

Environmental Microbiology: *Spring 2023 Course Syllabus*

NJIT Academic Integrity Code: All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

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.

Number of Credits: 3

Prerequisites: N / A

Course-Section and Instructors

Course-Section	Instructor
EVSC 385-101	Dr. Mengyan Li
EVSC 627-101	Dr. Mengyan Li

Office Hours for All Chemistry & Environmental Science Instructors:

Email: mengyan.li@njit.edu

Office Hours: Thursday from 1:00-3:00 PM or by appointment

Required Textbook:

Title	Environmental Microbiology
Author	Ian L. Pepper, Charles P. Gerba, Terry J. Gentry
Edition	3rd Edition
Publisher	Academic Press
ISBN #	0123946263

University-wide Withdrawal Date: The last day to withdraw with a **W** is Wednesday, November 10, 2021. It will be strictly enforced.

Learning Outcomes:

Students will:

1. Learn the distribution and diversity of microorganisms in the environment;
2. Understand the important roles of microorganisms in both the natural and engineered environments;
3. Master the molecular and physiological principals governing microbiology;
4. Understand the advantages and limitations of current tools for characterizing microbial populations and monitoring their activity in the environment;
5. Formulate scientific presentations to review trending topics and convert ideas of engineering solutions.

POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Quiz & Participation	10%
Homework	20%
Term Presentation	10%
Midterm Exam	30%
Final Exam	30%

Your final letter grade in this course will be based on the following tentative curve:

A	85-100	C	55-64
B+	80-84	D	50-54
B	70-79	F	<50
C+	65-69		

Attendance Policy: Attendance at classes will be recorded and is **mandatory**. Each class is a learning experience that cannot be replicated through simply “getting the notes.” Absence for the first, second, third, fourth, and fifth times will deduct 1, 2, 3, 4, 5 points, respectively, toward the final grade. Missing 6 classes or more can disqualify the students from passing the course.

Quiz: Quiz will be given on Canvas after each lecture, providing students with practices at home. Questions are all multiple choices. Answers will be discussed during the following class.

Homework: Homework assignments 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 and subject to the plagiarism check by Turnitin.com.

Term Presentation: 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 4 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.

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.

Please plan the oral presentation for about 12 minutes, leaving 3 minutes for questions and discussions. Alternatively, students can choose to make video clips (~ 5 minutes in length) with or without cartoons as a substitute for oral presentations.

Exams: 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. Questions with extra points (~10 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. The exams will be 120 minutes each and held during regular class time or the final period. Please be on time for exams as no extra time will be given if you are late. The following exam periods are tentative and therefore possibly subject to change:

Exam I	February 28
Exam II	TBD

The exam I and II will test your knowledge of the course material taught in Weeks 1-6 and 8-13, respectively.

Makeup Exam Policy: There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event that a student has a legitimate reason for missing a quiz or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the CES Department Office/Instructor that the exam will be missed so that appropriate steps can be taken to make up the grade.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times. Such devices must be stowed in bags during exams or quizzes.

Ethics: The shift to remote and converged teaching due to the COVID-19 pandemic has required that both instructors and students make changes to their normal working protocols for courses. Students are asked to practice extra care and attention in regard to academic honesty, with the understanding that all cases of plagiarism, cheating, multiple submission, and unauthorized collaboration are subject to penalty. Students must properly cite and attribute all sources used for papers and assignments. Students may not collaborate on exams or assignments, directly or through virtual consultation, unless the instructor gives specific permission to do so. Posting an exam, assignment, or answers to them on an online forum (before, during, or after the due date), in addition to consulting posted materials, constitutes a violation of the university's Honesty policy. Likewise, unauthorized use of live assistance websites, including seeking "expert" help for specific questions during an exam, can be construed as a violation of the honesty policy. All students should be familiar with the [NJIT Academic Integrity Code](#).

ADDITIONAL RESOURCES

Chemistry Tutoring Center: Located in the Central King Building, Lower Level, Rm. G12. Hours of operation are Monday - Friday 10:00 am - 6:00 pm. For further information please click [here](#).

Accommodation of Disabilities: Office of Accessibility Resources and Services (*formerly known as Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

- <http://www5.njit.edu/studentsuccess/disability-support-services/>

Important Dates See: Fall 2021 Academic Calendar, Registrar
<https://www5.njit.edu/registrar/fall-2021-academic-calendar/>

Course Outline

Week	Date	Topic	Assignment	Reading
1	T, 1/17	<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, 1/24	<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, 1/31	<u>Microbial Growth</u> Bacterial growth in batch and continuous culture, Monod kinetics, microbial growth in environment.	HW1 out	Ch. 3.1-3.3
4	T, 2/7	<u>Microbial Metabolism</u> Carbon and energy source, metabolic diversity, photosynthesis, respiration, fermentation, primary and secondary production.	HW1 due	Ch. 2.2.8, 3.4, 6.3
5	T, 2/14	<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.	HW2 out	Ch. 10, 11
6	T, 2/21	<u>Microbial Genetics</u> Genomics (chromosome and plasmid), genetic information transfer, antibiotic resistance.	HW2 due	Ch. 2.2.7, 13.1, 13.6, 21. 2, 31.4
7	T, 2/28	MIDTERM EXAM		
8	T, 3/7	<u>Advanced Molecular Tools (I)</u> DNA extraction method, hybridization-based and amplification-based assays, DNA fingerprinting.	term presentation topic out	Ch. 13, 21
9	T, 3/14	Spring Recess		
10	T, 3/21	<u>Advanced Molecular Tools (II)</u> sequencing analysis, bioinformatics and omic approaches for characterization of environmental microorganisms.		Ch. 13, 21
11	T, 3/28	<u>Microbial Environments (I): Soil</u> Earth environments, soil zones and phases, biotic and abiotic stresses, major microbial groups.	HW3 out	Ch. 4.1-4.4
12	T, 4/4	<u>Microbial Environments (II): Water</u> Physical and chemical characteristics, planktonic and benthic microbes, biofilm and microbial mats, freshwater environments.	HW3 due	Ch. 6.1, 6.2, 6.5

13	T, 4/11	<u>Microbial Environments (III): Air</u> Aeromicrobiology, aerosols and bioaerosols, aeromicrobiological pathways, microbial survival in the air.	HW4 out	Ch. 5.1-5.5
14	T, 4/18	<u>Biogeochemical Cycling</u> C/N/S cycling, microbial induced corrosion.	HW4 due	Ch. 16.1-16.4
15	T, 4/25	Term 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.

*Updated by Genti' Price - August, 2021
Department of Chemistry & Environmental Sciences (CES)
Course Syllabus, Spring 2023*
