BIOS 450: Advanced Microbiology

Tues/Thurs 11:00-12:15, TBH 180C

Instructor:
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Office hours: Tues/Thurs 1:00 and by appointment

Course description and objectives:
An overall objective for the course is to expose students to advanced concepts and principles of current microbiology, microbial ecology, and genomics. We will explore microbial diversity and ecology, molecular microbial genetics, techniques and tools used to explore microorganisms, bioenergetics and physiology, and applied microbiology. Topics covered include, but are not limited to: the diversity of microbial genes and genomes; the value of this diversity for life-sustaining biogeochemical cycles; the complexity and functionality of microbial communities; interactions between microbes and their environments, including human/animal hosts, aquatic/terrestrial environments, and engineered systems; and the influence of the environment in shaping and driving the evolution of microorganisms and their communities.

A good alternative name for this course is “Microbial Diversity,” since our focus will be on the incredible diversity (taxonomic, genetic, environmental, metabolic, and in terms of adaptation) found among microbes.

The course is geared towards advanced undergraduate and graduate students interested in microbial systems from an environmental, engineering, or medical perspective. Satisfactory completion of BIOS 350 is required. BIOS 220 is strongly recommended.

Learning Objectives:
For each topic listed below, students will be able to:

Microbial diversity and ecology:
- Outline the importance of microbial diversity in our understanding of biology
- Explain microbial systematics
- Describe microbial populations in nature
- Explore microbial symbiosis and community composition
- Explain the current microbial species concept and related debates
- Describe microbial food webs and the microbial loop

Molecular microbial genetics and tools:
- Identify methods used for identifying bacteria and interpret the outcome of various techniques
- Distinguish molecular and biochemical techniques used to describe microbes
- Describe various DNA sequencing technologies and their application to microbial community analysis
- Describe and interpret the different uses of metagenomics, metatranscriptomics, proteomics, and metabolomics

Bioenergetics and physiology:
• Explain the different lifestyle strategies used by microbes in aerobic and anaerobic environments.
• Explain the different lifestyle strategies used by microbes in environments with “extreme” characteristics, such as high salinity, pH, or temperature.
• Identify functional groups of microbes
• Describe different metabolic pathways that bacteria use including:
  - anaerobic and aerobic photosynthesis
  - Sulfur transformations
  - Nitrogen transformations
  - methane and C1 transformations
  - Trace metal transformations

Applied microbiology:
• Describe industrial uses of microorganisms in fermentation
• Describe industrial uses of microorganisms in biodegradation/bioremediation

My commitment to you:
I will always strive to be as fair as possible.
I will always strive to be clear in my expectations.
I will always strive to be organized and clear in my presentations.
I will always strive to be EVERYONE’S professor.
I will always strive to respect my students.
I will never test you on material I do not cover (I do cover a lot, mind you).

Evaluation:
  Participation: 10%
  My favorite microbe: 10%
  Four exams at 20% each: 80%
  Make-up exams will NOT be given.
  The final exam will not be cumulative

Grading Scale:
  100-85%= A; 70-85%= B; 55-70%= C; 50-55%= D; <50%= F

Textbook:
Brock Biology of Microorganisms 15th Edition (Madigan, Bender, Buckley, Sattley, Stahl)
If you have a prior edition of this text, no need to buy a new one. Just double check the readings and as me if you are unsure.

Any additional required readings will be provided on Blackboard

The course incorporates Pearson’s Modified Mastering Microbiology course content, which is available within the Blackboard course page. To access the course, you need the following:
• Your Blackboard account
• Your Pearson account (if you have used a Pearson product in the past such as MathXL, MyEconLab, etc. you have a login/password for Pearson, otherwise you will create one during the registration process)
• An access code for your Modified Mastering product (packaged with your new text at the bookstore)
Alternatively, you can purchase access with a credit card or PayPal account or opt to get temporary access while awaiting Student Financial Aid. *Please refer to your Pearson MyLab/Mastering Student User Guide for more information.

**My favorite microbe:**
Students will select and research an important microbial taxon (organism or functional group), focusing on aspects of its physiology, genetics, ecology, and biogeochemistry, and submit a short written summary (2-5 pages single-spaced, 12pt Times New Roman/Arial/Helvetica font) of the selected microbe. At least two primary literature papers should be cited, using the citation format of the journal *Applied and Environmental Microbiology.* **Proper grammar and spelling are important.**

Paper is due by 5pm on the day indicated on the calendar below. They can be printed out and turned in during class or emailed as a pdf or Word document.

Reference guidelines: http://aem.asm.org/site/misc/journal-ita_org.xhtml#03
UIC Writing Center: http://www.uic.edu/depts/engl/writing/

**Blackboard, Piazza, Learning Catalytics:**
Most materials, such as lecture slides and the updated syllabus and schedule, will be posted to Blackboard.

There is also an online forum for course help and discussions on Piazza at: https://piazza.com/uic/spring2018/bios450/home
We'll be conducting all class-related discussion here this term. The quicker you begin asking questions on Piazza (rather than via emails), the quicker you'll benefit from the collective knowledge of your classmates and instructors. I encourage you to ask questions when you're struggling to understand a concept—you can even do so anonymously.

