

Biology 355: Microbiology

Class meetings: PLEASE WEAR OR BRING LAB APPROPRIATE CLOTHING AND SHOES EVERY DAY WE HAVE CLASS. Microbes don't grow in 3 hour blocks, so we will often be starting cultures or checking results on Tuesdays and Thursdays. They also grow on their own schedule, so you will frequently be asked to return to the lab outside of lab time to gather results.

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Course Materials:

Required Texts:

1. Bauman, R. 2017. *Microbiology with diseases by taxonomy*, 5th ed. Pearson Education, Inc., CA.
2. Leboff & Burton. 2015. *Microbiology Theory and Application*, 4th ed. Morton Publishing Co, CO.

Course Description:

The lecture portion of this course will cover the history of microbiology, the structure, metabolism, growth, and genetics of microorganisms, and the control of microbial growth. It will also explore the diversity of microorganisms, with a special focus on bacteria and viruses. Bacterial and viral culturing and identification techniques will be emphasized in the laboratory.

Course Objectives:

In this course we will explore, and students will demonstrate knowledge or application of, the 38 concepts and competencies identified in the American Society for Microbiology's Recommended Curriculum for Undergraduate Microbiology Education. A full list of the concepts and competencies can be found at:

<https://www.asm.org/>

Course Policies:

Grading:

Exams (4)	50 %
News video	10 %
MRSA project/report	10 %
Unknowns project/report	10 %
Class/lab participation and performance:	20 %

Exams: closed book; in class (4th exam cumulative, finals week); a mix of multiple choice, short answer, case study, and other question styles.

News video: short “news report” video based on a recent research paper. Guidelines and rubric will be available on the Tartan.

Class/Lab participation and performance: includes participation in “clicker” questions, satisfactory completion of lab exercises, satisfactory performance of laboratory techniques, and satisfactory performance in small group activities.

MRSA project/report and Unknown ID project/reports: grade is based on both practical aspects of project completion and the quality of the written report. Guidelines for report format will be available on the Tartan.

Grade Scale:

97-100	A+	87-89.99	B+	77-79.99	C+	67-69.99	D+	Below 60 = F
93-96.99	A	83-86.99	B	73-76.99	C	63-66.99	D	
90-92.99	A-	80-82.99	B-	70-72.99	C-	60-62.99	D-	

If you are struggling with the material please see me for help ASAP! Please come to my office hours if you have questions/problems. I assure you that I don't charbroil, torture, or eat students during office hours. I do not offer individual extra credit assignments, so it is important that you get help early so you can pull your grade up by doing well on the remaining exams/assignments.

Attendance/Make ups:

Attendance at all lectures and laboratories is mandatory.

There will be no make-up exams! If you know that you will need to miss an exam because of a formal, documented school activity let me know now and I will arrange for you to take the exam early. If you miss an exam for any other reason, your cumulative final exam will count twice. If you score higher on the cumulative final exam than on one of the first three exams it will replace the lowest grade.

Laboratory exercises and class participation generally cannot be made up. Most days will include some sort of graded activity (clicker questions, worksheet, laboratory exercise, etc.). The first two grades of zero will be dropped, allowing you to miss two days without penalty. If you do not miss any activities, your last two grades in this category will be dropped. Laboratory skills learned early in the semester are essential for success in later laboratory projects, so please make every effort to attend. If you miss one of the early, essential labs you may be REQUIRED to complete that lab in place of the lab the rest of the class is doing during a later session.

Deadlines:

Assignments are due at the beginning of class. Assignments handed in after the deadline but less than 24 hours late will be docked 10 points (out of 100). Assignments will be docked 20 points if they are 24-48 hours late, 30 points if they are 48-72 hours late, etc. **YOU ARE RESPONSIBLE FOR HANDING IN YOUR WORK ON TIME EVEN IF YOU ARE ABSENT!** Email the assignment to me or send it in with a classmate.

