Bi330 Microbiology, Spring 2012
W, F 8:30-9:50, 101 Living-Learning Center South
Instructor: Karen Guillemin
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Course description: This course in Microbiology introduces students to the cell biology, physiology, and ecology of microorganisms. Students will gain an appreciation for the diversity and elegance of microbial life strategies and will become familiar with modern experimental methods for studying microorganisms in the laboratory and in their natural habitats. The course is organized in three units.

Unit 1: Microbial Cell Biology and Genetics. In the first third of the class, we will consider how microbial populations grow, experimental approaches for measuring this growth, and practical approaches for inhibiting microbial growth. We will then study the structure and function of microbial cells, including the cell wall, the cell membrane, and the genetic material. We will consider how genetic information is exchanged between microbial cells, giving rise to their remarkable phenotypic plasticity. Finally, we will consider how genetic approaches have been used to study cellular behaviors of microbial species, including their ability to communicate, to move and sense chemical gradients, and to develop into different cell types.

Unit 2: The Diversity of Microbial Physiologies. The second third of the class explores the metabolic diversity of microorganisms. We will consider the origins of life on earth and how microbial physiologies have diversified and changed our planet. We will study the metabolic strategies used by different classes of microorganisms that make their livings in remarkable ways from limited resources, for example, generating energy from sunlight and inorganic compounds. The focus of this unit is on the metabolic strategies and energetics of different physiologies, rather than on the details of the chemistry or enzymology.

Unit 3: Microbial Ecology and Microbial Interactions with Macroorganisms. The final third of the class focuses on the ecology of microbes and considers how microbial metabolisms function in concert in different environments. We will familiarize ourselves with modern experimental approaches to studying microbial communities in nature, and will survey the types of microbial communities that inhabit our planet. Then we will focus our attention on the microbial communities that live in association with plants and animals. We will investigate the molecular mechanisms by which microbes and their hosts orchestrate their co-existence, ranging from pathogenic to mutualistic relationships.

Learning objectives: As a student in Microbiology, you will become knowledgeable about the basic features of microbial cells, their lifestyles and metabolisms, and how they exist in their natural habitats. Secondly, you will learn about the logic of seminal scientific experiments in the history of microbiology and become familiar with the scientific strategies used by microbiologists to study microorganisms. This training in the critical thinking behind microbiological investigations will allow you to form educated opinions about microbes in your daily life, including issues of food safety, public health, and climate change. Finally, you will strive to imagine the future of microbiology: what will be the next great discoveries and application of microbiology, from new innovations in health care to alternative energy strategies? Consider how could you harness the knowledge you have gained in this course to better your life, your career, the human condition, and the planet.

Prerequisites: The prerequisites for this course are BI214 or BI252. The course assumes knowledge of biologically important macromolecules and familiarity with basic cellular processes such as DNA replication, transcription, translation, and regulation of gene expression. Much of this material is covered in Chapter 6 of the course textbook. Students should review these pages to make sure they are comfortable with this background material.

Office hours: My office hour will be held on Mondays and Thursdays 1-2 PM in Klamath 249C. If you are not free at this time, you may schedule an appointment to meet with me at another time. You may also email me with questions or comments at kguillem@uoregon.edu. Your email correspondences are an extension of your class participation, so please maintain a professional tone.

Course materials:
The textbook for this course is *Brock Biology of Microorganisms*, 13th ed. (Prentice Hall). The book is available at the UO Bookstore and will be on 2 hour reserve in the Science Library. Additional reading will be available on the Blackboard website.

The course website can be accessed through Blackboard: **https://blackboard.uoregon.edu**

Lecture notes will be posted the evening before class. **These notes are not a substitute for coming to class.** Besides the lecture material covered in class, for which the posted notes will only provide an outline, we will do class exercises and work problems that will be on the exams. If you must miss class, it is your responsibility to obtain detailed notes from a classmate.

Clickers. This course uses student-registered clickers in two ways. At the beginning of each lecture, students will use their clickers to complete a five minute quiz on the assigned reading. In addition, student will be asked to participate in the lecture and classroom exercises by answering clicker questions. **It is the responsibility of every student to bring his or her registered clicker, in functioning order, to class.** To accommodate a few unavoidable technical problems, I have built in some wiggle room into the grading scheme (see below). I will not grant extra points for missed questions due to clicker malfunctions.

Students with disabilities: The University of Oregon is working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact Disability Services in 164 Oregon Hall at 346-1155 or disabsrv@uoregon.edu.

Academic integrity: All students will be expected to adhere to the University's guidelines on academic integrity as outlined in the Student Conduct Code:
http://studentlife.uoregon.edu/programs/student_judi_affairs/conduct-code.htm
Students are encouraged to discuss class material with one another, including the reading and homework questions. However, all submitted written work, including answers to homework questions, must be the original work of each student.

