

Biology 310 and Biology 310L

General Microbiology Lecture and Laboratory

Spring 2020

Course Instructor: Dr. Heather Fullerton

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Office: Rita 208

Office hours: **T:** 10:30-11:30am **W:** 10:30-11:30am and by appointment

Lecture: **M/W:** 3:25-4:40pm, Rita 154

Labs: **T:** 12:20-3:20pm; **W:** 12:20-3:20pm; **R:** 12:15-3:20pm
All labs held in Rita 167

Required Texts: Brock Biology of Microorganisms, 15th Edition
Laboratory Manual (Provided on Oaks)

Optional text: Techniques in Microbiology: A Student Handbook, 1st Edition

Course Objective:

This course serves as an introduction to microbiology with a focus on the central role of microbes in the field of biology, the unique metabolic and organismal diversity of microbes, and their role in history from the origin of life to modern times. In addition, work in this course will help you to further develop and refine your skills in critical thinking, analysis, scientific communication, and interpersonal interactions.

Course Learning Goals:

Upon completing this course, you should be able to:

1. Understand microbiology within its historical context, and relate pivotal discoveries and major advances
2. Consider the role of microbes in the evolution of life on Earth
3. Describe structure-function relationships of microbial cell components
4. Understand microbial cell growth and regulation of cell division
5. Describe the mechanisms of regulation of microbial gene expression
6. Relate major pathways of anabolism and catabolism to the role of microbes in their environments
7. Discuss the impact of microbes on human society

Course Evaluation & Assessment

Your ability to meet course goals will be determined via your performance on various assignments and exams throughout the semester. Assignments may be altered at the instructor's discretion during the semester depending on available time and other course constraints. Please note that grades on Oaks are not be your final grade. The Oaks grades will reflect all work done and should be an indicator to you of your progress.

Grading

Your grade is weighted with 75% from lectures and 25% from labs.

Grades will be assigned as follows:

		A	>93	A-	90-92
B+	87-89	B	83-86	B-	80-82
C+	77-79	C	73-76	C-	70-72
D+	67-69	D	63-66	D-	60-62
F	<59				

Lecture Component

Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	20%
Online and in class assignments	10%
Total	75%

Lab Component

Lab Notebook checks	6%
Unknown 1	2%
Unknown 2	3%
Pre-lab quizzes	3%
Lab Quiz	3%
Lab Final	8%
Total	25%

Exams:

There will be 3 exams throughout the semester and one cumulative final. Each exam is worth 15% of your overall grade. The final exam is cumulative and worth 20% of your overall grade. Make-up exams will be provided if there is an emergency at test time, or due a university-sanctioned event, such as participation in a sporting events or academic conferences. If you cannot avoid being gone on an exam day, it is your responsibility to contact me at **least one week** prior to the scheduled test date. If a make-up exam is needed due to illness or an emergency, you will need to get an absence memo. Make-up exams will be written & oral and will be given at a time we deem appropriate and before the graded exam are handed back.

The final exam cannot be taken at another time, unless, as stated in The College Academic Regulations:

1. Two or more exams are scheduled simultaneously.
2. Legitimate and documentable extenuating circumstances prevent the student from completing the examination at the scheduled time (e.g., burial services for an immediate family member).

Assignments:

There will be both in-class and online assignments. Due dates for online assignments will be posted with the assignment. These activities often rely on group work and cannot be made up at a later date. You must be in class in order to participate and receive full credit.

Any missed in-class activities due to attendance at a university-sanctioned events, such as an away sporting event or scientific presentation, will not be counted against your grade.

Poll Everywhere Questions

Poll Everywhere will be used on most days for review and class discussion. Answers and/or participation will not be graded.

Attendance and absences:

Attendance in lecture will not be recorded on a daily basis. However, if you miss class you will not receive credit for in-class assignments. It is your responsibility to get notes, lecture materials or copies of activities from your classmates or from the oaks page. Late entrances are disruptive to your fellow students; please be respectful and arrive on time.

Email & Office Hours:

Email can be an efficient and effective mode of communication. Email is best used for things such as setting up office hour appointments or quick questions about content or assignments. Office hours are available for you to get questions answered and for you to work one-on-one with the instructor. While there are only 2 formally scheduled office hours, appointments can be scheduled individually.

Computers & Cell phones:

Computers and cell phones can be used for notetaking and other class related activities, like Poll Everywhere. Turn all cell phones to silent before class. Please be respectful to your classmates and do not email, text or check Instagram, snapchat, etc. during class. Everyone behind you can see that cat video you are watching.

College of Charleston Honor Code & Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when suspected, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This status indicator will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent.

