BIMM 120 | Microbiology | Fall 2020

Professor Eric Allen

Tue/Thu 9:30 – 10:50 am, Zoomland

	DATE	LECTURE TOPIC	Таѕкѕ
FUNDAMENTALS OF MICROBIAL BIOLOGY	Th Oct 01	1) Course Overview & Introduction to the Microbial World	"Incoming Survey" Mini-assignment
	Tu Oct 06	2) Cell Structure & Function Part I: Cell Walls & Membranes	"Bacteria in the News!" Mini-assignment
	Th Oct 08	 Cell Structure & Function Part II: Other Structures & Inclusions; Biofilms 	
	Tu Oct 13	*** Catch up day – finish Lecture 3 (part II) material	Quiz 1 = lectures 1 – 3 (part I)
	Th Oct 15	4) Molecular Biology of Bacteria & Archaea	"Reflections on microbial toolboxes" Mini-assignment
	Tu Oct 20	5) Microbial Differentiation, Regulation, & Sensing	"My favorite microbe ♥ " Mini-assignment
	Th Oct 22	6) Genomics of Microorganisms Part I	Read Paper #1 Homework 1 assigned
	Tu Oct 27	7) Genomics of Microorganisms Part II	No Mini-assignment this week
	Th Oct 29	8) Mobile Genetic Elements & Horizontal Gene Transfer	Quiz 2 = lectures 3 (part II) – 7 Homework 1 due
	Tu Nov 03	9) Microbial Growth & Cell Cycle (and vote!)	
	Th Nov 05	10) Microbial Trophic Dynamics: Carbon & Energy	
	Tu Nov 10	11) Metabolic Diversity I: Respiration & Fermentation	Quiz 3 = lectures 8 - 10
MICROBES IN THE ENVIRONMENT	Th Nov 12	12) Metabolic Diversity II: Photosynthesis	
	Tu Nov 17	13) Metabolic Diversity III: Unique Microbial Metabolisms	
	Th Nov 19	14) Microbial Ecology I: Microbial Species & Evolution	Quiz 4 = lectures 11 - 13 Read Paper #2
	Tu Nov 24	15) Microbial Ecology II: Biogeochemistry, Elemental Cycles	No Mini-assignment this week
	Th Nov 26	Thanksgiving Break – No class!	
	Tu Dec 01	16) Microbial Bioremediation	Read Paper #3 Homework 2 assigned
	Th Dec 03	17) Metagenomics: Sampling the Unknown	Quiz 5 = lectures 14 - 16
	Tu Dec 08	18) Symbiosis: Plant- & Animal-Microbe Interactions	Homework 2 due
	Th Dec 10	*** Catch up day (no new material)	No Mini-assignment this week
	Th Dec 17	"FINAL" 8:00 AM – 11:00 AM	Quiz 6 = lectures 17 - 18

Course content: <u>http://canvas.ucsd.edu/</u> (syllabus, lectures, assigned papers, homeworks, IA docs, etc.)

Optional Textbook: "Brock Biology of Microorganisms" by Madigan *et al.* Any recent edition is acceptable: 12th ed. (2008), 13th ed. (2010), 14th ed. (2014), or 15th ed. (2017). *See textbook reading lists on attached pages below*

CONTACT INFORMATION

Professor Eric Allen

Email: eallen@ucsd.edu

Office Hours: Fridays 3:00 – 4:00 pm (Zoom link available on Canvas) Office: 4170 Hubbs Hall (Scripps Institution of Oceanography campus) Phone: (858) 534-2570

Instructional Assistants	email	Office Hours (Zoom links available on Canvas)	
Saroj Gourkanti	<u>sgourkan@ucsd.edu</u>	Fridays 11:00 am – 12:00 pm	
Liv Songster	<u>osongste@ucsd.edu</u>	Tuesdays 2:30 – 3:30 pm	
Ellen Huang	<u>yuh221@ucsd.edu</u>	Thursdays 11:00 am – 12:00 pm	
Jaxon Wagner	jdw035@ucsd.edu	Wednesdays 10:00 – 11:00 am	
Loryssa Tade	ltade@ucsd.edu	Wednesdays 5:00 – 6:00 pm	
Sukruth Kadaba	<u>sskadaba@ucsd.edu</u>	Saturdays 11:00 am – 12:00 pm	
Philip Tran	plt004@ucsd.edu	Fridays 12:00 – 1:00 pm	

