

BISC 438 – COURSE SYLLABUS – SPRING 2020

Course Description: Bisc 438 Microbial Physiology is a course designed to give students a fundamental understanding of the cellular processes performed by bacteria. Topics will include cellular composition, membrane transport, energy generation, diversity of metabolic processes, gene regulation, intracellular signaling, motility, differentiation, and the behavior of populations of bacteria.

Course Requirements: Completion of Bisc 333 General Microbiology with a minimum grade of C.

Instructor: Dr. Patrick Curtis (pdcurtis@olemiss.edu, Office: Shoemaker 402)

Office Hours: Wednesdays, 1-3 PM

Teaching Assistant: Anurag Rijal (arijal@go.olemiss.edu)

Lecture: Combined lecture/lab, 3 hours, twice a week.

Textbook: The Physiology and Biochemistry of Prokaryotes (4th Edition), David White, James Drummond and Clay Fuqua. Oxford University Press.

Lab materials: Course materials for the laboratory portion will be provided by the instructor.

Attendance: The combined lecture/lab nature of the course necessitates that students attend all class periods in order to perform the experiments along with the day's lecture. There are no make-up lab periods - if you miss a lab, you miss the opportunity to learn that material and the ability to conduct any experiments scheduled for that day.

NO CELL PHONE DISRUPTIONS WILL BE TOLERATED IN LECTURE
Cell phone disruptions will have dire consequences for you and your classmates

Grades: The final grade will be composed of the grades from two exams during the semester, the final exam, and the laboratory component.

Lab grades: The lab counts the 100 points towards your final grade. 50 of these points will be available as lab quizzes that are taken during each lab; 50 will be available as a lab report on a primary research article of your choosing.

Lab quizzes: There will be 5-pt lab quizzes administered roughly once a week throughout the semester, with 11 quizzes total. Your lowest lab quiz grade is dropped and the highest ten quizzes count towards your final grade. Quizzes can cover material from the previous week's lab or that week's lab.

Lab report: During the course of this semester you will be participating in and performing original scientific research. The results of your semester-long project will be compiled into a research report worth 40 points (format to be determined). You will also perform a SHORT oral presentation of your results worth 10 points (format to be determined).

Grading Scale

90-100%	A
80-89%	B
70-79%	C
60-69%	D
59%-below	F

Conflicts: Make up exams are generally NOT given except under exceptional circumstances, such as a death in the immediate family or a serious illness, or other circumstances such as religious beliefs and observances and formal participation in scheduled activities of officially recognized groups, such as field trips in other courses and athletic teams. If you have a conflict with any scheduled exam this semester (including the final), contact Dr. Curtis as soon

as possible. If you are forced to miss an exam, provide Dr. Curtis with a written statement explaining the reason for the absence and supply supporting evidence. If health related, a note from your physician or nurse is required.

Disability Access and Inclusion: The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are approved through SDS, you must log in to your Rebel Access portal at <https://sds.olemiss.edu> to request approved accommodations. If you are NOT approved through SDS, you must contact Student Disability Services at 662-915-7128 so the office can: 1. determine your eligibility for accommodations, 2. disseminate to your instructors a Faculty Notification Letter, 3. facilitate the removal of barriers, and 4. ensure you have equal access to the same opportunities for success that are available to all students.

Lab behavior and safety:

A microbiology lab is a fairly dangerous place to be. As well as the usual danger from chemicals and glassware, you will also be working with live microorganisms. You will be working with bacteria that may have the potential to cause illness. You will be trained in the correct methods to work with these bacteria, and will be informed of lab safety rules and policies. If your instructor believes that you are violating these policies you will be penalized in terms of loss grade points. Continued violation of safety rules will result in you being removed from class and you will receive a 0 for the final grade. Safety should always be your main priority when working in the microbiology lab. While this policy may sound strict, consider that it is in place to protect you and others from microbiological hazards.

ATTIRE AND PROTECTION

Open-toed shoes (sandals), shorts, and/or loose-flowing clothing are NOT allowed. You are welcome to wear a lab coat or scrubs if you would like (but do not wear scrubs that you also wear in another setting - we will be working with potential pathogens). While you will be trained in the correct way to handle stains, chemicals, and microorganisms, if you are concerned about skin contact you are welcome to bring latex gloves to class (use “powder free” gloves if possible).

FOOD AND DRINK

Food and drink are never allowed in the laboratory. Any food items or trash must be disposed of in hallway trashcans (not those in the lab) before entering the laboratory. This includes bottled water.

WORK AREAS AND LABORATORY BENCHES

All work areas and benches must be kept clean and free of all unnecessary items at all times. Personal items should be kept in areas safe from contamination (e.g. tucked under the benches). At the start of every lab period you should wipe down your lab bench with disinfectant (located on each bench, paper towels are near the sink), and you should repeat this procedure following any lab spills. If any lab spill occurs notify your instructor. At the end of each lab period you must thoroughly disinfect your lab bench.

WASTE DISPOSAL

There are various types of waste disposal containers in the laboratory. Regular trash cans are for paper towels, loose paper and other regular trash. Glassware (slides, culture tubes etc.) that has not been used when working with live microorganisms is disposed of in the broken glass trash container. Any items that have been potentially contaminated by microorganisms (e.g. used agar plates, cultures, swabs) must be disposed of in the red biohazard container (non-glass items such as plates, swabs etc.) or in a biohazard glass waste box designated by your instructor (culture tubes etc.).

HAND WASHING

You are required to wash your hands before leaving the laboratory, and may also wish to do so at other times if you believe that you have contaminated them. It is also recommended that you wash your hands just before coming to class (use the sinks in the restrooms).

