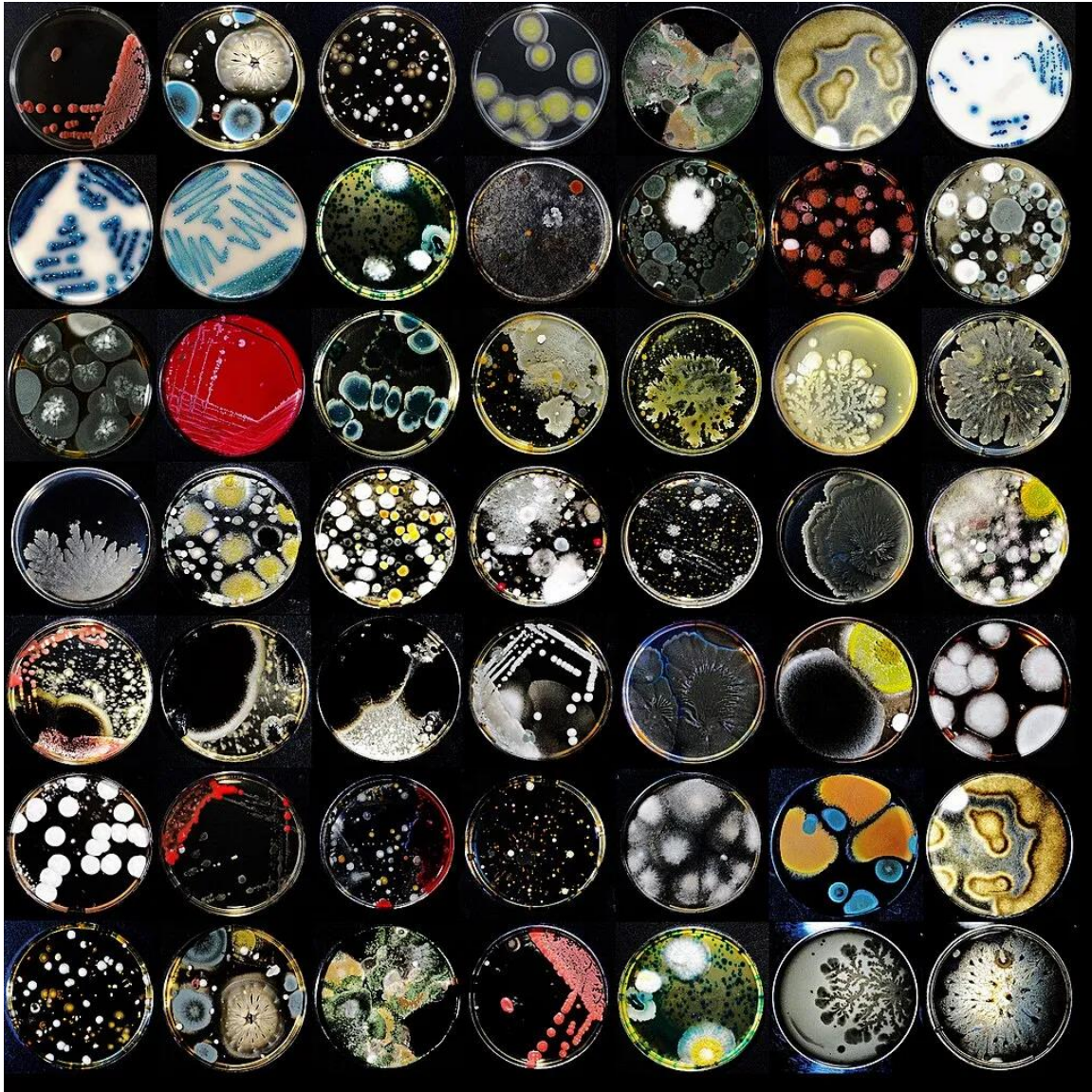




EVPP 305: Environmental Microbiology Essentials

SPRING 2026

COURSE INFORMATION

Instructor:	Dr. Jennifer Salerno
Lecture Time:	Tuesdays, Thursdays 9:00-10:15 AM
Lecture Location:	Innovation Hall 222
Office:	Potomac Science Center 3113
Office Hours:	Thursdays, 10:30 -11:30 AM in David King Hall or online by appointment
Email:	jsalerno@gmu.edu
Text (optional):	Brock Biology of Microorganisms (16 th Edition) Madigan et al.

