450-01 General Microbiology Lecture

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General Microbiology Lecture (BIOL450)
Spring 2014
Syllabus

Class time: Tues and Thurs 10:00-11:15
Location: Albers 107
Credit: 3 credit hours
Instructor: Dr. Kathryn Morris, 304 Albers Hall, 745-3554, morrisk10@xavier.edu
Office Hours: Wed 10:00-11:00, Thurs 1:30-2:30 or by appointment
Skype: (Dr.Morris.Xavier) I will be available on Skype during office hours, 7-10PM evenings before exams, and other random times throughout the semester. Anytime you see me online you are welcome to chat. Often, my computer will be online even though I may be away from my computer or talking with someone else, so please do not be offended if I do not reply to you immediately. I will get back to you as soon as possible.

Welcome to BIOL450! What is this class about? Well, have you followed the news in recent years about antibiotic-resistant MRSA infections or about disease outbreaks associated with fresh produce and meat products? Are you currently using an “antibacterial” product in your own household and washing your cutting boards carefully after cutting chicken? Do you enjoy eating pizza, the sourdough bread at Panera, or cheddar cheese? Are you curious about the roles viruses play in human health and the environment? Do you prefer choosing a yogurt that contains “probiotics” rather than products without such claims? Do you brew your own wine or beer at home? Do you wonder about the different kinds of mold that grow on food you keep for too long? Have you ever wondered why your doctor prescribes different antibiotics for different conditions? Are you curious about how microbes can ‘eat’ pollutants and clean up the environment? If your answer is “yes” to any of the above, you already have a practical acquaintance with the bacterial subjects of BIOL 450! Bacteria are pervasive in your own life and are critical to maintaining a balance in the biotic and abiotic cycles of our planet’s ecosystems.

COURSE DESCRIPTION AND GOALS
BIOL450 is an introduction to the study of microorganisms. I hope this course and its accompanying lab will enhance considerably your intellectual understanding as well as your appreciation of the many ways in which microbes have an impact on your life. It presents the basic biology of microorganisms, with major topic areas including structures and taxonomy, energetics, growth processes and control of growth, host-parasite relationships, diseases, and immunity. Put another way, you will learn about many different types of microorganisms, what they look like, how they grow and make energy, good things they do for you, how they’re specialized to kill you, lots of microbial diseases that can kill you, and finally, why you’re not actually dead.

Students taking this course should be able to see commonalities in structure and function between microbes and the larger organisms studied in previous Biology courses, but should also develop an appreciation of the unique features of microbes and the particular contributions they make both to nature as a whole and to human affairs in particular.
As a result of your regular attendance, careful reading in preparation for class, active engagement in each day’s class work, your taking of good notes and their careful review and revision, by the end of this course you should be able to:

- summarize the scientific advances that constituted the origin of the science of microbiology
- identify the features visible in microbial cells in microscopic preparations and explain the basis of the techniques used to prepare such images
- describe the biochemical structure of microbial cell features and their role in microbial life processes
- describe the procedures, nutrient media, and the environmental factors important in cultivation of microorganisms
- explain the methods by which the growth of microorganisms is measured
- explain the approaches used to control unwanted microbial growth and the challenges of bacterial drug resistance
- distinguish among the diverse ways in which microbes derive energy from their environment and link these to basic principles of energy generation
- indicate the importance of microorganisms as inhabitants of the healthy human body and describe the virulence factors that enable some microbes to inflict harm on the body with resulting disease states
- summarize the ways the human body defends itself from pathogens by its innate and adaptive immune responses

For Biology majors and minors, this course opens to view an area of biology which currently provides many career opportunities and offers a background for applications in environmental science, the health professions, molecular biology and biotechnology, and food production and safety, among other employment fields.

For Natural Sciences, Med. Tech., and other health-related majors, this course provides the underlying broad understanding of bacteria needed for a professionally-focused study of medically-significant species and their control.

