

Course title: Evolution of Infectious Diseases

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

Professor

Justin Meyer (jrmeyer@ucsd.edu)

Instructional Assistants

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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 (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. Do not miss class early in the term in case you have to miss later in the term.

i>Clicker frequency is **CA**

- If you do not want to attend lectures or you have scheduling conflicts, then you can opt out of i>clicker points. If you do this, your final will be worth 10% more. You'll need to notify your TA that you'd like us to calculate your grade without i>clicker points.

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 Thursday by 12pm and will be due the following Monday at 4pm. 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 problem submitting your homework, e-mail it to your IA immediately.** The first assignment will be due 4/10/17, and then weekly thereafter. Your Instructional Assistant will guide you through each assignment during the section after the assignment is submitted. If you need help with the assignment, please attend office hours on Friday and Monday or e-mail myself or your IAs. We will do our best to answer your questions, however, if your e-mails are sent after 10pm on Sunday, we cannot guarantee a response before the homework is due. **Only 1/2 of the points will be awarded for late homework and no points will be awarded for homework submitted after Friday of the week it was due.**

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 M	04:00 P	04:50 P	Audrey
A02 M	05:00 P	05:50 P	Stephanie
A03 M	06:00 P	06:50 P	Stephanie
A04 M	07:00 P	07:50 P	Audrey
A05 W	04:00 P	04:50 P	Animesh
A06 W	05:00 P	05:50 P	Animesh
A07 W	06:00 P	06:50 P	Evey

Office hours

Thursdays

Justin 3:30 – 4:30pm 3218 Muir Biology

Fridays

Alicia 11-12pm Muir Biology 1208

Everardo 12-1pm 4882 AP&M

Justin 1:00-2:00pm 3218 Muir Biology

Mondays

Audrey 11-12pm Muir Biology 1208

Stephanie 12-1pm Muir Biology 1208

Animesh 2-3pm Muir Biology 1208

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 to miss the midterm. No one is permitted to miss the final which will be on Thursday June 15th, 8 – 11 a.m.

Academic integrity

There will be no group work for this course.

- Don't use any aids during an exam
- Acknowledge and cite source material in your assignments
- 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 (and no, buying it does not make it "yours")
- Don't copy your online assignment answers from the Internet or from anyone
<http://academicintegrity.ucsd.edu/excel-integrity/define-cheating/index.html>

Schedule

April 4: Introduction to the course and the problem of evolving diseases

April 6: Introduction to natural selection and some mathematical principals

April 11: Introduction to population genetics: Selection of haploids

April 13: Introduction to the creation of genetic variation: mutation, genetic recombination, and horizontal gene transfer

April 18: Introduction to neutral genetic drift

April 20: Evolution of antibiotic resistance

April 25: Strategies to minimize the evolution of antibiotic resistance

April 27: Human coevolution with pathogens (guest lecture by Janelle Ayres)

May 2: Midterm, in class, no homework due this week

May 4: Beyond antibiotics, new synthetic biology strategies to treat diseases

May 9: Genome sequencing and the elucidation of evolutionary relationships

May 11: Detecting patterns of natural selection in genomes

May 16: Rapid pathogen evolution during the course of infections

May 18: Pathogen spread in hospitals

May 23: Predicting epidemic spread and viral evolution: SIR models

May 25: Gain of function mutations

May 30: Flu

June 1: HIV

June 6: Ebola/Zika (or new pathogen in the news)

June 8: 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.