You are responsible for checking blackboard every week and making sure you are doing all the work. You are responsible for knowing about all of the material distributed for this class, whether is mentioned in the syllabus, posted on Blackboard, posted on Piazza, or announced during lecture.

During some classes, I will ask you to respond to a number of questions using the Learning Catalytics student response system. I will use your responses to gauge the overall comprehension of the subject, to clear up any misunderstandings, and to learn your opinions on various topics. You may not use another student's account to answer questions for them. Answering questions for another student, whether they are present or absent, is unacceptable. To use Learning Catalytics, you will need to bring an internet-enabled device (smart phone, iPad, iPod Touch, tablet, or laptop) to every class. Please let me know if you do not have such a device.

**Note taking and sharing:**
Each student, in groups of 2-3 students, will help assemble class notes each week. These can (and should) include questions, things you are not clear about, or food for thought. Work with your peers to put together a single set of notes! These notes will be posted on Piazza, where everyone will be able to add comments and thoughts. **Discussion and comments on the notes are encouraged. I will chime in if there are specific questions or misinformation.**

These are to be submitted by Friday of the week of lecture.
Credit for this will be based on a) whether you did the assignment; b) whether your notes are comprehensive and c) whether you participate in discussion about the notes. Grammar/spelling aren't a priority, but remember that your peers will want to be able to understand your notes, so try to as clear as possible. It's ok if there are mistakes in your notes, too; if your peers don't catch them, I will. For each set of notes you do, you'll get 4 points if your notes are detailed and on time, 2 if they are late or poorly done, and 0 if you did not do it at all. You'll get an additional point for participating in discussions.

Other participation:
I expect you to attend class and ask questions (in class or on Piazza) when things do not make sense. This two-way communication with students is vital. We will also spend some time analyzing and discussing journal articles, and I expect you to participate in the presentation and discussion of these.

Policy for missed/late work:
Late work will not be accepted, nor will make up exams be permitted. If you believe you have an extenuating circumstance that requires or results in missed work, please contact me as soon as possible, prior to the exam or deadline, if possible.

Extra credit:
Attend relevant seminars for bonus points!
1. Each seminar you attend and write up will count as a max of 2 points added to an exam score.
2. The maximum number of extra credit points is +5 per exam. I will add the points at the end of the semester.
3. There will be an optional “Microbiological Creativity” assignment for extra credit. For this, you can explore a topic we learn about using creative approaches: art, music, cartooning, poetry, etc. This tends to be pretty fun!

Extra help:
If you aren’t doing well in class and don’t come to office hours or talk to me, then there is nothing that I can do to help you perform better. Instead, please let me help you to do your very best! I want to work with each of you to meet your goals for this class. Plus, I genuinely love this topic, and enjoy discussing it with students.

Academic honesty:
As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional integrity. All members of the campus community—students, staff, faculty, and administrators—share the responsibility of insuring that these standards are upheld so that such an environment exists. Instances of academic misconduct by students will be handled pursuant to the Student Disciplinary Policy:
http://www.uic.edu/depts/dos/studentconduct.html

Any student caught cheating will receive an F in the course, and face possible dismissal from the University.

Instances of academic misconduct will not be tolerated. This includes, but is not limited to:
- Possessing, using, or exchanging improperly acquired written or oral information in the preparation of homework, class project, and exams.
- Use of material that is wholly or substantially identical to that created or written by another individual or group.
- False claims of performance or work that have been submitted by a student

Disability accommodations:
Concerning disabled students, the University of Illinois at Chicago is committed to maintaining a barrier-free environment so that individuals with disabilities can fully access programs, courses, services, and activities at UIC. Students with disabilities who require accommodations for full access and participation in UIC Programs must be registered with the Disability Resource Center (DRC). Please contact DRC at (312) 413-2183 (voice) or (312) 413-0123 (TDD).

Other campus resources:
Academic support: UIC offers the tools and support you need for the best college experience possible. We provide access to extensive academic and student support services that help in your courses and in connecting with classmates. Peer mentoring, tutoring and specialized workshops make your academic experience better. All students are encouraged to take advantage of these resources and academic guidance.

Social support: College is more than academics. The opportunity to grow socially and culturally is just as important. UIC offers resources dedicated to student involvement, support, networking and social interaction.

Health and Wellness: The Wellness Center promotes healthy attitudes and behaviors through information, educational programs and skill-building activities. UIC’s Counseling Center helps students deal with stress, cope with the transition to college, gain strength from gender and cultural identity, and manage mental illness.

Student Support Services: [http://www.uic.edu/academics/student-support](http://www.uic.edu/academics/student-support)

Counseling Center: 312-996-3490 [http://counseling.uic.edu/](http://counseling.uic.edu/)

UIC Police: 312-355-5555 (emergency) or 312-996-2830 (non-emergency)

IN-Touch crisis hotline: 312-996-5535

Office of Access and Equity: 312-996-8670