Section	Section ID	Time	IA
A01	21277	Mon 10 – 10:50 am	Liv
A02	21278	Mon 11 - 11:50 am	Liv
A03	21279	Mon 4 - 4:50 pm	Jaxon
A04	21280	Mon 5 - 5:50 pm	Jaxon
A05	21281	Mon 6 - 6:50 pm	Sukruth
A06	21282	Wed 8 - 8:50 am	Ellen
A10	21286	Wed 9 - 9:50 am	Ellen
A08	21284	Wed 1 - 1:50 pm	Loryssa
A09	21285	Wed 2 - 2:50 pm	Philip
A11	25554	Wed 5 - 5:50 pm	Saroj
A07	21283	Wed 6 - 6:50 pm	Saroj

Discussion section times (Zoom links available on Canvas):

Attendance at Discussion Section will be not be taken and you are not required to attend. However, you will find regular attendance to be highly beneficial as the IA's will answer questions about the lectures, papers, and required readings AND they will present discussion material that will be GRADED (participation points). These "mini-assignments" will be given in discussion sections but do require that you be in attendance live.

Sections will start the week of Monday Oct 5th (week 2)

Grading:

There will be six quizzes scattered through the quarter, each worth 60 points, but only your five highest scoring quizzes will count. In this scenario, you may opt to skip one quiz or not take the final quiz during finals week if you are already satisfied by your score/grade in the course. Quizzes will consist of multiple choice and short answer questions, with questions taken directly from the lectures and assigned required readings. All quizzes will be administered asynchronously. You will have 45 minutes to one hour (or more) to complete a quiz in Canvas once you start (timed). The

five highest scoring quizzes are worth a total of 300 points. In addition, there will be two written homework assignments, each worth 50 points (see description below). There will also be a number of "mini-assignments" that constitute evidence of your participation in the course. These include short assessments given in discussion section, completion of polls, etc. and is worth a total of 100 points. In sum, 500 total points are up for grabs in this course. Final grades will be based on quiz scores, homework assignments, and "participation".

	Points	% of grade
Quizzes (5)	300	60%
(Mini) Assignments & Participation	100	20%
Homework 1	50	10%
Homework 2	50	10%
	500	100%

Your final grade will be based on the total number of points you receive. The class will not be graded on a curve UNLESS this would benefit the entire class and will be determined late in the quarter. >97% = A+, 93-97 = A, 90-93 = A-, etc.

Readings from the textbook are recommended but are not required. Topics covered in the recommended textbook readings, but not covered in class, will NOT be on the quizzes....

Homework written assignments (50 points each; 100 points total):

For the homework assignments, you will be given a few questions or tasks and asked to write a short report. Your answer(s) to these assignments should occupy <u>approximately 1 page</u> (it is okay if more than one page but please be concise). The questions will be posted on Canvas along with the due date (one week following the date assigned). Be sure to provide references to the source material (primary literature) used to obtain your answers!

Mini-assignments & Participations (10 points each; 100 points total):

Each week, or almost every week, a brief mini-assignment will be assigned that will require you to do some simple search and write 2-3 sentences about your findings -or- asked to provide comments on a question(s). These should be easy and take no longer than 20 minutes to complete. There is no right or wrong answers so if you complete the assignment on time, you will get full credit! These assignments will be published on Mondays and you will have until Friday at 11:59pm to complete them (approximately four days). Please do not submit your assignments late! One day late, i.e. submission on Saturday, will result in a 50% deduction in points (5 points); submission on Sunday will result in an 80% reduction in points (2 points); submission on Monday will be 0 points. These are easy so just get 'em done!

Course Website

The Canvas course site contains recorded video lectures, required readings (i.e. primary research articles), assignments, and quizzes. There will be three primary research articles that you will be required to read and understand (see course calendar for assignment dates). Why more reading? Well, microbiology is a highly dynamic science. Many exciting and important finding have yet to find their way into the textbooks which is why we turn to the primary research literature. Not only is reading papers fun but the correct approach to scientific literature can be a very rewarding experience. The materials/methods sections will provide you a 'train of thought' as to how the experiments were conducted/conceived ("how did they do that?") and critical reading of the paper will allow you to evaluate whether or not the results justify the conclusions ("why did they do that?"). These papers will provide a more thorough picture of modern microbiology. The papers will be introduced in class on the lecture date they are assigned and discussed further in your next section meeting. *Questions from the assigned papers will appear on the quizzes!*

Useful websites:

<u>PubMed</u>: <u>https://www.ncbi.nlm.nih.gov/pubmed/</u> (journal literature portal) <u>Google Scholar</u>: <u>https://scholar.google.com/</u> (journal literature portal) <u>Small Things Considered</u>: <u>http://schaechter.asmblog.org/schaechter/</u> (odds and ends from the microbial world) <u>Microbe wiki</u>: <u>http://microbewiki.kenyon.edu</u> (great resource for exploring a rich variety of microorganisms)

General guidelines for reading the research papers:

<u>Familiarize yourself with related topics</u>: Read the related material in the textbook to familiarize yourself with the subject matter. Research papers are written for people who already know something about the subject matter.

