

BI330: Microbiology, Spring 2015

W, F, 8:30-9:50 am, 123 Pacific

Instructor: Jeneva K. Anderson, Ph.D. (jfoster6@uoregon.edu)

Graduate Teaching Fellows: Maria Banuelos (mbanuelo@uoregon.edu)

Aleesa Schlientz (aleesas@uoregon.edu)

Kate Walsh (kwalsh2@uoregon.edu)

Course Description: This course in Microbiology introduces students to the cell biology, physiology, evolution and ecology of microorganisms. Students will gain an appreciation for the diversity and elegance of microbial life strategies, the role of microorganisms in global processes, and microbial interactions with macroorganisms. Student will learn how the scientific process is applied in microbiology and become familiar with modern experimental methods for studying microorganisms in the laboratory and in their natural habitats. The course is organized into four units.

Unit 1: Microbial cell biology: In the first portion of the course, we will study the structure and function of microbial cells, including the cell wall, the cell membrane, and the genetic material. Then we will consider how microbial populations grow, experimental approaches for measuring this growth, and practical approaches for inhibiting microbial growth. We will also discuss the biology and importance of non-bacterial microorganisms including microbial eukaryotes and viruses.

Unit 2: Microbial evolution and genetics: Next will we explore how genetic information is exchanged between microbial cells, how genes are made into proteins, and how this process is regulated. We will then take a more in-depth look at the genetic approaches which have been used to study cellular behaviors of microbial species, specifically including their ability to communicate, move, and sense chemical gradients. We will consider the origins of life on earth and how microbial physiologies have diversified and changed our planet. Finally, we will discuss examples of how microbial genes and physiologies have been harnessed for human benefit.

Unit 3: Microbial physiology and diversity: The third unit of the class explores the metabolic diversity of microorganisms. 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 4: Interactions and impacts of microorganisms: The final portion 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 mechanisms by which microbes and their hosts orchestrate their co-existence, ranging from pathogenic to mutualistic relationships.

Learning objectives: This course is designed provide you with information and skills necessary to develop a sound understanding of the scope of the microbial world, how it is studied, and its role in shaping this planet and all it's inhabitants. You will become knowledgeable about the basic features of microbial cells, their lifestyles and metabolisms, and how they exist in their natural habitats. You will gain an understanding of the logic of seminal scientific experiments in the history of microbiology and scientific strategies used by microbiologists to study microorganisms. This training will allow you to apply the process of science to think critically about important issues in microbiology in order to able to

form educated opinions about microbes in your daily life, including issues of food safety, public health, and climate change.

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.

Course materials:

Textbook. 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 readings will be available on the Blackboard website.

Website. The course website can be accessed through Blackboard (<https://blackboard.uoregon.edu>).

Lecture notes. Lecture notes will be posted on Blackboard (under “Course Documents”) the evening before class. These notes are merely an outline of what is to be discussed in class to aid in note taking; they are not a substitute for coming to class and will not completely cover all material to be discussed in class. If you miss class, it is your responsibility to obtain detailed notes from a classmate, as the instructor will not provide them.

iClickers. This course uses student-registered clickers in two ways. At the beginning of each lecture, students will use their clickers to complete a brief quiz on the assigned reading. In addition, students 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 each class. Clickers can be registered on Blackboard (under “Blackboard Registration”).

Acceptable technology use in the classroom. If you choose to use a laptop or tablet computer for note taking, please sit toward the back of the classroom so that your screen content does not become a distraction to others. If we notice you are using an electronic device for non-class related activities, you will be asked to refrain from bringing it to further lectures. Cell phone use is prohibited during lectures. All electronics (e.g. cell phones, music players, laptops, tablets) must be out of reach during all quizzes and exams. Instructor permission is required for recording lectures.

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 disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center (formerly Disability Services) in 164 Oregon Hall at 541-346-1155 or uoaec@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://conduct.uoregon.edu>). 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.

