

Microbial Ecology – BISC 522, Spring 2019
W: 2:30-5 pm, Shoemaker 219
3 credit hrs

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“If I could do it all over again, and relive my vision in the twenty-first century, I would be a microbial ecologist.”
E.O. Wilson (1994)

Course Description: Microbial Ecology examines the factors that control the abundance, distribution, growth rates, community structure, and metabolic activities of microorganisms in the environment. It includes examination of the importance of microbes and microbial processes to biogeochemical cycles, plant and animal health, environmental change, and biotechnology.

Course Objectives:

- Learn about the ecology of microorganisms at population, community and ecosystem levels.
- Gain familiarity with modern approaches and questions in microbial ecology by critical analysis through speaking and writing.

Class Organization: BISC 522 is an undergraduate/graduate level lecture and (mostly) discussion course. Weekly discussions will be based on readings from the literature in the field. For some classes, prior to discussion there will be a short lecture. For other classes, we'll jump right into discussion.

Readings:

Readings will be provided to you on Blackboard. They will be made available no less than 6 days before class. I will send you an email when readings have been placed on Blackboard. Over the semester, we will read in the vicinity of 40-50 papers.

Class Schedule

<u>week</u>	<u>Topic</u>
1	Introduction Small is beautiful
2	Fundamentals of microbial nutrition and bioenergetics
3	Microbial synthesis and degradation of organic matter
4	Microbial biogeochemistry – the N cycle
5	Population ecology of microorganisms
6	Microbial community structure
7	Student presentations I SPRING BREAK
8	Microbial foodwebs – the role of predators and parasite
9	Biofilms and other consortia
10	Host-microbiome interactions – plants
11	Human gut microbiome
12	Microbial disease ecology I
13	Microbial disease ecology II
14	Microbial ecology in a changing world
FINAL	Student presentations II

Grading

1. Participation in discussion of papers – This will include participation in discussion, and occasional leadership of discussion.

2. Paper reviews (weekly) – required of all students for specific assigned papers. Paper reviews should address the 5 questions below, and be 1-2 pages long. Late reviews will not be accepted, however to accommodate absences, you'll be allowed two missing reviews without an effect on your grade.

All reviews should be prepared and filed electronically in a personal file on Blackboard. Instructions for how to do this will be provided in class. Access to your file will only be possible by you and the instructor.

3. Paper presentations I and II - student presentations of papers chosen independently from the literature in microbial ecology. Presentations should be based on one of the 8 themes organized by Antwis et al. (2017).

Questions for Paper Reviews

1. What is (are) the main question(s) being asked and tested or evaluated, or topic being reviewed?
2. What makes this question interesting or important in a fundamental and/or applied way?
3. How was the question addressed? What basic methods were used (observation, experiment, modeling, meta-analysis)?
4. What are the main findings of the study?
5. In what way do the results advance or expand knowledge in microbial ecology?

Grading System:	Discussion participation	50%
	Paper reviews (weekly):	30%
	Paper presentations (10% each)	20%

Other Notes and Policies

1. *Special Needs*. Students with special needs (e.g. physical handicaps or learning disabilities) who need to make special arrangements should consult me within the first two weeks of the semester.
2. *Academic Integrity*. Any form of misconduct – cheating, plagiarism, fabrication – will subject violators to a failing grade in the course. I do encourage students to collaborate in studying and to review each other's written assignments, but all work turned in for a grade must be completed only by the student submitting the work.
3. *Incompletes*. Incompletes for the semester will not be given except in extreme circumstances beyond a student's control.
4. *Collaboration with me* – I welcome any and all opportunity to discuss with you the design and subject matter of the class. The class is a work in continual progress, and I am willing to consider modifying its design and content to meet specific student needs and interests.

Partial list of journals in which you can find papers in the field of Microbial Ecology.

Advances in Crop Science
Anaerobe
Annual Review of Microbiology
Antonie van Leeuwenhoek
Applied and Environmental Microbiology
Applied Microbiology and Biotechnology
ASM News
Biodegradation
Biogeochemistry
Biology and Fertility of Soils
Critical Reviews in Microbiology
Ecology
Ecology Letters
Emerging Infectious Diseases
Extremophiles
Environmental Microbiology
FEMS Microbiology
Frontiers in Ecology
Geomicrobiology Journal
Geophysical Research
Harmful Algae
Hydrobiology
ISME Journal (International Society of Microbial Ecology)
Journal of Bacteriology
Journal of Virology
Limnology and Oceanography
Marine Ecology
Marine Ecology Progress Series
Microbe
Microbial Ecology
Microbiology and Molecular Biology Reviews
Microbiology Reviews
Microbiome
Microscopy Research and Techniques
mSphere
Nature
Nature Reviews Microbiology
PLOS
Proceedings of the National Academy of Sciences (PNAS)
Proceedings of the Royal Society of London Series B-Biological Sciences
Science
Soil Biochemistry and Biology
Trends in Ecology & Evolution
Trends in Microbiology