

# BISC 438 – COURSE SYLLABUS – FALL 2014

**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](mailto:pdcurtis@olemiss.edu), Office: Shoemaker 402)

**Office Hours:** To be determined, or by appointment

**Teaching Assistant:** Satish Adhikari

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

**Textbook:** The Physiology and Biochemistry of Prokaryotes (4<sup>th</sup> 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:** You will select a recent (within the last 2 years) primary research article on a bacterial physiology topic of your choosing. Once cleared by Dr. Curtis, you will write summary of the article demonstrating your full understanding of the concepts and details of the material. The exact format and content of the report will be discussed by Dr. Curtis in class. The article report will be worth 50 points.

## 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.

**Students with Special Needs:** If you are a student with special disability needs, please schedule an appointment with Dr. Curtis.

## **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 disinfectant 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, Aug 26		Introduction, review of essential chemistry Experiment – The hunt for phage	N/A
Thurs, Aug 28		Bacterial genetics: organization, manipulation Experiment – Transposon mutagenesis	N/A
Tues, Sep 2	1	The Membrane: composition, components, energetics Experiment – Effect of uncouplers on growth	34-9, 111-4, 116-20
Thurs, Sep 4		Peptidoglycan and outer cell wall components Experiment – Role of LPS in protection	18-22, 27-31, 316-26
Tues, Sep 9	2	Cell growth Experiment – The growth curve	42-4, 55-71
Thurs, Sep 11		Chromosome replication and repair Experiment – DNA proofreading systems and error rate	77-92, 101-3, 415-9, 423
Tues, Sep 16	3	RNA synthesis Experiment – Transcriptional reporters	281-93
Thurs, Sep 18		Protein synthesis Experiment – DNA proofreading systems and error rate (cont)	296-308
Tues, Sep 23		Protein Secretion Experiment – DNA proofreading systems and error rate (cont), review	452-61, 467-8
Thurs, Sep 25		<b>Exam 1</b>	
Tues, Sep 30	4	Regulation of metabolic pathways Experiment – The enzyme assay	199-205
Thurs, Oct 1		Sugar metabolism Experiment – Energy generation: EMP vs ED pathways	222-41
Tues, Oct 7	5	TCA and Respiration Experiment – NADH dehydrogenases and growth	241-5, 248-9, 146-63
Thurs, Oct 11		Fermentations, fermentation balance Experiment – Food microbiology	383-7, 391-7
Tues, Oct 14	6	Inorganic metabolism Experiment – The Winogradsky column	335-9, 344-54
Thurs, Oct 16		Photosynthesis Experiment – Phototroph pigment profiling	175-92
Tues, Oct 21	7	Lipid biosynthesis Experiment – Survival under cold conditions	255-63
Thurs, Oct 23		Amino acid biosynthesis Experiment – Identification of auxotrophs	267-73
Tues, Oct 28		Nucleotide biosynthesis Experiment – review	264-7
Thurs, Oct 30		<b>Exam 2</b>	
Tues, Nov 4	8	Responses to Environment Stress Experiment – Solutes and osmotic stress	403-12, 421-5
Thurs, Nov 6		Intracellular signaling Experiment – The PHO regulon	482-94, 503-4

Tues, Nov 11	9	Motility and Chemotaxis Experiment – Identification of motility and chemotaxis mutants	534-46
Thurs, Nov 13		Extracellular signaling Experiment – Quorum sensing	566-72, 574-8
Tues, Nov 18	10	Biofilm formation Experiment – Environmental isolation of biofilms	551-62
Thurs, Nov 20		<i>Myxococcus xanthus</i> development Experiment – Hunting for Myxobacteria	587-95
		<b>Literature report due</b>	
Tues, Nov 25		Thanksgiving – no class	
Thurs, Nov 27		Thanksgiving – no class	
Tues, Dec 2	11	<i>Caulobacter crescentus</i> development Experiment – Development and phage resistance	598-601
Thurs, Dec 4		<i>Bacillus subtilis</i> development Experiment – review	601-610
Dec 8-12		Finals	