Try to answer the following questions as you read the required papers:

1. What questions were addressed in this paper?

Frequently the introduction (or the first few paragraphs of Science and Nature articles) will present background information and raise the questions that will be addressed in the paper.

2. What were the main conclusions from the paper?

The main conclusions will be summarized in the abstract and further discussed in the discussion section. Why were these conclusions important?

3. What experiments were performed to answer these questions?

These will be briefly summarized in the abstract, sometimes also in the discussion (or the last few paragraphs of science or nature papers), and will be discussed at length in the results section of the paper.

4. For each experiment:

What conclusion did the experiment allow? What were the caveats of each experiment? (i.e. were there alternative explanations?) What experiments ruled out these alternatives?

Read the assigned papers <u>before</u> attending lecture and sections and ask your IA any questions you may have. If questions remain, attend either your IA's or Dr. Allen's office hours.

To prepare for the quizzes:

- 1. Attend the lectures or watch the recorded versions! *ALL questions will come directly from the lectures and assigned papers.*
- 2. Read the papers! Both the midterm and final exam will have questions about the papers; these questions will require that you understand the experiments and what conclusions they reveal.
- 3. Attend section regularly, as you will be able to ask questions about the lectures and papers.
- 4. Read the related material in the optional textbook (note: the suggested reading assignments will always follow from section-to-section within a chapter; if you have any questions ask your IA). *These readings will reinforce the lectures and provide additional information that you will find useful.* Also don't be afraid to do extra reading to understand the material. Ultimately, if you understand the concepts you are in a much better position to answer the questions!
- 5. Do not cheat! Disciplinary steps will be taken when cheating is discovered. These steps may include failing the class and being reported to the appropriate authorities.

Based on prior experience, the students who do best in this class attend the lectures and sections, and read the papers before attending section. Make this be YOU!

***A MESSAGE FROM OUR FRIENDS AT THE UCSD ACADEMIC INTEGRITY OFFICE:

Statement of Academic Integrity:

Students are expected to do their own work, as outlined in the UCSD Policy on Integrity of Scholarship http://www.senate.ucsd.edu/manual/appendices/app2.htm. Academic misconduct will not be tolerated. Any student who engages in suspicious conduct will be confronted and subjected to the disciplinary process. Cheaters will receive a failing grade on the exam, and/or in the course. They may also be suspended from UCSD pursuant to University guidelines. (Translation: just don't do it!)

Academic misconduct includes but is not limited to:

- 1. <u>Cheating</u>, such as using "crib notes" or copying answers from another student during the exam.
- 2. <u>Plagiarism</u>, such as using the writings or ideas of another person, either in whole or in part, without proper attribution to the author of the source. 3. <u>Collusion</u>, such as engaging in unauthorized collaboration on exams, completing for another student any part or the whole of an exam, or
- 3. <u>Collusion</u>, such as engaging in unauthorized collaboration on exams, completing for another student any part or the whole of an exam, or procuring, providing or accepting materials that contain questions or answers to an exam or assignment to be given at a subsequent time.

SUGGESTED READINGS FROM "BROCK BIOLOGY OF MICROORGANISMS" TEXTBOOK

Brock Biology of Microorganisms 12th Edition

- Lecture 1 Introduction: 1-10, 377-390 Lecture 2 - Cell Walls & Membranes: 66-86 Lecture 3 - Cell Structures & Inclusions: 86-106, 158, 677-680 Lecture 4 – Molecular Biology: 175-182, 189-194, 2017-213 Lecture 5 – Differentiation & Sensing: 224-237, 242-246 Lecture 6 – Microbial Genomics I: 343-353, 355-360 Lecture 7 - Microbial Genomics II: 343-353, 355-360 Lecture 8 - Mobile Elements & HGT: 282-285, 294-303, 309-312, 360-364 Lecture 9 – Growth & C6ll Cycle: 141-157 Lecture 10 – N/A Lecture 11 – Trophic Dynamics: 107-113, 114-122 Lecture 12 – Respiration & Fermentation: 122-125, 613-618, 622-629, 631-635, 636-639 Lecture 13 – Phototrophy & Other Autotrophies: 578-595, 596-602, 605-608 Lecture 14 – Phototrophy & Other Autotrophies: 578-595, 596-602, 605-608 Lecture 15 – Microbial Species & Evolution: 367-374, 390-393 Lecture 16 – Microbial Biogeochemistry: 673-677, 694-705 Lecture 17 – Microbial Bioremediation: 705-713 Lecture 18 – Metagenomics: 658-662, 665-666 Lecture 19 - Plant and Animal Symbioses: 714-721, 725-730, 817-819 Lecture 19 – Microbiomes: 812-822
- Lecture 20 N/A



