Guest Speaker
<b>Week 16:</b> (April 16 & 18)	<b>Student presentation</b>	20-25 min talks by each <b>graduate</b> student on selected topics	
<b>Week 17:</b> (April 23 & 25)	Paper writing on select topic (permission required)		
<b>Week 16:</b> (April 29 to May 2)	<b>Final Exam (cumulative)</b>		

### ACADEMIC HONESTY:

As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University." Students are expected to act in accordance with the University of Florida policy on academic integrity (see Student Conduct Code, the Graduate Student Handbook or this web site for more details: [www.dso.ufl.edu/judicial/procedures/academicguide.php](http://www.dso.ufl.edu/judicial/procedures/academicguide.php)).

Cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

*We, the members of the University of Florida community,  
pledge to hold ourselves and our peers to the  
highest standards of honesty and integrity.*

### **UF COUNSELING SERVICES:**

Students may occasionally have personal issues that arise in the course of pursuing higher education or that may interfere with their academic performance. If you find yourself facing problems affecting your coursework, you are encouraged to talk with an instructor and to seek confidential assistance at the University of Florida Counseling Center, 352-392-1575, or Student Mental Health Services, 352-392-1171. Visit their web sites for more information: <http://www.counsel.ufl.edu/> or <http://www.health.ufl.edu/shcc/smhs/index.htm#urgent>

The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services, including primary care, women's health care, immunizations, mental health care, and pharmacy services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: [www.health.ufl.edu/shcc](http://www.health.ufl.edu/shcc)

Crisis intervention is always available 24/7 from:  
Alachua County Crisis Center: (352) 264-6789.

BUT – Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.

### **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.

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### **ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

If you require classroom accommodation because of a disability, you must first register with the Dean of Students Office (<http://www.dso.ufl.edu/>). The Dean of Students Office will provide documentation to you, which you then give to the instructor when requesting accommodation. The College is committed to providing reasonable accommodations to assist students in their coursework.

**DISCLOSURE:**

Instructor reserves the right to modify and adjust course outline as needed.