Students should be aware that unauthorized collaboration is a form of cheating. Research conducted and/or papers written for other classes cannot be used in whole or in part for any

assignment in this class without obtaining prior permission from the instructor. Students can find the complete Honor Code and all related processes in the Student Handbook at: <http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php>

Classroom Climate:

I am committed to establishing and maintaining a classroom climate that is inclusive and respectful for all students. Learning includes being able to voice a variety of perspectives, and classroom discussion is encouraged. While students' expressed ideas may vary and/or be opposed to one another, it is important for all of us to listen and engage respectfully with each other. I am also committed to a classroom and campus environment free of discrimination of all kinds. If you have experienced any harassing or discriminatory behavior, to include sexual harassment or sexual violence, I can provide you with information about support resources and reporting options, including those that are confidential.

Center for Student Learning:

Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at <http://csl.cofc.edu> or call 843.953.5635.

Special Arrangements:

The College will make reasonable accommodations for persons with documented disabilities. Students should apply at the Center for Disability Services / SNAP, located on the first floor of the Lightsey Center, Suite 104. **Students approved for accommodations are responsible for notifying me**, and for contacting me one week before exam accommodation is needed.

Physical & Mental Health Resources

If you find yourself experiencing physical illnesses, please reach out to student health services (843.953.5520). If you find yourself experiencing any mental health challenges (anxiety, depression, stressful life events, sleep deprivation, loneliness, and/or homesickness) please consider contacting either the Counseling Center (professional counselors at <http://counseling.cofc.edu> or 843.953.5640) or the Cougar Counseling Team (certified volunteers through texting "4support" to 839863 or visit <http://counseling.cofc.edu/cct/index.php>). You can also visit both on campus on the 3rd floor of Robert Scott Small. These services are there for you to help you cope with difficulties you may be experiencing and to maintain optimal physical and mental health.

Food & Housing Resources

If you are facing challenges in securing food and housing please contact the Dean of Students for support (<http://studentaffairs.cofc.edu/about/salt.php>). You can visit the Cougar Pantry in the Stern Center (2nd floor), a student-run food pantry that provides dry-goods and hygiene products at no charge to any student in need. For more information about food and housing assistance that is available to you, visit <http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php>

Tentative Lecture and Exam Schedule

	Date	Topic	Readings
Week 1	Jan 8	Course overview Microbial life overview <i>Online only</i>	Syllabus 1.1 - 1.6 Videos on Oaks
Week 2	Jan 13	Historical Perspective Cell Structure & Growth	1.9 - 1.14 2.1 - 2.7
	Jan 15	Cell Structure & Growth Continued	3.1, 5.1, 5.3, 5.5
Week 3	Jan 20	MLK Jr Day – No Class	
	Jan 22	<i>In-class assignment</i> Cell Structure, Growth & Motility	2.9 - 2.13 5.2, 5.6 - 5.8
Week 4	Jan 27	Cell Structure & Genome Replication	7.2 - 7.5, 7.7 9.3, 9.5 - 9.6 15.20
	Jan 29	Genome Replication & Organization	11.1, 11.2, 11.5-11.8
Week 5	Feb 3	Genome Replication & Organization <i>In-class assignment</i>	23.5
	Feb 5	Exam 1	
Week 6	Feb 10	Central Dogma <i>In-class assignment</i>	4.1 - 4.5 15.18 23.8
	Feb 12	Transcriptional Regulation & Protein synthesis	4.7 - 4.13 6.1 - 6.4, 6.6 - 6.8, 7.6
Week 7	Feb 17	Transcriptional & Translational Regulation	6.11 - 6.13, 6.14 - 6.15
	Feb 19	Microbial Lifestyles <i>In-class assignment</i>	5.9 - 5.14 6.7 15.1, 15.17
Week 8	Feb 24	Energetics	3.4 - 3.7, 3.10 - 3.12
	Feb 26	Energetics continued Carbon Metabolism	14.7, 14.19 3.8, 3.9, 21.1
Week 9	Mar 2	Exam 2	
	Mar 4	Carbon Metabolism	14.5, 14.16 - 14.17
Week 10	Mar 9	Carbon Metabolism continued	14.20, 14.21
	Mar 11	Photosynthesis	14.1 - 14.4
Week 11	Mar 16	Spring Break – No Class	
	Mar 18	Spring Break – No Class	
Week 12	Mar 23	Photosynthesis continued	15.2 - 15.7
	Mar 25	Sulfur cycle	14.9, 14.14 21.4

Week 13	Mar 30	Nitrogen cycle <i>In-class assignment</i>	14.6, 14.11 - 14.13 21.3 23.3
	April 1	Nitrogen & Sulfur cycles Continued <i>In-class assignment</i>	15.9 - 15.13
Week 14	April 6	Phylogeny	13.3, 13.7, 13.10
	April 8	Exam 3	
Week 15	April 13	Ecology	20.1 - 20.5, 20.9, 20.10, 20.14
	April 15	Microbial Ecology & Metagenomics	9.1 - 9.2, 9.7 - 9.8 19.8
Week 16	April 20	Animal Associated Microbes	23.9, 23.12 - 23.13
	April 22	Animal Associated Microbes Continued <i>In-class final review</i>	24.1 - 24.5, 24.10 - 24.11
Final Exam		Monday, April 27, 2019 12:00-3:00 pm	