Course resources:

Instructor office hours: Instructor office hours will be Tuesdays from 10-12 noon, and Thursdays from 1-3:00 PM in Klamath 73. If you are not available at those times, you may schedule an appointment with me between 10am and 4pm, Tuesdays-Fridays. I will be available to answer brief questions via

email (jfoster6@uoregon.edu) throughout normal working hours. Your email correspondences are an extension of your class participation, so please maintain a professional tone.

GTF office hours: The GTFs are available to answer questions for both the lecture and lab component of this course. Their office hours are as follows:

Maria Banuelos, Wednesdays 10-11AM, Onyx 360

Alessa Schlientz, Tuesdays 8-9AM, Onyx 360

Kate Walsh, Mondays, 2-3 PM, LISB 317

Additional resources, including supplemental readings, videos, etc. will be posted on Blackboard throughout the course.

Student evaluation:

There will be five components taken together to assess student learning throughout the course: Unit exams, Problem Sets, Reading Quizzes, Participation, and a Final Exam. There will be two methods for final grade calculation, of which the highest score will be taken:

Method 1:

Unit Exams (3 * 10%) = 30%

Final Exam = 20%

Problem Sets (best 4/5) = 30%

Reading Quizzes (best 15/16) = 15%

Participation = 5%

Method 2:

Unit Exams (2 * 15%) = 30%

Final Exam = 20%

Problem Sets (best 4/5) = 30%

Reading Quizzes (best 15/16) = 15%

Participation = 5%

This method allows the student to drop one exam score, while weighting the others higher. Both methods take the top problem set and reading quiz scores into account for the final grade. Given the flexibility in grading, **there will be no other opportunities for late submission or make-ups for unit exams, problem sets, or reading quizzes.** Please do not ask for exceptions. For students who need accommodations due to absences for documented medical or family emergency leave, or university sanctioned travel (club/ASUO sports and activities do not qualify), notify the instructor in a timely manner.

Unit Exams. The course is divided into four sections. Units 1-3 will end with an exam that tests the knowledge of material covered in that section. Material from unit 4 will be covered in the final exam. Each unit exam will consist of a variety of multiple choice, short answer, and longer, multi-section questions. You will be provided with example questions and study guides prior to the exams. Each unit exam is worth 10% of your final grade for grading method 1. For grading method 2, you have the option to drop one unit exam score, and the other two unit exams will be worth 15% of your final grade. For each grading method, your unit exam scores will be worth a total of 30% of your final grade. Unit exams will be given during the lecture time in class (see schedule). **Early or make-up exams will not be offered.**

Final Exam. The final exam is designed to cover material from Unit 4, and will also be comprehensive on material covered in all the units. The comprehensive questions will be designed to assess your ability to synthesize concepts covered in all units. The final is scheduled during finals week at 10:15 am, Wednesday June 10. **There will be no opportunity to take the final exam at a different time, so accommodate travel plans accordingly.**

Problem sets. There will be five problem sets, administered through Blackboard, that will consist of questions designed to help solidify material covered in the lectures and reading. Problem sets are due by 8:00 AM on Friday on the weeks designated on the class schedule (see below). They will be

available by Tuesday evening prior to the Friday they are due. Questions will be located in the "Assignments" folder on Blackboard. 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 7.5% of your final grade and the lowest score will not be counted. **Late problem sets will not be accepted.**

Reading quizzes. At the beginning of each lecture when there is not a regular quiz scheduled (see above), there will be a brief quiz on the assigned reading using iClickers. 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 15% of your final grade. **There are no make-ups for reading quizzes.**

In-class participation. During each lecture I will pose questions to be answered using iClickers. Students who answer 85% of these in-class clicker questions (regardless of whether their answers are correct) will receive full credit, which constitutes 5% of the final grade. This grading scheme is designed to accommodate unavoidable technical problems, so extra points will not be granted for missed questions due to clicker malfunctions (see iClicker in Course Materials).