COURSE DESCRIPTION

Knowledge of microbiology is an essential part of an environmental science education. Many environmentally important issues have a central microbial component (e.g., biogeochemical cycling, bioremediation, wastewater treatment, microbially enhanced environmental toxicity, wildlife disease, zoonoses). This course is targeted at undergraduate students studying the environment from a natural science or science policy perspective. It is appropriate for those students who have not had previous coursework in microbiology or whose previous experience of microbiology was focused mainly on human health topics. Previous introductory environmental science coursework is required to get the optimum education from this course. **The course is intended as a general introduction to microbiology with a special focus on the study of the biology, ecology, distribution, and activity of microorganisms in natural and built environments.** It is a first-level course with a laboratory component. Whether you're headed for careers in ecology, environmental consulting, wildlife biology, policy, or applied microbiology, this course provides foundational knowledge and practical skills that prepare you for upper-level work in microbial ecology, aquatic ecology, wildlife disease, or industrial/environmental microbiology. The laboratory portion (EVPP306) is a co-requisite. EVPP 305 and 306 must be taken in the same semester unless either was previously completed with a passing grade, or you have permission from the instructor.

LEARNING OUTCOMES

By the end of this course, you will be able to:

Remember & Understand (Foundational Knowledge)

- Identify major groups of microorganisms and describe their basic biology and ecological roles.
- Explain core microbial processes, including nutrient cycling, bioremediation, and environmental toxicity.
- Summarize how microbes contribute to environmental issues such as water contamination, wildlife disease, and zoonotic transmission.

Apply (Skill Use in New Contexts)

- Apply microbiological principles to analyze real environmental scenarios and case studies.

Analyze (Critical Thinking)

- Compare microbial communities across different ecosystems (aquatic, terrestrial, built).
- Analyze how microbial processes influence environmental health, sustainability, and policy decisions.

Evaluate (Judgment & Interpretation)

- Critically evaluate the effectiveness of microbial applications in environmental management (e.g., wastewater treatment, industrial microbiology).

- Assess accuracy and implications of media coverage involving microbes (“Microbes in the Media”).

Create (Original Work & Integration)

- Develop a presentation that integrates microbial biology with an environmental issue of interest.
- Propose innovative or evidence-based solutions that use microbes to address environmental challenges.

COURSE FORMAT

Most class sessions begin with ~1 hour of lecture on the main topic. We’ll close with a short feature—Under the Scope or Microbes in the Media—where we examine interesting organisms or current events involving microbes. If there’s a microbe you want to learn more about, let us know and we can add it to the rotation.

Lectures, labs, and discussions are designed to work together. Lab activities reinforce lecture concepts through hands-on techniques such as culturing, microscopy, and environmental sampling.

STUDENT EXPECTATIONS

- Active participation: Class discussions and case studies rely on your engagement.
- Canvas: Check regularly for updated schedules, readings, and announcements (especially if guest speakers or events require changes).
- Assignments:
 - Quizzes and exams test foundational knowledge.
 - Case studies develop analysis and evaluation skills.
 - The Environmental Microbiology one-pager emphasizes creativity and synthesis.

