

Fall 2018

EVSC 627 - Environmental Microbiology

Mengyan Li

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EVSC 385/627
ENVIRONMENTAL MICROBIOLOGY
FALL, 2018

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Lecture Hours: • Tue **6:00 – 9:05 p.m.** Tiernan Hall 106

Office Hours: • Tue 1:00 - 3:00 p.m. Tiernan Hall 384
(by appointment)

Textbook: Ian L. Pepper, Charles P. Gerba, Terry J. Gentry (2014). *Environmental Microbiology* (3rd Edition). Academic Press.
ISBN-10: 0123946263 or ISBN-13: 978-0123946263

Reference Books: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl (2014). *Brock Biology of Microorganisms* (14th Edition). Benjamin Cummings.
ISBN-10: 0321897390 or ISBN-13: 978-0321897398

Eugene L. Madsen (2015). *Environmental Microbiology: From Genomes to Biogeochemistry* (2nd Edition), Wiley-Blackwell.
ISBN-10: 1118439635 or ISBN-13: 978-1118439630

Course Slides and Selected Papers (see Moodle)

Course Description:

This course provides a comprehensive overview of the important microorganisms and microbial processes involved in a variety of natural and engineered environments. Conventional and advanced techniques for laboratory culturing and molecular monitoring will be introduced in combination with trending environmental topics covering nutrient cycling, bioremediation, microbial induced corrosion, greenhouse gas emission, antibiotic resistance, and wastewater treatment, water disinfection. Traditional lectures and exams will be supplemented with discussions of experimental design and data interpretation by reading current research articles and field cases.

<u>Grading:</u>	Midterm Exam	30%
	Final Exam	30%
	Homework	10%
	Term Paper & Presentation	15%
	Quiz & Participation	<u>15%</u>
		100%

Exams are closed book/note. Exams will be a combination of multiple choice, short answer, and calculated questions. Open answer questions/designs may be included depending on the material covered. The exams will be 120 minutes each and held during regular class time or the final period. Please arrive early for exams as no extra time will be given if you are late. Questions with extra points (10 to 15 points) will be given in the exam. For undergraduates (UG), the gained extra points will be counted into the final grade of this exam; for graduate students (GS), the final exam grade will be normalized to a total scale of 100 points.

Homework Problems are due exactly one week after their assignment. No late submission will be accepted without the written permission of Dean of Students. Certain homework questions are required to be submitted online via Moodle and subject to the plagiarism check by Turnitin.com.

Term Presentation for Undergraduates (UG) should review a topic from the textbook (Environmental Microbiology, 3e, Pepper) that is NOT covered by the course lectures. Presentation will be engaged by a team of approximately 3 students to outline the importance, principles, mechanisms, design, operation, application, and limitation, if appropriate for the selected topic. Students are highly recommended to search for resources beyond the textbook to enhance the integrity and depth of the topic. Students are encouraged to consult with the instructor for the preparation of the term presentation. Please plan your talk for about 25 minutes, leaving 5 minutes for questions and discussions. Presentations will be given in the last week of the class.

Term Paper & Presentation for Graduate Students (GS) should review assigned topics on environmental microbiology *individually*. The term paper needs to be at least 3 pages (font 12, 1.15X spaced) in length excluding figures and references, though inclusion of figures and tables is recommended to facilitate the delineation. Selected peer-reviewed journal articles will be provided to the students for better initialization of the term paper and oral presentation. From the references of the provided articles or publications that cited these two articles or relevant to the assigned topic, you are required to find 3 or more additional research articles to enhance the integrity and depth of your paper. Students are encouraged to consult with the instructor. Please plan your talk for about 15 minutes, leaving 5 minutes for questions and discussions. Both paper and presentation are weighed equally for grading. Presentations will be arranged at the end of the classes after the Midterm Exam.

Quiz will be given at the end of each lecture, serving to evaluate both participation and understanding of the learned material. Thus, one third of the credit will be given if you are present in the class. The other two thirds will be judged based on the correctness of your answers. The lowest score will be dropped and won't be counted toward your final grade.