Student Evaluation:
Exams: The course is divided into three sections, each of which will end with an exam that tests knowledge of material covered in that section. The exams will consist of multiple choice questions, short answer questions, and longer, multi-section questions. I will provide you with example questions and study guides prior to the exams. Each exam will count towards 20% of your final grade.

Problem sets: There will be six problem sets, administered through Blackboard, that will consist of multiple choice questions designed to help solidify material covered in the lectures and reading. The problem sets will be due by 8:00 AM on the morning of the Wednesday lectures indicated on the syllabus, and they will be available Saturday morning, in the Assignments folder on Blackboard, prior to their due date. You will be able to save your work and return to the questions as frequently as you like, but you must submit your answers by 8:00 AM on the due date. You will be able to view your answers and the correct answers through the grade book on Blackboard after the due date has passed. Each problem set will be worth 5% of your final grade, and your problem set lowest score will not be counted.

In class quizzes: At the beginning of each lecture, starting with lecture 2, I will give a five minute quiz on the assigned reading, using student registered Clickers. These quizzes are designed to encourage you to do the assigned reading and to come promptly to the beginning of class. If you do the reading, answering these questions will be straightforward. The total of your top 15 out of 16 quiz scores will make up 10% of your final grade.

Student participation: During each lecture I will pose questions to be answered using student registered clickers. Students who answer 85% of these in class clicker questions (regardless of whether their answers are correct) will receive full class participation credit, which constitutes 5% of the final grade.

Grading:
The final course grade will be calculated as follows:

Exam 1 (lectures 1-6)	20%
Exam 2 (lectures 7-11)	20%
Exam 3 (lectures 12-17)	20%
Problem sets (best 5/6)	25%
Quizzes (best 15/16)	10%
Class participation	5%

(% in class clicker questions answered, with 85% or greater sufficient for full credit)

No make-up exams or quizzes will be administered and no late problem sets will be accepted. If you miss an exam and do not provide written proof of a medical or family emergency, or University sanctioned travel (club sports do not qualify), you will receive a score of 0 for the missed exam. For valid excuses, an average of all your homework and quiz scores for that unit will be used to calculate a substitute for the exam score for that unit (normalized to the performance of the rest of the class), and your class problem set and quiz scores for your course grade will be calculated from all of your remaining problem sets and quizzes (no lowest scores will be dropped). No accommodations will be made for a second missed exam.

Lecture schedule and reading assignments:
The tentative lecture schedule is indicated below, subject to change. Students are responsible for all material covered during class and in the assigned reading.

Date	Week	Lecture	Topic	Reading
April 4	1	1	Microbiology: history and today	Chapter 1
April 6	1	2	Microbial growth, gene regulation, and the stringent response	Chapter 5.1-5.11 Review Chapter 6, especially 6.12-6.13 Chapter 8.1-8.5, 8.10
April 11	2	3	Prokaryotic cell structure and function and antimicrobial agents **Problem set 1 due**	Chapter 2.1-2.6 Chapter 3.1-3.2, 3.6-3.11 Chapter 26.1-26.4
April 13	2	4	Genetic exchange in bacteria	Chapter 6.6-6.7 Chapter 9.10 Chapter 10.6-10.9
April 18	3	5	Genetic regulation of quorum sensing and sporulation **Problem set 2 due**	Chapter 10.1 Chapter 3.12 Chapter 8.12
April 20	3	6	Genetic regulation of motility and chemotaxis	Chapter 3.13-3.15 Chapter 8.7-8.9
April 25	4	**Exam 1 on Unit 1**		
April 27	4	7	Microbial diversity and the origins of life	Chapter 2.7-2.12 Chapter 16.1-16.6
May 2	5	8	Fermentation and respiration **Problem set 3 due**	Chapter 4.1-4.12 Chapter 14.1
May 4	5	9	Photosynthesis	Chapter 13.1-13.5
May 9	6	10	Chemolithotrophy **Problem set 4 due**	Chapter 13.6-13.15
May 11	6	11	Anaerobic metabolisms and syntrophy	Chapter 14.5-14.12
May 16	7	**Exam 2 on Unit 2**		
May 18	7	12	Approaches in microbial ecology	Review Chapter 6.11 Chapter 22.1-22.5, 22.7
May 23	8	13	Microbial metabolisms in ecosystems **Problem set 5 due**	Chapter 23.1-23.5 Chapter 24.1-24.3
May 25	8	14	Microbial metabolisms in animal digestive tracts	Chapter 25.6-25.10
May 30	9	15	Microbial interactions with plants **Problem set 6 due**	Chapter 25.1-25.5
June 1	9	16	Microbial pathogens of animals	Chapter 27.6-27.13
June 6	10	17	Microbial mutualists of animals	Chapter 25.11-25.14 Chapter 27.1-27.5
June 8	10	**Exam 3 on Unit 3**		