

General Microbiology Laboratory: PMB/MCB C112L, Spring 2014*

Instructor: Michi Taga (taga@berkeley.edu^{**})

GSI: Christopher Hann-Soden (channsoden@berkeley.edu^{**})

Laboratory personnel: Irania Alarcon, Kendra Ovitz

Lab: Wednesday 1-5 p.m., GPB 209; First lab session: January 22

Discussion: Monday 2-3 pm, 283 Dwinelle; First Discussion: January 27

Office Hours:

Instructor: Mondays, 3-4 p.m., 351A Koshland

GSI: TBA

Prerequisite: PMB/MCB C112 (General Microbiology) or an equivalent course taken previously or concurrently, or permission of instructor

Course Overview:

The goals of this course are for students to become proficient in basic microbiology research methods and experimental design. The course covers fundamental principles and techniques of the microbiology lab including sterile technique, culturing, and microscopy. Students will learn these methods in the context of a research project on the isolation, characterization, and identification of antibiotic-producing soil microorganisms.

Each week, the lab manual for the following week's experiments and additional reading will be posted on bcourses. Read this material carefully before the Monday discussion session preceding each lab and be prepared to discuss the material with the class.

Grading:

Grades will be based on the following components which are explained in detail below.

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| Lab Notebook: | 10% |
| Lab Report 1: | 5% |
| Lab Report 2: | 10% |
| Midterm Exam 1: | 10% |
| Midterm Exam 2: | 25% |
| Journal article summaries, oral presentation | 10% |
| Final Lab Report: | 25% |
| Attendance: | 5% |
| Participation, conduct, and lab skills: | Up to 7% change in final grade |

Lab notebook

Each student will keep a carbon-copy lab notebook for the course. The purpose of the lab notebook is to gain the skills necessary for keeping complete, accurate, and organized records of your experiments. Before each lab session, read and understand the materials associated with that day's lab and complete the **pre-lab assignment** in your notebook prior to class. The purpose of the pre-lab assignment is to encourage you to read, understand, and plan your

* This syllabus is subject to change. If changes are made, a new version will be posted on bcourses.

** Please write "C112L" in the subject line of all emails. Failure to do so may delay our response to you.

experiments before coming to class. The pre-lab assignment includes the Title, Background, Objective, and a Methods Summary (see descriptions below). During class, you will write a detailed version of the Materials and Methods and the Results and Conclusions sections. The instructors will collect and grade pages of your lab notebook sporadically during the course. For some lab sessions, a problem set to be completed in the lab notebook will also be part of the pre-lab assignment. These **pre-lab problems** will be due at the beginning of the lab session (1:10 pm) and may not be turned in late. Complete the pre-lab problems on a separate page in your notebook and show all work to receive full credit. **Although you will be performing the experiments together with your lab partner, the lab writeup and pre-lab problems must be done individually.**

Components of the lab notebook: Each lab writeup will have the following components. In addition, you may find it helpful to use the first page of your notebook as a table of contents for reference.

Pre-Lab Assignment:

Title:

Come up with a descriptive title of the experiment to be done. Your title can be different from the one listed in the lab manual.

Background:

Explain the general **relevance** of the experiment and present hypotheses, if applicable.

Objective:

State the **purpose** of the experiment.

Methods Summary:

List the methods you plan to use without providing detailed descriptions. Use subheadings to indicate different parts of the experiment.

Complete during lab:

Materials and Methods:

Write this section while performing your experiments. State clearly the **procedures** of the experiment and the materials used such that they can be reproduced by another individual who has never performed the experiment.

Results:

State all of your **observations** and data from the experiment clearly. Include graphs, figures, and drawings with text explaining each.

Conclusion:

Write your **interpretations** of each result. Include an explanation of why you think the experiment turned out the way it did, what the results mean. Note your ideas for additional experiments you could do to follow up or clarify the work.

Write as clearly and succinctly as possible; readability is important for a lab notebook because you will need to refer to it in the future, and others will need to read it in your absence.

Guidelines for keeping the lab notebook:

- Write your name and the title on the first page.
- Write the date on every page.
- Write with a ballpoint pen. Your work must be clearly visible and legible on both copies.

- Use the lab notebook only for material directly related to the lab (pre-lab problems, pre-lab writeup and lab writeup). Use a separate notebook for taking notes during discussions. Bring both notebooks to lab and discussion.
- All calculations and notes directly related to the lab should be written in the lab notebook.
- The lab manual should be used only as a guide. You should state everything in your own words. Direct copying from the lab manual or from any other source will be considered plagiarism and will result in zero credit and possible disciplinary action.

Lab Reports

Two short lab reports will be due during the semester that describe experiments that each span 3-4 classes. These reports should include the following sections: Title, Abstract, Introduction, Materials and Methods, Results, and Discussion, and have an expected length of 2-3 pages.

Midterm Exams

The midterm exams will include a written component and a practical component and will be taken during scheduled lab periods. The written component will test your understanding of concepts and your ability to apply your knowledge to new problems. The practical component will test the laboratory skills you've learned. Thus, it is critical to learn how to do all of the lab techniques individually rather than relying on your partner. You will use your lab notebook as a guide during the midterms. Therefore, it will be greatly beneficial to keep a good notebook!