<u>Grading Scale:</u>	A	≥ 85
	B+	[80, 85)
	B	[70, 80)
	C+	[65, 70)
	C	[55, 65)
	D	[50, 55)
	F	< 50

Ethics: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Specifically, students should understand the definition of ***plagiarism***. The information on plagiarism at the link is required reading: <https://honorcouncil.georgetown.edu/whatisplagiarism>.

In the event that personal or family issues may impact your performance, Dean of Students will be involved to address said issue. Please copy me in the emails for your record.

Accessibility: Student with documented disabilities should contact the Instructor immediately in a private manner. Appropriate accommodations will be made accordantly after consultation with the Disability Resources and Services at NJIT. Additional information can be found at: <http://www.njit.edu/counseling/services/disabilities.php>.

EVSC 385/627: ENVIRONMENTAL MICROBIOLOGY
Tentative Syllabus Fall, 2018

<u>WEEK</u>	<u>DATE</u>	<u>TOPIC</u>	<u>HOME- WORK</u>	<u>READING</u>
1	T, 9/4	<u>Microorganisms and Environmental Microbiology (I)</u> Introduction to environmental microbiology, importance of microorganisms, classification of microorganisms, bacteria.		Ch. 1, 2.1, 2.2.1-2.2.6
2	T, 9/11	<u>Microorganisms and Environmental Microbiology (II)</u> Archaea, fungi, protozoa, virus and other biological entities.		Ch. 2.2.9, 2.3, 2.4, 2.5
3	T, 9/18	<u>Microbial Growth</u> Bacterial growth in batch and continuous culture, Monod kinetics, microbial growth in environment.	Topics assigned for GS	Ch. 3.1-3.3
4	T, 9/25	<u>Microbial Metabolism</u> Carbon and energy source, metabolic diversity, photosynthesis, respiration, fermentation, primary and secondary production.	HW1 out	Ch. 2.2.8, 3.4, 6.3
5	T, 10/2	<u>Conventional Cultural and Physiological Methods</u> Extraction and isolation techniques, plating and other cultural methods, measuring microbial activities in pure culture, carbon respiration, isotopic and radiolabeled tracers.	HW1 due	Ch. 10, 11
6	T, 10/9	<u>Microbial Genetics</u> Genomics (chromosome and plasmid), genetic information transfer, antibiotic resistance.		Ch. 2.2.7, 13.1, 13.6, 21. 2, 31.4
7	T, 10/16	MIDTERM EXAM		
8	T, 10/23	<u>Advanced Molecular Tools</u> DNA extraction method, hybridization-based and amplification-based assays, DNA fingerprinting, sequencing analysis, bioinformatics and omic approaches for characterization of environmental microorganisms.		Ch. 13, 21

9	T, 10/30	<u>Microbial Environments (I): Soil</u> Earth environments, soil zones and phases, biotic and abiotic stresses, major microbial groups.	Topics assigned for UG	Ch. 4.1-4.4
10	T, 11/6	<u>Microbial Environments (II): Water</u> Physical and chemical characteristics, planktonic and benthic microbes, biofilm and microbial mats, freshwater environments.		Ch. 6.1, 6.2, 6.5
11	T, 11/13	<u>Microbial Environments (III): Air</u> Aeromicrobiology, aerosols and bioaerosols, aeromicrobiological pathways, microbial survival in the air.	HW2 out	Ch. 5.1-5.5
12	T, 11/20	NO CLASS (Thursday Classes Meet)	HW2 due	
13	T, 11/27	<u>Biogeochemical Cycling</u> C/N/S cycling, microbial induced corrosion.		Ch. 16.1-16.4
14	T, 12/4	<u>Biodegradation and Bioremediation</u> Overall process of biodegradation, contaminant structure, toxicity and biodegradability, environmental factors affecting biodegradation, biodegradation of organic pollutants, bioremediation techniques.		Ch. 17
15	T, 12/11	UG PRESENTATION		
16	TBD	FINAL EXAM		

PLEASE NOTE: THIS SYLLABUS, INCLUDING THE SCHEDULE, IS SUBJECT TO CHANGE BASED ON MATERIAL COVERED AND OTHER FACTORS. ANY CHANGES ARE AT THE DISCRETION OF THE INSTRUCTOR AND/OR DEPARTMENT, AND WILL BE COMMUNICATED AS SOON AS POSSIBLE TO ALL STUDENTS.