Brock Biology of Microorganisms 13th Edition

- Lecture 1 Introduction: 1-10, 34-36, 454-467
- Lecture 2 Cell Walls & Membranes: 48-64
- Lecture 3 Cell Structures & Inclusions: 64-81, 133, 674-676
- Lecture 4 Molecular Biology: 151-157, 170-174, 192-197
- Lecture 5 Differentiation & Sensing: 210-223, 226-231
- Lecture 6 Microbial Genomics I: 314-323, 327-333
- Lecture 7 Microbial Genomics II: 314-323, 327-333
- Lecture 8 Mobile Elements & HGT: 159-162, 273-281, 286-288, 333-336
- Lecture 9 Growth & Cell Cycle: 118-132
- Lecture 10 N/A
- Lecture 11 Trophic Dynamics: 86-90, 92-98, 106-108
- Lecture 12 Respiration & Fermentation: 98-101, 373-377, 381-388, 390-394, 395-397
- Lecture 13 Phototrophy & Other Autotrophies: 341-354, 354-358, 361-367
- Lecture 14 Phototrophy & Other Autotrophies: 341-354, 354-358, 361-367
- Lecture 15 Microbial Species & Evolution: 447-452, 467-470
- Lecture 16 Microbial Biogeochemistry: 670-673, 699-709
- Lecture 17 Microbial Bioremediation: 713-717
- Lecture 18 Metagenomics: 649-658
- Lecture 19 Plant and Animal Symbioses: 723-730, 732-741, 745-749
- Lecture 19 Microbiomes: 793-796
- Lecture 20 N/A



Brock Biology of Microorganisms 14th Edition

- Lecture 1 Introduction: 1-12, 355-363, 369-376 Lecture 2 – Cell Walls & Membranes: 32-47 Lecture 3 – Cell Structures & Inclusions: 48-63, 159, 602-605 Lecture 4 – Molecular Biology: 108-115, 120-127 Lecture 5 – Differentiation & Sensing: 216-230 Lecture 6 – Microbial Genomics I: 183-193, 198-205 Lecture 7 – Microbial Genomics II: 183-193, 198-205 Lecture 8 – Mobile Elements & HGT: 208-211, 299-307, 310-311 Lecture 9 – Growth & Cell Cycle: 144-158 Lecture 10 – N/A Lecture 11 – Trophic Dynamics: 74-85, 95-96 Lecture 12 – Respiration & Fermentation: 86-89, 401-424 Lecture 13 – Phototrophy & Other Autotrophies: 380-400 Lecture 14 – Phototrophy & Other Autotrophies: 380-400 Lecture 15 – Microbial Species & Evolution: 348-352
- Lecture 16 Microbial Biogeochemistry: 598-602, 632-642
- Lecture 17 Microbial Bioremediation: 645-647, 650-657
- Lecture 18 Metagenomics: 204-206, 579-587
- Lecture 19 Plant and Animal Symbioses: 672-679, 682-691, 696-699
- Lecture 19 Microbiomes: 706-712
- Lecture 20 N/A



Brock Biology of Microorganisms 15th Edition

- Lecture 1 Introduction: 1-11, 26-29, 364-376
- Lecture 2 Cell Walls & Membranes: 35-47
- Lecture 3 Cell Structures & Inclusions: 48-64, 620-624, 152
- Lecture 4 Molecular Biology: 103-108, 115-119
- Lecture 5 Differentiation & Sensing: 174-188, 192-196
- Lecture 6 Microbial Genomics I: 242-251, 257-265
- Lecture 7 Microbial Genomics I: 242-251, 257-265
- Lecture 8 Mobile Elements & HGT: 108-109, 313-323, 325-328, 254-256
- Lecture 9 Growth & Cell Cycle: 138-151
- Lecture 10 N/A
- Lecture 11 Trophic Dynamics: 74-84, 94-96
- Lecture 12 Respiration & Fermentation: 85-91, 419-425, 427-431, 434-438, 441-443
- Lecture 13 Phototrophy & Other Autotrophies: 393-410, 413-416
- Lecture 14 Phototrophy & Other Autotrophies: 393-410, 413-416
- Lecture 15 Microbial Species & Evolution: 364-370, 382-384
- Lecture 16 Microbial Biogeochemistry: 615-620, 652-662
- Lecture 17 Microbial Bioremediation: 666-670, 673-680
- Lecture 18 Metagenomics: 257-259, 595-604
- Lecture 19 Plant and Animal Symbioses: 700-709, 714-718, 721-726
- Lecture 19 Microbiomes: 730-740
- Lecture 20 N/A