FIRE AND OTHER HAZARDS

Many of our lab activities will involve the use of Bunsen burners to sterilize lab materials. When burners are not in use, turn off the gas supply. If you're having trouble getting the burner to light, turn off the gas and ask the instructor for help. If you smell gas, check to see if burners nearby have been left on. Be aware that people around you may be using open flames, and take appropriate precautions. You may wish to tie back long hair, and avoid wearing loose, flowing clothing to minimize the chance of fire.

In the event of a fire in the laboratory, a fire extinguisher is located on the wall near the microscopes (small fires may be extinguished without the extinguisher). In the event of a fire on a person, follow the "drop and roll" rule (drop the person to the ground, and roll them to snuff out the flames). In the event of fire in the building (fire alarm) evacuate the laboratory and use stairs to exit the building.

SPILLS

Notify the instructor of any spills or broken glass. Bacterial spills should be covered with a paper towel and disinfected for 5 minutes before clean up. Broken glass must carefully be placed in the broken glass waste container.

LABORATORY ACCESS

You are only allowed in the laboratory during class time or if you are accompanied by the course instructor.

GENERAL LAB BEHAVIOR AND CONDUCT

Use common sense when working in the laboratory. Many of the safety procedures that we follow are there to protect you. Think about what you are doing and everything will go fine.

Work with your lab partner or group. Some exercises are designed for pairs; others may be for larger groups. This is to make the work manageable within the scheduled lab time. If you're having problems with a lab partner or group, talk to your instructor about it.

Only students registered for BISC 438 are allowed in the laboratory. If you are not registered you may not attend the lab. Do not bring friends, family, children, or other individuals to the laboratory.

Practical jokes, rowdy behavior, or any other "goofing off" is not allowed in the laboratory, and potentially endangers other students or lab personnel. Show respect and consideration for other students.

Tentative Schedule (subject to change)

Date	Quiz	Topic	Textbook pages
Tues, Jan 21		Introduction, review of essential chemistry Experiment – None	N/A
Thurs, Jan 23		Bacterial genetics: organization, manipulation Experiment – Transposon mutagenesis, Research Project: Mutagenesis	N/A
Tues, Jan 28	1	The Membrane: composition, components, energetics Experiment – Effect of uncouplers on growth, Research Project: Passage 1	34-9, 111-4, 116-20
Thurs, Jan 30		Peptidoglycan and outer cell wall components Experiment – Role of LPS in protection	18-22, 27-31, 316-26
Tues, Feb 4	2	Cell growth Experiment – The growth curve, Research Project, Passage 2	42-4, 55-71
Thurs, Feb 6		Chromosome replication and repair Experiment – Continue research project	77-92, 101-3, 415-9, 423
Tues, Feb 11	3	RNA synthesis Experiment – Transcriptional reporters, Research Project: Passage 3	281-93
Thurs, Feb 13		Protein synthesis Experiment – Research Project: Plating	296-308
Tues, Feb 18		Protein Secretion Experiment – Review, Research Project: Streak Plating	452-61, 467-8
Thurs, Feb 20		Exam 1	
Tues, Feb 25	4	Regulation of metabolic pathways Experiment – The enzyme assay, Research Project: Start Cultures	199-205
Thurs, Feb 27		Sugar metabolism Experiment – Energy generation: EMP vs ED pathways, Research Project: Adhesion assay	222-41
Tues, Mar 3	5	TCA and Respiration Experiment – NADH dehydrogenases and growth, Research Project: Motility Assay	241-5, 248-9, 146-63
Thurs, Mar 5		Fermentations, fermentation balance Experiment – Food microbiology	383-7, 391-7
Tues, Mar 10		Spring break – no class	
Thurs, Mar 12		Spring break – no class	
Tues, Mar 17	6	Inorganic metabolism Experiment – The Winogradsky column, Research Project: Start Cultures	335-9, 344-54
Thurs, Mar 19		Photosynthesis Experiment – Research Project: Holdfast Staining	175-92
Tues, Mar 24	7	Lipid biosynthesis Experiment – Survival under cold conditions, Research Project: Start Cultures	255-63
Thurs, Mar 26		Amino acid biosynthesis Experiment – Identification of auxotrophs, Research Project: Phage Assay	267-73
Tues, Mar 31		Nucleotide biosynthesis Experiment – review	264-7
Thurs, Apr 2		Exam 2	

Tues, Apr 7	8	Responses to Environment Stress	403-12, 421-5
		Experiment – Solutes and osmotic stress, Research Project: Start Cultures	
Thurs, Apr 9		Intracellular signaling	482-94, 503-4
		Experiment – Research Project: Genomic DNA and Restriction Digest	
Tues, Apr 14	9	Motility and Chemotaxis	534-46
		Experiment – Research Project: Clean-up and Ligation	
Thurs, Apr 16		Extracellular signaling	566-72, 574-8
		Experiment – Quorum sensing, Research Project: Clean-up and PCR	
Tues, Apr 21	10	Biofilm formation	551-62
		Experiment – Environmental isolation of biofilms, Research Project: PCR Results and Sequencing Set-up	
Thurs, Apr 23		<i>Caulobacter crescentus</i> development	598-601
		Experiment – Development and phage resistance	
Tues, Apr 28	11	<i>Myxococcus xanthus</i> development	587-95
		Experiment – Research Project report and presentations	
Thurs, Apr 30		<i>Bacillus subtilis</i> development	601-610
		Experiment – review	
May 4-8		Finals	