Students preparing for a career in Science Education at the secondary level* should find in this course all the basic concepts about the world of microorganisms needed to educate their own future students and to safely involve them in interesting learning activities at an appropriate level.

Students taking BIOL 450 are seniors or graduate students (with some very well-prepared juniors) who have completed General Biology, several upper division Biology courses, General Chemistry and Organic Chemistry. I DEVELOP TOPICS IN GENERAL MICROBIOLOGY ASSUMING THE BACKGROUND PROVIDED IN THESE PREVIOUS STUDIES. For example, I expect that all of you are very familiar with basic cell structure, the structural and functional features of the major types of biomolecules, the functional features of membranes, the workings of the ADP/ATP cycle, glycolysis and the Krebs cycle, the DNA/RNA/protein relationship, etc. I hope that you will find Bacteriology neatly knitting together many concepts you have developed in your long study of biology!

* This course involves content addressing the following standards in the NSTA Reporting Standards for Science: 2a, 3a
I will teach BIOL 450 primarily in a lecture format using PowerPoint slides. Taking notes during lecture is a valuable way for you to retain the course material so I will generally not post complete lectures online. A set of personal notes is the result of your listening, reading, and writing and therefore involves many parts of your brain and many skills to create. While you are writing, filling in, revising, and possibly recopying your notes, TRUE LEARNING IS TAKING PLACE. I will post abbreviated lectures containing many of the figures in the lectures so that you can focus on understanding the material in class instead of on copying diagrams. If you feel you are not a good note-taker, I offer the following advice about development of a good set of class notes:

1. Read the text to prepare for class. You will understand the topic in a broad sense and no “surprises” will confuse you during class. You’ll also know what is available in your text to help you clarify the concepts presented.

2. Avoid taking down a list of words or phrases that have no connections to each other. Review your notes promptly after class in order to link up ideas so they make sense.

3. If you know you’ve missed something, put a mark in the margin during class so you remember you have to fill in the missing ideas. Use a rereading of the text to fill in the gaps, or review your notes with a friend to make sure they are complete.

4. Finally, be sure to visit me well before an exam if these measures don’t work and you’re afraid your notes and the concepts they cover are still lacking. I will be glad to review them with you and to suggest how you can improve your note-taking skills.

During this semester's classes, I will often draw your attention to news items related to the microbial world as they appear in the newspaper or in the scientific journals I review. Microorganisms are very "newsworthy" and you will find many opportunities to complement your classroom learning with practical learning in everyday life. Some of you may even work in lab settings where microbes are experimental or clinical subjects. I value your experiences and insights, so please let the class know if you have read something, observed something, or learned something at work that can contribute to our learning!

**BIOL 451, General Microbiology Laboratory, is a required corequisite to this lecture course.** It will add to your learning a hands-on experience for many of the topic areas we'll cover in this lecture.

The following items provide the practical information you will need about this course:

**EXAMS:** There will be four exams during the semester, and a fifth during finals week. All exams will focus most heavily on recent material, but will be cumulative in the sense that we will continue to use material learned early in the semester throughout the remainder of the semester. Tests will generally be worth 100 points each and will consist of multiple-choice questions (usually representing about 60% of the test) and a variety of other question types. For example, there will occasionally be drawings or diagrams of structures related to our topics, or graphs of bacterial phenomena, which you must label, modify, or interpret. On every test, some questions will require explanations or discussions of topics so that you must demonstrate your UNDERSTANDING of the subject matter by explaining it clearly. Selection
of relevant information and logical development of complete ideas will be required in these answers for full credit.

The **EXAMS MUST BE TAKEN at the times listed** in the accompanying class schedule, unless special permission for an exception has been arranged **beforehand**. Some of you may experience legitimate conflicts such as those for professional or graduate school interviews, medical care, or team travel, and I will try to accommodate your needs in these or similar **unavoidable** instances. Look over the class schedule before you plan other types of travel or personal activities, as these will not be accepted as valid reasons for missing an exam.

