BIEB 152 SP20

Course title: Evolution of Infectious Diseases

Lecture podcasts available **Tuesday & Thursday at ~9:30 am**

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

35 Percent: Weekly homework assignments
25 Percent: Midterm exam
40 Percent: Final exam

Lectures
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 you listen (and re-listen) to the lecture podcasts (https://podcast.ucsd.edu/). Professor Meyer will deliver each lecture during the normally scheduled class period (Tu/Th 8:00 am – 9:20 am) and then the podcast will be automatically uploaded afterwards. These podcasts will also be broadcasted on UCSD-TV and posted on YouTube.

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

The **Zoom** app will be used for sections and office hours. It can be found at https://zoom.us/, use your UCSD e-mail to sign up.

If you need a laptop, UCSD will loan you one https://eforms.ucsd.edu/view.php?id=490887

Weekly homework assignments
Weekly homework assignments will be posted on the Canvas website on Saturday mornings and they will be due the following Friday before 8 am (just before the first section). **Students that enroll late are responsible for all assignments.** Homework will be submitted through Canvas. 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 the document to your IA immediately**. The first assignment will be due 4/17/20, and then weekly thereafter. Your Instructional Assistant will guide you through sample problems in section that will help you answer your homework. **Late assignments are not accepted because I upload an answer key on Friday when the homework is due**.

You will receive 70% 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 70% is your reward for trying the problem.

We will drop the lowest scoring homework assignment.

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 you have to miss section, these problems and the answers will be posted on Canvas.

section ID	day	time	Zoom code	IA
A01	F	8:00a-8:50a	798-785-452	Xiyu Liu
A11	F	9:00a-9:50a	690-859-261	Xiyu Liu
A02	F	10:00a-10:50a	930-868-585	Katrina Myers
A03	F	11:00a-11:50a	239-368-391	Tyger Saltman
A04	F	12:00p-12:50p	239-368-391	Tyger Saltman
A05	F	1:00p-1:50p	829-264-7857	Elijah Horwitz
A06	F	2:00p-2:50p	627-195-771	Claire Morris
A07	F	3:00p-3:50p	328-164-696	Katrina Myers

A08	F	4:00p-4:50p	690-110-754	Kexin Li
A09	F	5:00p-5:50p	452-290-098	Bryant Cao
A10	F	6:00p-6:50p	837-265-254	Saksham Gupta

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

Day	Zoom	Teacher
Mon 9-10	521-224-290	Kexin Li
Tues 12:30-1:30	644-533-695	Saksham Gupta
Mon 2-3	412-342-171	Claire Morris
Mon 3-4	453-264-372	Katrina Myers
Tues 10:30-11:30	826-830-163	Tyger Saltman
Tues 4-5	479-738-692	Bryant Cao
Mon 5-6	829-264-7857	Elijah Horwitz
Tues 5-6	153-367-974	Xiyu Liu
Mon 10:30-11:30	685-399-740	**Justin Meyer**

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 midterm will be held **May 7, 8-9:20**. No one is permitted to miss the final which will be on **Thursday June 11th, 8 – 11 a.m.** Exams will be held online, likely through Canvas. If a student experiences a medical emergency and must miss the final, the student is required to submit a medical excuse ASAP. An incomplete will be processed and we'll work out a time post-recovery to take the exam. All course material, including the final exam, must be completed before the end of the Fall quarter.

Academic integrity
http://academicintegrity.ucsd.edu/excel-integrity/define-cheating/index.html

Schedule
March 31: Introduction to the course and the problem of evolving diseases. **COVID-19 update**
April 2: Coronaviruses, with an emphasis on the viral strain SARS-CoV-2 that causes the disease COVID-19
April 7: Introduction to the creation of genetic variation: mutation, genetic recombination, and horizontal gene transfer
April 9: Introduction to neutral genetic drift
April 14: Introduction to natural selection
April 16: Evolution of antibiotic resistance
April 21: Strategies to minimize the evolution of antibiotic resistance
April 23: Beyond antibiotics, new synthetic biology strategies to treat diseases
April 28: Genome sequencing and the elucidation of evolutionary relationships
April 30: Detecting patterns of natural selection in genomes

May 5: Rapid pathogen evolution during the course of infections
May 7: Midterm, online during the lecture time. Material from first 9 lectures.
May 12: Pathogen spread in hospitals
May 14: Predicting epidemic spread and viral evolution: SIR models
May 19: Host shifts and gain of function mutations
May 21: Flu/HIV
May 26: Ebola/Zika
May 28: Human coevolution with pathogens
June 2: SARS-CoV-2 evolution
June 4: **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 to 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.

Studying for exams
I will provide previous years' midterms and finals in order to help students prepare for the exams. These, combined with the homework problems and section questions are what students should focus on when studying. Next, students should review the lecture slides and podcasts.

Curving?
I do not curve the final scores or the test scores. If the average for an exam is low, then I will add points to everyone's score to boost grades. Along these lines, I **do not round up** when computing the final letter grade. In the past, the grading scale I've used is:

A+	100% or more
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 receiving an A or higher. I receive many requests each year, so I am unable to customize the content of the letter. The letter I send emphasizes why BIEB152 students who earn a high score will excel in any future endeavor.