***** New hybrid remote and in person version *****
Lectures in person and available as podcasts, attendance is not necessary but appreciated
Sections in person or online, attendance is not necessary
Exams are online but must be taken during the scheduled time
Office hours on Zoom

Course title: Evolution of Infectious Diseases

Lecture delivered in person GH 242**, Tuesday & Thursday 11 am - 12:25 pm**

Lecture recordings available in the Canvas Media Gallery

Professor
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**Please add 'BIEB 152' to the subject line of e-mails*

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 like SARS-CoV-2.

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
42 Percent: Weekly homework assignments (8 total, grade is based on highest 7)
24 Percent: Midterm
34 Percent: Final exam

Lectures
Lectures will be in-person and podcasts will be available online.

Lectures for this course are critical because there is no textbook. The topics we discuss, like Covid-19, are too new to be covered in textbooks. Because of this, it is critical that students listen (and re-listen) to the lectures.

The **Canvas website** will be used to distribute information and files, collect homework, take exams, and to communicate.

Weekly homework assignments
Weekly homework assignments will be posted on the Canvas website on Friday nights, and they will be due the following Tuesday by midnight. **Students that enroll late are responsible for all assignments.** Homework will be submitted through Canvas. Each student should make sure they receive electronic confirmation that the file was uploaded properly. **If no confirmation is received within 10 minutes, or if any problems are encountered during submission, then the document should be e-mailed to their IA immediately**. The first assignment will be due **April 12th**, and then weekly thereafter. There will be 8 homework assignments in total. Instructional Assistants will guide students through sample problems in section that will help students answer homework problems. **Late assignments are not accepted**.

Students must show their work in completing problems. Students will receive 75% credit for attempting each homework problem, the remaining credit will be awarded if the answer is correct. Students will not receive partial credit for wrong answers; the initial 75% is the reward for attempting the problem.

We will drop one of eight homework assignments. We do not drop any additional homework assignments unless a student provides a medical excuse that spans more than a single week. These excuses should be submitted to the professor.

Exams (midterm and final)
The midterm will cover material from the first 4 weeks of the course. The final is cumulative. There are no makeup midterms. If a student misses the midterm, then their final exam will be worth 58% of their final grade. The final exam is cumulative. Both exams will be administered through Canvas at the scheduled times.

Academic integrity

Note, we routinely check Chegg and other sites for course material, please do not share the course material.
http://academicintegrity.ucsd.edu/excel-integrity/define-cheating/index.html

Sections
Sections are used to help prepare students for their upcoming homework. In section, your IA will go over a problem set that is highly similar to the next homework. If a student must miss section, they can find the problems and the answers on Canvas. Students may attend other sections unless we encounter a problem with certain sections having too many students.

Section ID	Day	Time	Building	Room	IA
A01	M	8:00a-8:50a	HSS	1315	Strobel, Hannah
A02	M	10:00a-10:50a	HSS	2154	Enustun, Eray
A03	M	11:00a-11:50a	HSS	2154	Enustun, Eray
A04	M	12:00p-12:50p	HSS	2154	Mylvara, Avani
A05	M	4:00p-4:50p	**ZOOM**	**https://ucsd.zoom.us/j/4644635498**	Abbasi, Shane
A06	W	8:00a-8:50a	HSS	2154	Strobel, Hannah
A07	W	9:00a-9:50a	HSS	2154	Horwitz, Elijah
A08	W	7:00p-7:50p	HSS	2154	Horwitz, Elijah
A09	W	8:00p-8:50p	HSS	2154	Duong, Jolyne
A10	F	4:00p-4:50p	HSS	2150	De La Fuente, Caesar
A11	F	5:00p-5:50p	HSS	2150	Chen, Taian
A12	F	6:00p-6:50p	HSS	2150	Ly, Victoria
A13	W	2:00p-2:50p	HSS	1128A	Samovar, Cassidy

Office hours
Instructors will help students with any content; however, the timing of the section is ideal to discuss the homework submitted the day before.