**If a medical or other personal emergency occurs at the time of the exam that prevents you from getting here, you must immediately notify me by talking to me personally (745-3554) or by leaving a detailed message on my voice mail. If this procedure is not followed, or if you have no acceptable excuse for missing an exam, you will not be permitted to take a make-up exam and will receive a 0. All make-up exams will be given on the last Friday of the semester, and will be **entirely essay based.**

**Preparing for exams.** It will be most imperative for your success on exams that your notes from class are **complete** and that you have assimilated the concepts they contain to form a body of knowledge that you can **USE** to think about the microbial world accurately and creatively. Most of what you need to do will on tests will come from you well-done notes! Don’t overlook your fellow students as resources for review – student study groups are often a most effective teaching supplement, and putting heads and notes together can create an intellectual powerhouse! I will be **more than happy** to review your individual notes with you, or to answer queries by e-mail to complete or clarify information. If you and several fellow classmates think it would be helpful to schedule a group review session on any topic, I will be happy to do so upon request.

Be sure that you have read the assigned portions of the text carefully and allowed yourself time to look thoroughly at the illustrations, tables, or graphs and their captions. When you are studying for an exam this should not be the first time you have seriously looked at your text. Each sub-section of the chapters in your text contains a useful “MiniReview” at its conclusion with a short series of questions designed to sample your understanding of the material addressed. There is an additional review of key terms and a lengthier set of review application questions at the end of the chapter. Some of these may concern topics we have covered, but others focus on information from sections we omitted.

**Attendance:** I hope that this course and its subject matter will receive a reasonable portion of your time and attention this semester. At the minimum, I expect you to attend ALL classes – class attendance should not be considered optional. I do not take attendance for students enrolled in the class for credit, but I do make a mental note of who attends. Regular attendance earns you special privileges and special treatment, such as ability to take an exam early (even if you don’t have a documented excuse) and rounding up if your final course grade lands between grades. If you do not attend class regularly, you do not earn special treatment. In the case of truly excessive absences, I reserve the right to deduct up to 10 points from your class total (at my own discretion). Please notify me as soon as possible if you anticipate a necessary absence or have missed class because of illness.
I also expect you to be respectful of your peers and of me. Turn off your cell phone. Avoid texting, Facebooking, looking at Tumblr, or otherwise browsing the internet. If you are smiling at your crotch, I know you are not doing something related to the class. If you are holding your phone in front of your face and scrolling with your thumb, I know you are not doing something related to the class. The only acceptable use of wireless-enabled devices is to take notes, look up supporting materials, or to make sound recordings of the lecture. I reserve the right to ban technology that interferes with the learning environment.

**Academic accommodations.** Most of you are aware of the services offered by the Learning Assistance Center. If you are eligible for accommodations on the basis of a diagnosed disability for which you have provided documentation to the LAC, be sure to contact me and provide the appropriate Student-Faculty agreement form to arrange your accommodations.

**Reading outside of class.** In addition to the textbook reading assigned for each day’s topic, I will occasionally provide you with copies of articles from scientific periodicals or news sources which have a bearing on topics we are discussing in class. Consider these articles as part of the “text” for the course and read them carefully, as I will occasionally prepare exam questions from such supplemental reading material. These readings may also be the basis for extra credit opportunities on an exam.

**Grading.** Your final grade will be based on your performance on the five scheduled tests noted on your course schedule. The first four exams will be worth 100 points each, and the final exam will be worth 150 points, for a total of 550 points. I do not have projects or papers as part of this class because there are so many of these required for your Lab course. This does mean that there are no assignments to ‘pad’ your lecture grade so you must be well prepared for exams.

\[ A = 93-100, \ A- = 90-92, \ B+ = 87-89, \ B = 83-86, \ B- = 80-82, \ C+ = 77-79, \ C = 73-76, \ C- = 70-72, \ D+ = 67-69, \ D = 63-66, \ D- = 60-62, \ F = \text{below 60} \]