Reading:

You are expected to read the assigned text chapters prior to class. If you don't keep up with the reading, it will be detrimental to your class participation grade. You will not be assigned homework from the text, but we will use it during problem solving, and exam questions will often be similar to the questions found at the ends of the chapters. Occasionally I will ask you to read a journal article or case study in preparation for a problem solving session, and this reading will be mandatory. **I reserve the right to give quizzes (and make them part of your grade) if it becomes clear that no one is doing the reading!**

Cheating/Plagiarism:

I have no tolerance for cheating or plagiarism. In this course your major written assignments will be individual efforts, so avoid working together to avoid the appearance of plagiarism. Sharing figures or tables is cheating! If you are unsure if what you are about to do constitutes cheating or plagiarism, ask me. The first offense of cheating or plagiarism will result in a zero on the assignment, and a letter to the registrar. A second offense will result in a failing grade (F) in the course. If you have cheated in one of my courses in the past, the first offense in this course will result in a failing grade (F) in the course.

Seeking help from the writing center is NOT cheating, and I strongly encourage this if you struggle with written assignments. Having another student proofread your work is also acceptable and encouraged!

Classroom behavior:

Please turn off all cell phones and other electronic gadgets before class. These items are not allowed in the classroom during exams. **PHONES MUST BE KEPT IN THE PROVIDED ZIPLOCK BAGGIES IN THE LAB.** When we work in the computer lab you are to spend your time working on the assignment, not updating your Facebook page. If I catch you using the computer for something inappropriate during class time, you will receive a grade of "0" for class participation that day. Disruptive behavior (talking, playing games on your phone, etc.) will not be tolerated. If you engage in disruptive behavior you will be asked to leave and will receive a grade of "zero" for participation that day.

Safety:

Safety is extremely important in the microbiology lab. There is a real risk of you becoming ill or you spreading illness to others if you do not follow appropriate safety procedures. Due to the risks associated with microbiology lab, you will be asked to leave if you do not come to class dressed appropriately or if you do not follow safety regulations (provided in a separate handout). If you are pregnant, may become pregnant, or are immune compromised, or if you are living with someone who is pregnant, may become pregnant, or is immune compromised you should bring the attached list of bacteria to your physician so he or she can help you determine what organisms you can and cannot handle.

Disabilities:

Students with a disability requiring accommodations or any student who believes that he or she will require accommodations should contact Kim Ochsenbein in the Academic Support Center located in the lower level of Thaw Hall (865) 981-8124. Students are encouraged to make contact before or during the first week of classes.

LIST OF ORGANISMS USED IN THE BIO355 MICROBIOLOGY TEACHING LABORATORY UNDER
BSL-2 CONDITIONS (varies by semester)

Alcaligenes faecalis
Bacillus coagulans (ATCC 7050)
Bacillus cereus
Bacillus subtilis
Bacillus licheniformis
Bacillus thuringiensis
Bacillus megaterium
Corynebacterium xerosis (ATCC 373)
Enterococcus faecalis
Enterobacter aerogenes
Escherichia coli C
Escherichia coli (Carolina)
Escherichia coli B
Escherichia coli K-12
Escherichia coli AB3612 (Ames test strain)
Hafnia alvei (ATCC 51815)
Klebsiella pneumonia
Kocuria rosea
Lactobacillus plantarum (ATCC 8014)
Lactococcus lactis
Morganella morganii
Micrococcus luteus
Mycobacterium smegmatis
Moraxella catarrhalis
Neisseria sicca
Proteus mirabilis
Proteus vulgaris (ATCC 6380)
Providencia stuartii (ATCC 49809)
Pseudomonas aeruginosa (ATCC 10145)
Rhodospirillum rubrum
Salmonella enterica serovar typhimurium (ATCC 29629 & ATCC 29631)
Serratia marcescens (ATCC 13880)
Staphylococcus aureus
Streptococcus oralis (ATCC 6249)
Methicillin Resistant S. aureus (ATCC 33592)
Methicillin Resistant S. aureus (to be isolated from environment)*
Staphylococcus epidermidis

*To identify MRSA at various sites on campus we will be culturing and sub-culturing unknown bacteria. While BSL-2 procedures will be followed and aerosol risks will be minimized (growth of bacteria will be on solid media only –no liquid cultures will be used), this project will be inappropriate for anyone who is pregnant or immunocompromised because we cannot predict what pathogens we might be handling.

Organisms that don't have an ATCC number beside them were obtained from Carolina, Wards Science, or Microbiologics. All organisms were purchased commercially.