Journal article summaries, oral presentation

We will read and discuss a published journal article as a class during the Monday discussions in the first half of the course. Later in the course each student will present another published paper to the class. For both papers, a 1-page written summary will be due.

Final Lab Report

Each student will prepare a formal lab report on the soil isolation research project that spans the entire course. The report should follow the format of research articles published in the *Journal of Bacteriology* and should include the following sections: Title, Abstract, Introduction, Materials and Methods, Results, Discussion, and References. The expected length is approximately 10 pages. **The final report is due at 5:00 p.m. on Tuesday, May 13.** "Early" reports submitted between 9:00 a.m. on Monday, May 5 and 9:00 a.m. on Friday, May 9 will be graded and returned within 48 hours. **Early reports will be eligible for a resubmission that will be due at 5:00 p.m. on Tuesday, May 13.** If a revised report is submitted, the grades for the early and revised reports will be averaged. If a revised report is not submitted, the grade on the early report will be the final grade. Reports submitted after the final deadline will be accepted but will receive 5% fewer points for each day after the due date.

Attendance

As there is no substitute for the learning that occurs in the lab and discussion, attendance is mandatory for the labs and discussions. We will begin promptly at 10 minutes after 1 p.m. for the lab and 10 minutes after 2 p.m. for the discussion; you will receive partial credit for attendance if you arrive late. Contact the instructor and provide documentation in the case of illness or emergency. You will not be penalized for excused absences.

Participation

This class relies heavily on interactions among the students and instructors. Everyone is encouraged to ask questions and participate in discussions. If you do not understand something, speak up. There will be many opportunities to share your questions and ideas in various formats during the course.

Lab Conduct

Appropriate lab conduct involves following the lab safety rules and general policies outlined below. In addition, an important component of the course is collaborating effectively with your lab partner. Make an effort to contribute equally, and be mindful of different learning styles. If you have a serious conflict, please speak privately to one of the instructors.

Lab Skills

One of the goals of the course is for you to become proficient in standard microbiology techniques. Therefore, your ability to perform the techniques by the end of the course will be reflected in your grade.

Lab Safety:

For your safety, everyone must follow these rules while in the lab:

- No eating or drinking.
- No open-toed shoes.
- Wear gloves, safety goggles and lab coat when appropriate. These items are supplied for you. We will tell you when they are required.
- Accidents occur occasionally in labs. Report all accidents to an instructor immediately. You will not be penalized for any accident.
- In case of a fire alarm, exit the lab immediately and gather in the lawn area on the south side of GPB.

General Policies:

- Electronic devices such as cell phones and music players may not be used in the lab or discussion. Please turn them off or switch them to silent mode. Laptops may not be used during lab or discussion except when specified.
- There may be periods of time in which you need to wait between steps of an experiment. Spend this time preparing for the next step, writing in your notebook, or discussing the experiment. Stay in the lab during these times and refrain from doing activities unrelated to the course.
- You are expected to follow UC Berkeley's guidelines regarding academic integrity. Failure to do so will result in formal disciplinary action and an F grade on the assignment and/or in the course. Definitions of academic dishonesty, cheating, plagiarism, and related topics can be found at <http://students.berkeley.edu/osl/sja.asp?id=983&rcol=1202>. UC Berkeley's policy on cheating and plagiarism can be found at <http://catalog.berkeley.edu/policies/conduct.html>.

Accommodations for Students with Disabilities:

Please contact the instructor if you need accommodations for any physical, psychological, or learning disability, or if you need to make us aware of any emergency medical information.

Lab Schedule

| <u>Date</u> | <u>Lab</u> |
|-------------|---|
| January 22 | Lab 1: Introduction to Sterile Technique and Experimental Microbiology |
| January 29 | Lab 2: Effect of Hand Washing on Microbial content; Introduction to Counting Bacteria |
| February 5 | Lab 3: Counting Bacteria (Part 2); Isolation of Soil Microbes |
| February 12 | Lab 4: Screen for Antimicrobial Activity (Part 1) |
| February 19 | Lab 5: Screen for Antimicrobial Activity (Part 2) |
| February 26 | Lab 6: Screen for Antimicrobial Activity (Part 3) |
| March 5 | Midterm Exam 1 |
| March 12 | Lab 7: Microscopy 1: Introduction to Light Microscopy |
| March 19 | Lab 8: Microscopy 2: Gram Staining |
| March 26 | No lab (Spring Break) |
| April 2 | Lab 9: Using Spectrophotometers to Measure Bacterial Populations |
| April 9 | Lab 10: Bacterial Growth Dynamics |
| April 16 | Midterm Exam 2 |
| April 23 | Lab 11: Identification of Microbes (Part 1) |
| April 25 | Lab 12: Identification of Microbes (Part 2) |
| May 5-9 | Final lab report: Optional early submission |
| May 13 | Final lab report due |

Other dates:

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| February 10 | Lab report 1 due |
| February 24 | Journal article 1-page summary due |
| March 16 | Lab report 2 due |
| April 1-30 | Journal article 1-page summary and oral presentation |