METX 119L Syllabus

LOCATION AND TIMES

Laboratory Sessions: T/W/Th 9-1 PM, Thimann Labs 229

INSTRUCTOR

Professor Chad Saltikov saltikov@ucsc.edu Phone: 831-459-5520
Office: 438 Physical Sciences Office Hours: 1:15-2:15 T/Th

TEACHING ASSISTANTS*

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** office hours and phone TBA*

COURSE WEB SITE

eCommons

WHAT YOU NEED FOR THE LAB

1. Each lab exercise (background, actual protocols, assignments) is available as PDFs on the eCommons web portal. You need to download and print copies so you can have them with you in the lab.
2. A three-ring binder with dividers.
3. Binder paper (three hole punched), can be lined or graph-style
4. Additional handouts will be available in PDF formats and can be downloaded from the course website.
5. Optional books: you can use the book associated with METX119. Additional reading will be made available on the course eCommons portal.

COURSE OVERVIEW AND GOALS

Microbiology laboratory provides a basic foundation in laboratory skills that are used in diverse areas such as basic research, food microbiology, clinical diagnostics and pharmaceuticals production.

Each lab exercise begins with a pre-lab. On some days you will have more than one pre-lab. You cannot start the experiment until the instructor or TA has approved your prelab writeup. Each exercise will end with either an discussion assignment or a lab report. These will be handed out as the course proceeds.

In this course, you will learn:

- How to keep materials sterile
- How to work safely with risk group 2 organisms
- The rationale and choice of appropriate microbiological media and test systems
- Standard microbiology lab techniques such as microbial enumeration, serial dilutions, plating, isolating single colonies, using pipettes, basic calculations, microscopy, and recording observations
- How to isolate and sequence DNA and compare to existing databases
- To gather and process experimental data, interpret observations, solve problems and report findings
- To draw inferences from observations
- Terms, facts, concepts, and theories of microbiology
- To work productively with others
- To follow scientific protocols safely and efficiently
- To write scientifically

COURSE WORK AND GRADING

Grading is based on the following breakdown:

1. Notebook (10 points for each exercise; 9 exercises)	90 points
2. Assignments (5 points each; two assignments)	10 points
3. Laboratory Report (one lab report)	100 points
4. Quizzes (5 points each; one per week 1, 2, 3, and 4)	20 points
5. Lab Practical Exam	100 points
6. Attendance/Participation/Safety	15 points

Grades

93-100%	A
90-92%	A-
87-89%	B+
83-86%	B
80-82%	B-
77-79%	C+
70-76%	C
60-69%	D
<60%	F

1. NOTEBOOK

NOTEBOOK: You will need a three-ring binder and dividers that separate each lab exercise for your notebook. The notebook should begin with a cover page with your name and table of contents. The next pages should be the various exercises separated with dividers. For each exercise, you should begin with the Prelab write up. The proceeding pages should be the daily entries you make during the lab (on regular binder paper lined or gridded). You should be making lab notebook entries during class as you do the experiments. Finally you will end the exercise with a Discussion. Here is the basic structure of the notebook entry for an exercise:

- First page: **Pre-lab** write up. This should be the first page of the notebook entry for an exercise. The structure should be: **Date**, **Title**, **Purpose/Goal** of the experiment and a **Methods Overview**. We will talk more about this in class on what to include in your prelabs.
- Next pages: your daily entries such as methods, observations, and results. You must include the date of the entry, followed by a description of what you did, even if you did exactly what was printed in the exercise. Also include any results, drawings, data. Think of these entries as a daily dairy of what you've been doing in the lab.
- The last section is the **Discussion**. This section will be where you answer a series of discussion questions listed at the end of each exercise. These are designed to help you practice scientific record keeping, writing, and data presentation/analysis related to the particular exercise.
- Each notebook section is to be submitted shortly after the conclusion of the exercise.
- **Assessment of the notebook**: The prelab write up, 2 points; keeping detailed daily entries, 3 points; discussion questions, 5 points.

2. ASSIGNMENTS

Several assignments will be given out: Biosafety and Library Assignments. Due dates will be discussed in class.

3. LABORATORY REPORT

Lab reports will be written in the format of a scientific research article. Each will contain these sections (1) Introduction; (2) Materials and Methods; (3) Results; (4) Discussion; (5) References. The lab report must be typed, double-spaced, and submitted to your eCommon Dropbox in addition to a hardcopy to the instructor/TA. You should use 1-inch margins and Times/Times New Roman 12 point font. Tables, figures and graphs, unless otherwise specified, must be computer generated and labeled completely. There will be a minimum number of references to be included with your laboratory report. Specific guidelines will be given in advance of the report. Effective scientific writing is one of the most important skills that you can develop--we strongly encourage that you get started early on your reports so you can get help if you are having trouble.

4. QUIZZES

In the first four weeks, you will be given a weekly quiz, usually online through eCommons. Quizzes will be based on the assigned materials and/or lab exercises.

5. LAB PRACTICAL

A practical exam covering several microbial techniques will be administered at the end of the course. It will cover proper use and execution of the various techniques you learned in the course.

6. ATTENDANCE/PARTICIPATION

Attendance/Participation: The experiments conducted will require the coordinated efforts of at least two, sometimes four, and occasionally all of the students in the class. Some of the class assignments will require the entire time period scheduled to complete. It is therefore imperative that you arrive on time and prepared. Students will be evaluated individually on timeliness, preparation, and participation.

Lab safety: Proper use and disposal of hazardous reagents, live organisms, and equipment is mandatory. Instructions on how to safely handle the materials used in this class will be provided daily. You are expected to follow all directions as indicated in the lab exercises and discussed in class. Students that repeatedly do not follow directions will be dropped from the course and reported to their college provost according the Academic Misconduct policy: https://www.ue.ucsc.edu/academic_misconduct.