VERY TENTATIVE SCHEDULE*

Date	Topic	Text Chapter/Pages	Major Assignment Due
W Aug 22	Lab: Intro, syllabus, safety, taxonomy, history of micro	Lab p1-9 Ch 1	
R Aug 23	Review of chemistry & cell structure Structures of bacteria and archaea	Ch 2 & 3	
T Aug 28	Microscopy & staining	Ch 4	
W Aug 29	Lab: Microscopy/diversity of microorganisms	Lab 3.1, 3.2, 3.3, 3.4 See Tartan	
R Aug 30	Metabolism	Ch 5	
T Sep 4	Metabolism	Ch 5	
W Sep 5	Lab: Culturing bacteria – basic techniques[#]	Lab 1.2, 1.3, 1.4, 2.1	
R Sep 6	Nutrition & growth	Ch 6	
T Sep 11	Staining protocols and Ames test protocol Genetics review (if time allows)	Lab manual Ch 7	
W Sep 12	Lab: Ames test[#] Microscopy/staining techniques	Lab 10.6 Lab 3.5, 3.6, 3.7	
R Sep 13	Microbial genetics & recombinant DNA	Ch 7 & 8	
T Sep 18	Exam 1	Ch 1-8 & lab material	Exam 1
W Sep 19	Lab: Antimicrobials & Antibiotics[#]	See Tartan, Lab 7.3	
R Sep 20	Antimicrobials	Ch 9	
T Sep 25	Antibiotics	Ch 10	
	READ ON YOUR OWN	Ch 11 & 12	
W Sep 26	Lab: Culture characterization[#] Infection & Immunity	Ex 2.2, 2.3, 2.4, 2.6, 4.4, 4.5, 4.6, 5.28 Ch 14-18	
R Sep 27	Infection & Immunity	Ch 14-18	
T Oct 2	Infection & Immunity	Ch 14-18	
W Oct 3	Infection & Immunity & Prepare for MRSA project	Ch 14-18 See handout	Pre-lab research for MRSA project
R Oct 4	NO CLASS - FALL BREAK		
T Oct 9	MRSA project[#]	See Tartan	
W Oct 10	Lab: MRSA project[#]		
R Oct 11	Wrap up and review		
T Oct 16	Exam 2	Ch 9-10, 14-18 & lab material	Exam 2
W Oct 17	Lab: MRSA project[#] Gram positive cocci and bacilli	Ch 19	
R Oct 18	Gram negative cocci and bacilli	Ch 20	
T Oct 23	Biochemical tests (start cultures)[#]	Ex 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.20, 5.21, 5.27	

W Oct 24	Biochemical tests[#] Other pathogenic bacteria	Ex 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.20, 5.21, 5.27 Ch 21	
R Oct 25	Biochemical tests[#]		
T Oct 30	ID of unknown bacteria[#]	Handout, 5.31	Biochemical test results
W Oct 31	Lab: ID of unknown bacteria[#] Fungi	Ch 22	
R Nov 1	ID of unknown bacteria[#] Protozoa	Ch 23	MRSA project report due in class (printed)
T Nov 6	worms	Ch 23	Journal article for news video (pdf) emailed by noon
W Nov 7	Lab: ID of unknown bacteria[#] Case studies		
R Nov 8	Exam 3	Ch 19-23 and lab material	Exam 3
T Nov 13	Viruses	Ch 13	
W Nov 14	Lab: Phage titering and typing[#] Viruses	Ex 6.5, 10.7 Ch 24, 25	
R Nov 15	Viruses	Ch 24, 25	
T Nov 20	Viruses	Ch 24, 25	
Nov 21/22	NO CLASS - THANKSGIVING		
T Nov 27	Prions	Ch 13	Article worksheet due in class. News video link must be received by 2 pm
W Nov 28	Screening of news videos		
R Nov 29	Case studies		Course feedback form (time will be given in class)
T Dec 4	Lab Practical exam⁺		
W Dec 5	Lab Practical exam⁺		Unknowns project report due at 9 am (printed copy)
Dec TBA	Cumulative Final Exam		

* With a larger group than usual, some labs may take longer than they have in the past. Also, since we deal with living things, some scheduling flexibility is necessary if cultures don't grow as expected, etc. I will try very hard not to move exams or other major assignments unless absolutely necessary. I appreciate your flexibility!

[#]Laboratory exercises with this designation are likely to require that you come to the lab outside of normal class time. For most projects this will just be to remove plates from an incubator or to gather results, but during the Identification of Unknown Bacteria lab you can expect to spend significant time outside of class in the lab. Lab hours will be announced weekly.

⁺You will be assigned an appointment for your lab practical exam during one of these class times.