BIOLOGY 159a
Project Laboratory in Microbiology

Instructors
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Teaching Assistants
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Course Meeting Times
Lecture MW 1:00-2:00
Lab MW 2:00-5:00 OR TTh 2:00-5:00 Students may have to complete lab work outside of the designated times. Preparation and efficiency will minimize this extra time.
Office Hours Tuesdays 11:00-12:00 or by appointment

Prerequisites
BIOL22ab and BIOL18ab (or their equivalents) or permission of the instructor.

Required Materials
“I, Microbiologist” Sanders and Miller, ASM Press.
Laboratory Notebook (Bound notebooks are preferred)

Course Description “There are 2 possible outcomes: If the result confirms the hypothesis, then you've made a measurement. If the result is contrary to the hypothesis, then you've made a discovery.”– Enrico Fermi

This course will model how laboratory science is actually done while teaching you the fundamentals of microbiology. In the lecture periods, you will explore the microbial ecology of soil as well as how humans exploit microbial biology. In the lab, you will first isolate microorganisms from soil and identify and characterize your microbes using classical and modern techniques. Then, with guidance, you will plan and implement a mini-research project. Finally, you will present your research in a paper and in a poster session.

Biology 159a may be different from other lab courses you have taken. In this class, there is no predetermined outcome to most of the experiments we will be doing. The instructors will guide, mentor, and brainstorm with you. However, we will not necessarily know what will make your experiments “work” or what you did wrong or even what the “right” answer should be. Since we all have extensive laboratory experience, we can usually make useful suggestions, but there are no guarantees. You may even find that we
have different ideas about what to do. This is part of the scientific process. We want you to have fun and (within reason) try an experiment that may not work.

**Learning Goals**
After completing Biology 159a you should be able to

1. Discuss several factors influencing the ecology and evolution of soil microorganisms, as well as how humans exploit these microorganisms.

2. Explain and use classical microbiological techniques (cultivation methods, microscopy, and tests for antibiotic production/resistance, carbon source usage, etc) and modern molecular genetics techniques (DNA isolation, PCR, sequence and phylogenetic analysis, etc) to identify and characterize microorganisms.

3. Keep an accurate and useful laboratory notebook so that you can reproduce your experiments.

4. More easily read and understand scientific journal articles.

5. With guidance, create and implement a well-developed research plan to answer a simple question relating to soil microbiology.

6. Critically evaluate experiments (other people’s and your own) by analyzing the quality, statistical significance, limitations, and interpretation of data.

7. Use standard scientific writing to describe the background and motivation of your research, the methods you used, as well as the results and implications of your experiments.

8. Present your results orally in conjunction with a thoughtfully designed poster.

**Grading**
Lab Component 30%  
10 % Notebook  
10 % Technical Skills  
10 % Effort and Participation

Final Paper Describing Research 30%

Oral Presentation of Research 20%

Quizzes (oral and written) 10%

Homework 10%
Grades will be based on how well a student’s research project is planned, conducted and reported. The success or outcome of the project will not impact the grade.

**Student collaboration on assignments** This is a collaborative course so students are encouraged and in some cases may be required to work together. However, since each student will be assessed individually, the contribution of each student in a group must be fully described for each assignment/lab day. Quizzes are an exception to this policy—they will be entirely individual endeavors.

**Make-up/Late Assignment policy** To allow you some flexibility with your lives, the lowest quiz grade and homework grade will be dropped. However, there will be no makeup quizzes and no late work will be accepted.

**Attendance policy** Attendance is mandatory. However, I know that life happens so please let me know as far in advance as possible if you will be absent. Chronic absenteeism (more than three absences) will negatively impact your grade. In addition, all lab work must be completed, so plan on spending several hours making up any class that you miss.

**Academic Integrity** Student conduct that deviates from that outlined in “Rights and Responsibilities” will result in penalties that may include receiving no credit for an assignment, failing the class, or being suspended from the university. Students are responsible for consulting one of the instructors for clarification, if they are unsure of the policy for an assignment.

**Disabilities** Students who have a documented disability on record at Brandeis and who wish to have a reasonable accommodation made for you in this class should contact Dr. Cooper at the beginning of the semester.

**Electronics Policy** During class time, please do not use your phones or computers for anything other than course related activities unless it is a TRUE emergency. I would appreciate if you tell me before class that you are waiting for an urgent message.

I also urge you to take lecture notes using a pen and paper. There are several reasons for this. The lure of the internet is strong and even if you don’t intend to, you may end up online and thus not really in class taking notes. If you end up checking Facebook or buying concert tickets while any member of the class is talking, you will be rude and distracting to everyone. (I assume all of you want to be respectful.) In addition, current research suggests that taking notes on your laptop is just not as effective as taking notes by hand (1). Sure you write down more of what the instructor says, but you think about it less.

I know some of you may really want or need to take notes on your computers. If you do, please come and talk to me about it.