

EvSc 375
ENVIRONMENTAL BIOLOGY
SPRING, 2017

Dr. Mengyan Li

Department of Chemistry and Environmental Science
New Jersey Institute of Technology
Email: mengyan.li@njit.edu

Lecture Hours: • Mon & Wed **10:00 – 11:25 a.m.** Central King Building 220

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

Textbook: David A. Vaccari, Peter F. Strom, and James E. Alleman (2005).
Environmental Biology for Engineers and Scientists. Wiley-Interscience
Print ISBN: 9780471722397 or Online ISBN: 978-0471741794

Reference books: Jay H. Withgott, and Matthew Laposata (2014). *Essential Environment:
the Science behind the Stories* (5th Edition). Pearson Benjamin Cummings
ISBN-10: 0321984579 or ISBN-13: 978-0321984579

Richard T. Wright, and Dorothy F. Boorse (2014). *Environmental
Science: toward a Sustainable Future* (12th Edition). Pearson Education
ISBN-10: 0321811534 or ISBN-13: 978-0321811530

Course Slides and Selected Papers (see Moodle)

Course Description:

This course provides a comprehensive (both qualitative and quantitative) introduction of biological science and its close connections with our natural and engineered environmental systems. Broad topics include sanitary microbiology, nutrient cycles, biodiversity conservation, population ecology, environmental pollution, and hazardous management.

Scope and Structure:

Part I is devoted to an introduction to general biology, outlining fundamental biological concepts, principles, and methodologies. This is envisioned to be used as a study guide, as well as a summary of prerequisite information for latter parts of this course.

Part II focuses on microorganisms and their vital roles related to human health and waste treatment. Biogeochemical processes that are of interest to environmental scientists and engineers will be further discussed.

Part III addresses an introductory ecological approach to understanding man's impact and dependence on the natural environment.

Part IV introduces a number of essential biological treatment techniques that have been widely used for wastewater treatment, sludge decomposition, and environmental remediation.

Part V is centered on environmental health and toxicology. Toxicity assays, data interpretation, and risk assessment will be discussed for common classes of pollutants.

<u>Grading:</u>	3 Exams	65%
	Homework	15%
	Term Presentation	10%
	Quiz & Participation	<u>10%</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 90 minutes each and held during regular class times. Please arrive early for exams as no extra time will be given if you are late.

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 are requested to be submitted online via Moodle, which is subject to the plagiarism check by Turnitin.com.

Term Presentation should review any particular process, issue, or technology of your choice related to environmental biology. Presentation will be engaged by a team of 3 to 4 students to outline the importance, principles, mechanisms, design, operation, application, and limitation, if appropriate for the selected topic. Students are encouraged to consult with the instructor for the preparation of the term presentation. Please plan your talk for about 15 minutes, leaving 3 to 5 minutes for questions and discussions.

Quiz will be given at the end of selected lectures, serving to evaluate both participation and understanding of the learned material. Thus, half of the credit will be given if you are present in the class. The other half 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:

All students are expected to act in an honest and ethical manner consistent with NJIT's University Code on Academic Integrity, which can be found at <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>. The consequences for acts of academic dishonesty will range from punitive grade reduction to course failure. Specifically, students should understand the definition of plagiarism. The information on

plagiarism at the link below 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.

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. Please refer the link below for additional information: <http://www.njit.edu/counseling/services/disabilities.php>

EvSc 375: ENVIRONMENTAL BIOLOGY
Tentative Syllabus Spring, 2016

<u>CLASS</u>	<u>DATE</u>	<u>TOPIC</u>	<u>HOME- WROK</u>	<u>READING</u>
1	W, 1/18	Part I: Fundamentals of Biology <u>Introduction and Perspective</u> The study of biology, complexity, ethics, sustainability.		Ch. 1
2	M, 1/23	<u>Taxonomy and Evolution</u> Biological hierarchies, evolution, taxonomy.	HW1 out	Ch. 2
3	W, 1/25	<u>The Cell</u> Organic structure and physicochemistry, cellular structure and function.		Ch. 3, 4
4	M, 1/30	<u>Molecular Biology</u> DNA replication, protein synthesis, mutations and DNA repair, polymerase chain reaction.	HW1 due	Ch. 6.2, 6.3
5	W, 2/1	<u>Genetics</u> Genotype and phenotype, heredity.		Ch. 6.1
6	M, 2/6	<u>Bioenergetics</u> Metabolism, thermodynamics, oxidation-reduction.	HW2 out	Ch. 5.1
7	W, 2/8	<u>Enzyme Kinetics I</u> Single-substrate kinetics.		Ch. 5.2, 5.3
8	M, 2/13	<u>Enzyme Kinetics II</u> Multiple-substrate kinetics, effect of pH and temperature.	HW2 due	Ch. 5.3
9	W, 2/15	<u>Biochemical Pathways</u> Glycolysis, fermentation, respiration, beta-oxidation, photosynthesis.		Ch. 5.4
10	M, 2/20	EXAM 1 – Covering mainly basic principles of environmental biology, metabolism, stoichiometry, thermodynamics, and kinetics.		

11	W, 2/22	Part II: Environmental Microbiology <u>Microbes I</u> Discovery, classification, bacteria.		Ch. 10
12	M, 2/27	<u>Microbes II</u> Archaea, Eukarya, virus.		Ch. 10, 12.9
13	W, 3/1	<u>Microbial Growth</u> Stoichiometry, metabolism, batch growth curve.		Ch. 11.1, 11.7
14	M, 3/6	<u>Microbial Assessment and Control</u> Microscopy, counting and measuring techniques, pathogenesis, control of infection.	HW3 out	Ch. 11,12
15	W, 3/8	<u>Biotransformation</u> Oxidation, reduction, phase I & II reactions.		Ch. 13.1, 16.1, 18.5
16	M, 3/20	<u>Biogeochemical Cycling I</u> C cycling.	HW3 due	Ch. 13.1, 14.2
17	W, 3/22	<u>Biogeochemical Cycling II</u> N/P/S cycling.		Ch. 13.2, 13.3, 14.2
18	M, 3/27	EXAM 2 – Covering mainly environmental microbiology.		
19	W, 3/29	Part III: Environmental Ecology <u>Energy Flow and Species Interaction</u> Energy pyramid, food web, impact factors.		Ch. 14.1, 14.2, 14.3
20	M, 4/3	<u>Population and Communities</u> Population growth, richness and diversity.		Ch. 14.4
21	W, 4/5	Part V: Biological Pollution Control <u>Wastewater Treatment</u> Process fundamentals, attached-growth systems, Suspended-growth systems.		Ch. 16.1
22	M, 4/10	<u>Sludge Treatment</u> Anaerobic digestion, aerobic digestion, composting.	HW4 out	Ch. 16.2

23	W, 4/12	<u>Bioremediation</u> Phytoremediation, bioremediation.		Ch. 16.7
24	M, 4/17	Part V: Environmental Health and Toxicology <u>Toxicology and Exposure Routes</u> Mechanisms, effects, carcinogens, uptake.	HW4 due	Ch. 17, 18
25	W, 4/19	<u>Dose-Response</u> Extrapolation, toxicity testing.		Ch. 19, 20.1
26	M, 4/24	<u>Contaminants and Risk Assessment</u> Effects of specific substances, human and ecological risk assessment.		Ch. 21, 22.1
27	W, 4/26	Student Presentation		
28	M, 5/1	EXAM 3 – Mainly on environmental ecology, toxicology, and biological pollution control.		

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.