Name	Day/Time	Zoom information
Abbasi, Shane Milan	M 2-3pm	https://ucsd.zoom.us/j/4644635498
Chen, Taian	Tu 9-10am	795 624 5671
De La Fuente, Caesar Andre	M 4-5pm	337 482 2327 Passcode: Lambda
Duong, Jolyne	W 2-3pm	https://ucsd.zoom.us/j/3308719321
Enustun, Eray	Tu 9-10am	https://ucsd.zoom.us/j/2257221371
Horwitz, Elijah Kai	Tu 1-2pm	829 264 7857
Ly, Victoria	M 1-2pm	https://ucsd.zoom.us/j/96429841833
Meyer, Justin	Th 1-2pm	https://ucsd.zoom.us/j/94144948396

Mylvara, Avani Voruganti	Tu 10-11am	954 3292 6669
Samovar, Cassidy Drew	M 2-3pm	https://ucsd.zoom.us/j/96240199002
Strobel, Hannah Megan	F 1-2pm	https://ucsd.zoom.us/j/98363521272

Schedule broken into 10 modules:

Introduction to the course and ongoing pandemic

March 29: Introduction to the course and the problem of evolving diseases
March 31: The biology of coronaviruses

Fundamentals of evolution (random processes)

April 5: Introduction to the creation of genetic variation: mutation, genetic recombination, and horizontal gene transfer
April 7: Introduction to neutral genetic drift

Fundamentals of evolution (natural selection)

April 12: Introduction to natural selection (broad concepts)
April 14: Introduction to natural selection (population genetics)

Antibiotic resistance

April 19: Evolution of antibiotic resistance
April 21: Strategies to combat antibiotic resistance

Phylogenetics

April 26: Genome sequencing and the elucidation of evolutionary relationships
April 28: Molecular clocks

Elucidating past evolution by sequencing today's genomes

May 3: Detecting natural selection in sequences (dN/dS ratio)
May 5: **Midterm** (Material from first four weeks)

Tracking pathogen evolution and spread using genomics

May 10: Rapid pathogen evolution during infections
May 12: Pathogen spread in hospitals

Evolution of infectivity, virulence, and host range

May 17: Predicting epidemic spread and viral evolution: SIR models
May 19: Host shifts

Viral evolution

May 24: HIV evolution
May 26: Flu evolution

Viral evolution continued and course conclusion

May 31: SARS-CoV-2 evolution
June 2: Full course review

Course structure:
Students will have three opportunities to learn the course material: lecture, then section, and then through answering homework problems. Each week we will introduce new material, then the following week students will answer questions in section related to the previous week's lectures. Homework will then be assigned to be turned in the following week. This means that each course module will be stretched across 2.5 weeks and that modules will overlap.

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. Periodically we will provide materials online to complement lectures. Note that readings posted are meant to enhance students' education but are not essential to complete homework or to answer exam questions.

Studying for exams
All exam material will be taken from the section/homework problems and lectures.

Curving?
In the past, we have not curved the final scores or the test scores. This year's format is different than previous years and if the change negatively impacts scores, then we will curve the course so that the average is a B or higher. Along these lines, we **do not round up** when computing the final letter grade. The grading scale we intend to use is:

A	92.5-100%
A-	90-92.5%
B+	87.5-90%
B	82.5-87.5%
B-	80-82.5%
C+	77.5-80%
C	72.5-77.5%
C-	70-72.5%
D	60-70%
F	<60%

Letter of reference policy
I am more than happy to submit letters of recommendation for students in the top 10% of the course. I chose this cut off because many universities request that I rank the student and a ranking lower than top 10% can hurt applications. Students requesting letters also must agree that I can share their letter grade, course score, and percentile ranking. I receive many requests each year, so I am unable to customize the content of the letter beyond adding a few bullet points woven into the text. The letter I send emphasizes why BIEB152 students who earn a high score will excel in any future endeavor.