

Course title: Evolution of Infectious Diseases

Lecture **8:00 - 9:20 Tuesday & Thursday** Solis Hall 107

Professor

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Instructional Assistants (IAs)

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Short Course Description

Doctors who treat infectious diseases are faced with a uniquely difficult problem since the pathogens they treat often evolve, rendering today's therapies useless tomorrow. The need to consider evolution has often been overlooked when developing treatments, however with the spread of antibiotic resistance it is now of great concern. Future medical treatments will have to include comprehensive strategies that go beyond treating disease, but also counteract the evolutionary potential of pathogens. To this end, the Evolution of Infectious Disease Course will provide a thorough review of concepts and methods in evolutionary biology, with a focus on subjects that can be used to manage disease. This course will offer a thorough review of infectious disease evolution, practice with using the newest analytical techniques to track pathogen evolution, and discussions on the latest reports of disease evolution: from breakthroughs in slowing antibiotic resistance, to the emergence of new strains of zoonotic viruses.

Course Goals

- Build a fundamental understanding of concepts and methods in evolutionary biology
- Provide background on disease evolution research and future directions in the field
- Develop analytical skills to evaluate DNA sequences and other data to study the evolution of infectious diseases

Grading

25 Percent: Weekly homework assignments

10 Percent: Lecture attendance taken by answering iClicker questions (students may opt out of this)

25 Percent: Midterm exam

40 Percent: Final exam

Lectures

Attending the lectures for this course is very important. Homework assignments and the material for the exams will be taken directly from the lectures. Given their importance, the lectures will be podcasted (<https://podcast.ucsd.edu/>) and notes will be transcribed (<http://lecturenotes.ucsd.edu/>) to assist with studying. Students who attend lectures will be rewarded with points given through iClicker questions interspersed throughout the lectures. Simply registering an answer will give full credit. **I will drop the two lowest clicker scoring days, but no more.**

i>Clicker frequency is CA

- If you do not want to attend lectures or you have scheduling conflicts, then you may opt out of i>clicker points. If you do this, your final exam will be worth 10% more.

The **TritonEd website** will be used to distribute information, collect homework, and communicate

Weekly homework assignments

Weekly homework assignments will be posted on the TritonEd website on Friday by 10 pm and will be due the following Friday at 10 pm. **Students that enroll late are responsible for all assignments.** Homework will be submitted through TritonEd. Please make sure that you've received a confirmation e-mail that your file was received. **If you do not receive a confirmation within 10 minutes, or have any other problems submitting your homework, e-mail it to your IA immediately.** The first assignment will be due 4/13/18, and then weekly thereafter. Your Instructional Assistant will guide you through sample problems that will help you answer your homework. **Late assignments are not accepted because I upload an answer key on the Saturday after they are submitted.**

You will receive 50% credit for completing each homework problem, the remaining credit will be awarded if the answer is correct. You will not receive partial credit for wrong answers; the initial 50% is your reward for trying the problem. Homework is difficult and requires a strong understanding of the lecture material to complete.

We will drop the lowest scoring homework assignment.

Sections

Section attendance is not mandatory, but students who attended sections last year scored on average 5% higher. This is the difference between a B+ and an A. To encourage attendance this year, we will award bonus points during section. Each section will begin with a question related to the previous week's homework. Simply attending section and submitting an answer will award you 0.5% extra credit towards your final grade. That's 0.5% per section, a total of 4.5% if all nine sections are attended.

A01	DI	W	8:00am	8:50am	WLH	2209
A02	DI	W	9:00am	9:50am	WLH	2209
A03	DI	W	10:00am	10:50am	WLH	2209
A04	DI	W	11:00am	11:50am	WLH	2209
A05	DI	W	12:00pm	12:50pm	WLH	2209
A06	DI	F	8:00am	8:50am	WLH	2209
A07	DI	F	9:00am	9:50am	WLH	2209
A08	DI	F	3:00pm	3:50pm	WLH	2209
A09	DI	F	1:00pm	1:50 PM	WLH	2114

Office hours

Instructors will help you with general concepts and lecture and section material, not specific homework questions, those are to be completed independently.

Mondays

Justin 9-11 am 3218 Muir Biology

Hannah Strobel 12:30 – 1:30 pm 3880 AP&M

Tuesdays

Hamanda Cavalheri 1-2 pm 4882 AP&M

Brian Tsu 2-3 pm 4882 AP&M

Animesh Gupta 4-5 pm 4882 AP&M

Exams

There will be only two exams, a midterm and a final. If you have to miss the midterm, then your final will be worth 65% of your grade. The final is cumulative and very difficult, so it is not recommended that you miss the midterm. No one is permitted to miss the final which will be on Thursday June 15th, 8 – 11 a.m. No calculators or notes allowed for either exam.

Academic integrity

There will be no group work for this course

- Don't use any aids during an exam
 - Don't alter a graded exam and submit for regrade
 - Don't copy another student's assignment, in part or in total, and submit it as your own work
 - Don't purchase help or assignment completion from anyone
 - Don't copy your assignment answers from the Internet or from anyone
- <http://academicintegrity.ucsd.edu/excel-integrity/define-cheating/index.html>

Schedule

April 3: Introduction to the course and the problem of evolving diseases

April 5: Introduction to the creation of genetic variation: mutation, genetic recombination, and horizontal gene transfer

April 10: Introduction to neutral genetic drift

April 12: Introduction to natural selection

April 17: Evolution of antibiotic resistance

April 19: Strategies to minimize the evolution of antibiotic resistance

April 24: Beyond antibiotics, new synthetic biology strategies to treat diseases

April 26: Genome sequencing and the elucidation of evolutionary relationships

May 1: Detecting patterns of natural selection in genomes

May 3: Midterm, in class, no homework due this week

May 8: Rapid pathogen evolution during the course of infections

May 10: Pathogen spread in hospitals

May 15: Predicting epidemic spread and viral evolution: SIR models

May 17: Gain of function mutations

May 22: Flu

May 24: HIV

May 29: Ebola/Zika

May 31: Human coevolution with pathogens

June 5: TBD

June 7: Full course review

Readings

Scientists' understanding of the evolution of infectious diseases is rapidly improving with the advent of new genome sequencing technologies. Therefore, there is not an up-to-date textbook that we can use for this course. I have, however, provided reading materials online to complement each lecture. Note that readings posted are meant to enhance your education but are not essential to read to complete homework or answer exam questions. Of course, reading this text will improve your understanding of the material and your ability to answer questions, however this is extra information not required to receive a high score.