Missing class policy: If you need to miss class you must notify the instructor at least 24 hours in advanced for approval. If you miss a lab period you may not be able to make up the experiment. You will be dropped from the course for any unexcused absences.

POLICIES

1. A completed notebook, assignments, quizzes, lab report, and exam must be complete to receive credit for this course.

2. Policy on late assignments/reports: Items turned in late will receive an automatic 50% deduction in point value per day. We will not accept anything that is turned in more than 3 days late.

3. Policy on plagiarism and cheating: There is a zero tolerance for academic misconduct. This includes but is not limited to cheating, fabrication, plagiarism, or facilitating academic dishonesty (helping a friend) or as further specified in the *Student Policies and Regulations Handbook*. Any paper, test, report, notebook, or any other document that bears your name should be written by you in your own original words; should not be copied from any other source ***including the lab manual***; and not previously submitted in any other course by you or anyone else. In other words, the work you turn in is your own original work and is not copied, reworded, or closely paraphrased from someone else's paper, lab manual, website, scientific paper, book, or any other source.

Written work that you generate can have ideas and information that are not your own, however you must properly cite the source of these ideas and information and in the correct written format too. Conveying ideas and information that is not your own without proper attribution is considered plagiarism. How to properly write and cite a source of information will be discussed in class. It is expected that you follow the guidelines given by the instructor on how to cite published works and/or ideas. If you do not follow the rules your work will not be accepted and you risk disciplinary actions according to procedures outlined in the academic misconduct section of the UCSC Academic Integrity Policies (http://www.ue.ucsc.edu/academic_integrity).

As noted above, rewording or closely paraphrasing sources even with proper citation is still considered plagiarism. To help avoid inadvertent plagiarism, first read the source, then put the source away where you can't see it, and then make some notes on the ideas you just read. From your notes craft your original words to describe the source. Be sure to properly cite the source too.

Lastly, you should remember that as a UCSC student you agreed to abide by the policies of the University Rules of Conduct. It is expected that you are familiar with the code of conduct and disciplinary actions that may result of academic misconduct. These policies are found in the **Student Guide to Academic Integrity** http://www.ue.ucsc.edu/ai_student-guide

If you have any questions about what constitutes unfair collaboration or plagiarism, please contact the instructor.

Students who violate the academic integrity policy (e.g. are caught cheating or plagiarizing) will be reported to their college provost. Academic punishment will include: zero points on the work in question for the first incidence. The second incident will result in a failing grade in the course.

REFERENCE MATERIAL

Texts: You should utilize your microbiology textbook as a reference, or if you don't have it anymore, use one that is on reserve at the library (Brock Biology of Microorganisms and Microbial Life 2nd Edition) or the excellent on-line free text called Todars Microbiology, at http://www.textbookofbacteriology.net/

Scientific literature. Successful lab reports will require you to investigate more deeply the subjects presented in the course. This investigating will require library research and citation of scientific research collected from journal articles. Pubmed is the primary literature databases used by research scientists. Google searching can get you some useful information. However, websites should be used with caution. Exceptions might be made when referencing Kenyon Micro Wiki, CDC, FDA, NIH, or EPA publications.

LAB EXERCISES AND SCHEDULE:

Lab safety
Isolation of strains (from a mixed culture)
Exercise 1. Microscopy: calibration, simple strain, Gram stain, Phase Contrast
Exercise 2. Media preparation
Exercise 3. Serial Dilutions & plating: analysis of soil
Exercise 4. Food Microbiology: analysis of dairy products
Exercise 5. Water Quality: *E. coli* source tracking
Exercise 6. Characterization of strains: biochemical characterization of unknown strain
Exercise 7. Antibiotic susceptibility of unknown strain
Exercise 8. Growth kinetics of *E. coli*
Exercise 9. 16S rRNA gene analysis of unknown strain

Week	Tue	Wed	Thr
1	7/26 • Introduction • Lab Safety • Ex 1 Microscopy Calibration & Micrometry	7/28 • Ex 2 Media preparation • Ex 3 Serial Dilutions & plating • Isolation of strains part I	7/29 • Ex 3 Serial Dilutions II • Ex 1 Microscopy II Simple stain • Isolation of strains part II
2	8/2 • Ex 4 Food Microbiology (milk) • Ex 5 Water Quality Part I (MPN/MF) • Isolation of strains part II (make overnight culture)	8/3 • Ex 5 Water Quality Part II • Ex 1 Microscopy II: Gram stain • Isolation of strains part II (pellet cells)	8/4 • Ex 4 Food Microbiology II • Ex 5 Water Quality Part III (DNA) • Ex 6 Characterization of strain (DNA)
3	8/9 • Ex 5 Water Quality Part IV (Nanodrop/PCR) • Ex 6 Characterization of strain (Nanodrop/PCR) • Ex 6 Characterization of strain (set up overnights)	8/10 • Ex 7 Antibiotic susceptibility I • Ex 6 Characterization of strain (physiology testing)	8/11 • Ex 5 Water Quality (Gels) • Ex 6 Characterization of strain (Gels) • Ex 7 Antibiotic susceptibility II • Characterization of strain (analysis)
4	8/16 • Ex 6 Characterization of strain: (PCR Cleanup/Sequencing/analysis) • Ex 1 Microscopy III: phase contrast	8/17 • Ex 1 Microscopy III: phase contrast	8/18 • Ex 8 Growth kinetics • Ex 1 Microscopy III: phase contrast
5	8/23 • Ex 9 16S rRNA gene analysis (strain characterization/computer lab)	8/24 • Ex 9 16S rRNA gene analysis (strain characterization/computer lab)	8/25 • Lab Practical Part