Laboratory Specific learning goals

1. Use a microscope knowledgeably and with ease
2. Culture various bacterial species per their physiological needs and environmental adaptations
3. Quantify bacteria from samples including soil, water, and pure cultures
4. Use selective and differential media to identify unknown bacterial cultures

Lab Specific Policies. *Any additional lab specific policies will be discussed the first day of lab.*

Required books and Laboratory Materials

Bound Lab Notebook (No spiral notebooks)
Sharpie Marker (Preferably black)
Safety Glasses
Lab Coat

General

- a. To participate in laboratory exercises, you must have your lab coat and safety glasses. You must wear closed toe shoes while in the microbiology lab. If you wear inappropriate footwear, you will not be allowed to stay in lab. Cellphones are to remain stored for the duration of the laboratory period. If you use your cellphone during lab you will be asked to leave the room. This is for safety reasons.
- b. For some experiments, you must come in after hours to observe cultures or move them to the refrigerator as indicated in the lab manual.
- c. There is to be no talking during the quizzes or practical exams. You are required to remain in the laboratory during any tests and quizzes.

Laboratory Notebook:

- a. Details on contents and layout of the laboratory notebook are available in the laboratory manual.
- b. A *bound* laboratory notebook is required (no spiral notebooks). The pages will need to be numbered and you will need to keep an updated table of contents. You are not required to have a notebook that makes carbon copies. Your notebook will be graded.
- c. **Before you come to lab**, read the required laboratory exercises and complete the pre-lab quiz. You are welcome to print off the lab manual or copy the materials and methods to your lab notebook. It may be helpful to make brief, numbered lists of steps, and/or drawing a flowchart of the lab exercise(s).
- d. You are required to record your lab results after incubation of cultures. For example, if an incubation is 24 hours and your lab is scheduled at 12:15 on Thursday, you will need to come into micro lab afternoon on Friday to record your results.
- e. Questions should be answered in the discussion section of your laboratory notebook.

Attendance:

- a. Attendance is mandatory. There will be **no** make-up labs.
- b. Students who will miss lab for a university-sanctioned event (e.g. sports, music performance, etc.) need to notify the laboratory instructor no later than one week prior to the lab to be missed so that appropriate arrangements can be made.
- c. If you miss **3** or more labs, for any reason, then you will receive a WA (withdrawn for excessive absences) for the course (BIOL 310 and 310L). This will impact your GPA similar to receiving an 'F'.

Safety: *Additional safety information will be provided in lab.*

- a. Close-toed shoes and a lab coat is required. Gloves are be used while working with stains, hazardous chemicals, and bacterial cultures. Gloves and lab coats should not be worn outside the lab.
- b. Long hair needs to be tied back or put up. This will prevent your hair from catching fire or falling into the bacterial cultures
- c. Wash hands at the beginning the lab period **and** before you leave the laboratory room.
- d. Lab benches will need to be cleaned with disinfectant at the beginning of the laboratory period and after you have completed the laboratory exercises.

Tentative Weekly Lab Schedule

Weeks 1 & 2 (Jan 8 & 14 - 16)

No Labs

Week 3 (Jan 21- 23)

Safety Overview & Lab Expectations

Microscope Intro & assignments

Wet mounts

Ubiquity of Microbes

Epidemic Simulation

Week 4 (Jan 28 - 30)

Nutrient Broth & Agar Prep Demo
Colony morphology
Simple Staining
Aseptic Techniques
Motility Agar

Week 5 (Feb 4 - 6)

Gram Staining
Streak plate
Notebook check - 1

Week 6 (Feb 11 - 13)

How to use a micropipette
Serial Dilutions
Examination of Water

Week 7 (Feb 18 - 20)

Isolation of Endospore forming organisms
Endospore staining
Unknown #1

Week 8 (Feb 25 - 27)

Endospore stain of isolate
Effect of UV Radiation
Oxygen Requirements
Impact of pH
Unknown #1 report due

Week 9 (Mar 3 - Mar 5)

Notebook check - 2
Lab Quiz
Differential media – Part one:
 Blood agar, Columbia CNA Blood agar, MSA
Biochemical differentiation – Part one:
 Bacitracin test, Catalase, Coagulase

Week 10 (Mar 10 - 12)

Differential Media – Part two:
 MacConkey Agar, EMB, HE Demo
Swarming agar

Week 11 (Mar 17-19)

Spring Break – No Labs

Week 12 (Mar 24 - 26)

Biochemical differentiation – Part two:

Phenol Red fermentation broths (Glucose & Lactose), MR-VP, Citrate, Urea, TSI,
Oxidase test (Optional)

Week 13 (Mar 31 – Apr 2)

Antibiotics

Antiseptics

Disinfectants

Remel RapID

Unknown #2 assigned

Week 14 (Apr 7- 9)

Starch Hydrolysis

Casein Hydrolysis

Snyder test

Lactic acid bacteria

Unknown #2 due

Week 15 (Apr 14 - 16)

Final notebook check

Lab Final