

Microbiology Lab (BIMM 121)–Spring 2020

Lecture: Canvas – 9:30 AM - 10:50 AM, Tuesday and Thursday

Labs: Canvas (984873) – 11:00 AM - 1:50 PM, Tuesday and Thursday

Canvas (984874) – 11:00 AM - 1:50 PM, Tuesday and Thursday

Instructor: Dr. Aubrie O'Rourke

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Office hours: by request between the hours of 12:20 to 1:20 Tuesday and Thursday.

Instructional Assistants (IAs):

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Welcome to Microbiology Laboratory and associated Lecture!

Here we will be using current techniques in microbial physiology, microbial genomics, microbial evolution, and microbial ecology to explore the role of microbes in health, industry, and the environment. We will provide the background to and introduce inquiry-based experiments which will cover the fundamentals of both working with live microscopic organisms at the bench and bioinformatically analyzing their genomes at the computer. This class consists of three Modules as outlined in the lab manual. These include: Module 1. **Microbes in the world (and beyond)**, Module 2: **Microbes and Industry**, and Model 3: **Microbes and Health**.

BY THE END OF THE COURSE YOU'LL BE ABLE TO:

1. Appreciate the structure, physiology, and diversity of microorganisms.
2. Appreciate interactions of microbes with other organisms.
3. Appreciate interactions of microbes with their environment.
4. Detect and interpret evidence of microbial evolution.
5. Isolate, identify, grow, and quantitate microorganisms.
6. Understand laboratory tasks using aseptic technique.
7. Analyze and interpret experimental data to draw accurate and statistically sound conclusions.
8. Communicate scientific research - its justification, methods, and findings - effectively.
9. Recognize unknowns in microbiology.
10. Value the relevance of microbiology today.

Assignments and point distribution*:

Task	Points	Percentage out of total
Reading Assignments	140	17.50%
Lab Activities	100	12.50%
Weekly Assessments	290	36.25%
Week 7 (midterm assessment)	100	12.50%
Final paper and check points:	170	21.25%
Total points	800	100.00%
Task	Points	Percentage out of total
Week 1 Reading Assignment	20	2.50%
Week 2 Reading Assignment	20	2.50%
Week 2 Lab Activities	20	2.50%
Week 2 Assessment	25	3.13%
Week 3 Reading Assignment	20	2.50%
Week 3 Lab Activities	20	2.50%
Week 3 Assessment	25	3.13%
Select a Review Topic and Team	10	1.25%
Week 4 Reading Assignment	20	2.50%
Week 4 Lab Activities	20	2.50%
Week 4 Assessment	50	6.25%
Team Outline of Review Paper	20	2.50%
Week 5 Reading Assignment	20	2.50%
Week 5 Assessment 1	40	5.00%
Week 5 Assessment 2	25	3.13%
Week 6 Assessment	50	6.25%
First Draft of Review Paper	20	2.50%
Week 7 Reading Activity	20	2.50%
Week 7 Lab Activity	20	2.50%
Week 7 Assessment (in Lieu of Midterm)	100	12.50%
Week 8 Lab Activity	20	2.50%
Week 8 Assessment	25	3.13%
Second Draft of Review Paper	20	2.50%
Week 9 Reading Assignment	20	2.50%
Week 9 Assessment	50	6.25%
Team Review Paper (in Lieu of Final	100	12.50%
Total points	800	100.00%

* Points are precisely allocated; however, they may be subject to change.

GRADING SCALE

97-100 = A+

93-97 = A

90-93 = A-

87-90 = B+

83-87 = B

80-83 = B-

77-80 = C+

73-77 = C

70-73 = C-

60-70 = D

<60 = F

MATERIALS REQUIRED FOR THIS COURSE:

1. **Access to CANVAS:** Online lab materials, grades and other course information will be posted on CANVAS. Please make sure you are able access this platform. Your homework and lab activities will need to be submitted to Turnitin via CANVAS.
2. **Lecture Notes:** Lectures will be presented through Zoom in Canvas. This means we will meet at the assigned class time through our online platform as if we were on campus. Each Zoom session will be recorded and posted. Synchronous instruction will continue until Zoom cannot support it. In that event, lectures will be prerecorded and posted to Canvas. Slides will be posted on CANVAS for each lecture. Please access them before class so that you may take notes.
3. **Lab Instructions:** When onsite, this course consists of a 3-hour lab. We are adapting the lab portions of this course to online and will provide you with weekly activities in lieu of on-site instruction.

HOW TO SUCCEED IN THIS CLASS:

1. **Attend live or watch recorded Lectures.**
 - If you have a question in Zoom, raise your hand through the raise your hand button or feel free to type into the Zoom meeting chat or unmute your microphone and ask your question. If you have a question that comes to you outside of class, add it to the discussion board on CANVAS for that lecture and another student, an IA or Dr. O'Rourke will address it.
2. **Be prepared for online instruction and communicate to your instructor if you are not.**
 - We understand these are unique times. We understand that you may be in a different time zone. In the first week you will take a survey so that we can get a better feel for what time zone you are in and if you have the computational resources for our planned lab work. If you do not have the necessary hardware, we will work with you to ensure equity.
3. **Keep an open mind. Read and reflect. Stretch often. Wash your hands.**

Tentative Class Schedule:

Week date	Lecture topic	Lab activity
Week 1 Tuesday March 31, 2020	Intro Course logistics	Time zone /Technology poll.
Week 1 Thursday April 2, 2020	Intro continued	Two book chapter readings will be provided with associated activity. Due Monday April 6, 2020.
Week 2 Tuesday April 7, 2020	Microbes and the World (and beyond): Sterile technique	sterile technique basics, culturing microbes from surfaces, culturing microbes from patients. One scientific article reading will be provided with associated activity. Due Friday April 10, 2020.
Week 2 Thursday April 9, 2020	Microbes and the World (and beyond): Microscopy	microscopy basics, parts of a microscope, focusing a microscope, Interactive microscope, cellular appearance
Week 2 Assessment: Microbes under the Microscope activity. Due: Week 3 Thursday April 16, 2020.		
Week 3 Tuesday April 14, 2020	Microbes and industry: fermentation and isolating microbes from a mixture	T streaks, Isolations methods, Reading on yogurt production.
Week 3 Thursday April 16, 2020	Microbes and industry: Personalized probiotics isolating microbes from a mixture	One scientific article reading will be provided with associated activity. Due Monday April 20, 2020.
Week 3 Assessment: Identify a probiotic in clinical trials and report on its composition, details of trial and approval status. Due: Week 4 Thursday April 23, 2020.		
Week 4 Tuesday April 21, 2020	Microbes and industry: Differential identification based on physiology	Microbial identification methods: Staining, fermentation tests, thermotolerance tests, etc. One scientific article reading will be provided with associated activity. Due Friday April 24, 2020.
Week 4 Thursday April 23, 2020	Microbes and industry: Molecular identification techniques.	16S PCR and Sanger sequencing, whole genome sequencing.
Week 4 Assessment: Zoom recorded presentation on different microbial identification tests for microbe of your choice. Due: Week 5 Thursday April 30, 2020		
Week 5 Tuesday April 28, 2020	Microbes and industry: microbial interactions in yogurt and CRISPR	Reading on CRISPR in yogurt: Spacer finding on paper with associated activity. Due Friday May 1, 2020.
Week 5 Thursday April 30, 2020	Microbes and industry: microbial interactions in yogurt and CRISPR	Characterization of CRISPR arrays in commercial and heirloom yogurt: Spacer finder internet tools, Spacer identification
Assessment: 1. Write up: Statistical analysis of CRISPR array sizes for all sequences and report on the spacers found and analysis for one array. 2. Student literature review on human gut <u>microvirome</u> (think phage) or probiotic influence on human gut. Due: Week 6 Thursday May 7 2020.		

Tentative Class Schedule (continued)

Week date	Lecture topic	Lab activity
Week 6 Tuesday May 5, 2020	Microbes and industry: identifying and studying microbes in bulk communities 16S Illumina sequencing, metagenomics	Amazon Web Services (AWS) tutorial. Command line tutorial.
Week 6 Thursday May 7, 2020	Microbes and industry: identifying and studying microbes in bulk communities	Unix tutorial and 16S Sanger sequencing data analysis
Week 6 Assessment: 16S Sanger sequencing analysis activity write-up. Due: Week 7 Thursday May 14, 2020		
Week 7 Tuesday May 12, 2020	Microbes and health: biofilms and the impact on humans	Project proposal examples will be provided with an associated activity. Due Friday May 15th, 2020.
Week 7 Thursday May 14, 2020	Microbes and health: introduction to SBW25 biofilm evolution model	Research for generating your own proposal and budget.
Week 7 Assessment: Plan sequencing experiment - 'write a proposal' - with budget (requires calculating coverage below). Due: Week 8 Friday May 22, 2020		
Week 8 Tuesday May 19, 2020	Microbes and health: microcosm diversity and genome sequencing.	microcosm observations, quantitative isolation - serial dilution and counting colonies
Week 8 Thursday May 21, 2020	Microbes and health: microcosm diversity and genome sequencing: library prep.	whole genome library prep and determining how much sequencing to get to adequate coverage
Week 8 Assessment: Calculate frequencies from colony count data and run statistics Due: Week 9 Thursday May 28, 2020		
Week 9 Tuesday May 26, 2020	Microbes and health: bacterial resequencing to identify mutations and track evolution	<u>fastqc/fastx/breseq</u> pipeline on AWS
Week 9 Thursday May 28, 2020	Microbes and health: bacterial resequencing to identify mutations and track evolution	Read biofilm papers and do associated activity. Due Monday June 1, 2020.
Week 9 Assessment: write-up on mutations Due: Week 10 Thursday June 4, 2020		
Week 10 Tuesday June 2, 2020	Finishing touches on Review Topic with Team.	Finishing touches on Review Topic with Team.
Week 10 Thursday June 4, 2020	Team Review Paper Due Finals week. June 9, 2020.	Team Review Paper Due Final Week. June 9, 2020.

Statement on Academic Integrity:

Academic dishonesty (including, but not limited to, cheating and plagiarizing) will not be tolerated. Students found to have committed academic dishonesty will be referred to the UCSD academic integrity office and may receive a failing grade for the course.

Statement on Inclusivity:

Everyone will come to this course with different backgrounds, knowledge, and perspectives. We want to create a classroom culture that respects this human diversity. Accommodations can be made for students with a letter from OSD. Please see Dr. O'Rourke for follow up.

Policy for Point Discrepancies

Please first contact your assigned TA to resolve any point discrepancies. If this point of contact cannot resolve the discrepancy, the TA will present the matter to the professor and will ask for a recommendation on how to remedy. If a regrade by the professor is required, the grade can change in either direction as a result of this review.

Prepare yourself to journey to the outskirts of what is currently known!