COURSE SCHEDULE

WEEK	DATE	TOPIC/READING
1	Jan 20	Introduction to Environmental Microbiology Ch1: 1.1, 1.4-1.6; Ch20: 20.1
	Jan 22	History of Environmental Microbiology Ch1: 1.7, 1.11, 1.12, 1.13 Under the Scope: Anthrax – <i>Bacillus anthracis</i> Ch32: 32.8
2	Jan 27	Microbial Ecology of the Chesapeake Bay Ch20: 20.1, 20.9, 20.10 Under the Scope: Harmful algal blooms
	Jan 29	Review of Chemistry, Biochemistry, and Macromolecules for Environmental Microbiology Ch3: 3.2
3	Feb 3	Microbial Domains, Prokaryotes, Eukaryotes, Viruses Ch13: 13.1-13.6 Under the Scope: <i>Vibrio vulnificus</i>
	Feb 5	Prokaryote Cytology Ch2: 2.1-2.12 *Selection of One-Pager Topic Discussed
4	Feb 10	Eukaryote Cytology Ch2: 2.13-2.15 Under the scope: Hawaiian bobtail squid <i>Vibrio</i> symbiosis Ch 23: 23.10

	Feb 12	Microbial Diversity (Bacteria and Archaea) Slides provided for select Phyla from Ch16-18 *Students post microbe on discussion board
5	Feb 17	Bacterial Growth in Culture and in Nature Ch4
	Feb 19	Microbial Metabolism: Fermentation and Respiration Ch3: 3.6-3.9
6	Feb 24	Review Session
	Feb 26	Midterm Exam #1
7	Mar 3	Microbial Metabolism – Chemotrophy and Phototrophy Ch3: 3.11; Ch14: 14.3-14.6
	Mar 5	Environmental Microbiology Methods Ch19: 19.1-19.2; 19.9-19.12 Microbes in the Media *Find a recent news article relating to microbiology and be prepared to provide a summary and discuss in class
8	Mar 10	NO CLASS – SPRING RECESS
	Mar 12	NO CLASS – SPRING RECESS
9	Mar 17	Environmental Molecular Biology Ch19: 19.6-19.8; Ch12: 12.7 *One-pager Outline Due end of week

	Mar 19	Microbial Symbioses with Plants and Animals Ch23: 23.1
10	Mar 24	Biogeochemical Cycles of Carbon, Nitrogen, and Sulfur Ch21: 21.1, 21.3, 21.4, 21.9
	Mar 26	Review Session
11	Mar 31	Midterm Exam #2
	Apr 2	Microbial Eukaryotes Ch18 Fungi and Protist Diseases Ch34: 34.1-34.7
12	Apr 7	Microbial Threats to the Environment: Mercury Methylation Ch21: 21.8 *One-pager Due
	Apr 9	Wastewater, Drinking Water Purification and Indicator Organisms Ch22: 22.6-22.10; Ch33: 33.1, 33.2
13	Apr 14	Applied & Industrial Environmental Microbiology • Bioremediation of Organic Pollutants • Microbial Degradation of Plastics and Emerging Contaminants • Microbial Fuel Cells and Bioenergy • Industrial Waste Treatment Using Microorganisms • Biosorption and Bioaccumulation of Heavy Metals
	Apr 16	Vector borne and Zoonotic Pathogens Ch32: 32.1-32.7

14	Apr 21	Water borne pathogens and Climate Change Ch33: 33.3-33.5
	Apr 23	Class presentations (4-minute lightning talks)
15	Apr 28	Class presentations (4-minute lightning talks)
	Apr 30	Review for final exam
16	May 7	Final Exam 7:30 – 10:15 AM

PARTICIPATION AND MAKE-UP WORK

While participation is not part of your grade, **attendance is important because we will use this time to for class discussions, to go over project ideas, to review for exams, and for in class activities and assignments (which are graded)**. If a schedule conflict arises preventing you from attending class, please let me know. If you anticipate being unable to turn in an assignment on time, please contact me. I recognize that “life happens” and with ample notice, I can offer flexible solutions that are reasonable and within my limits.

GRADING

Weekly Quizzes	10%
Homework/in class assignments	10%
First Mid-term Exam	20%
Second Mid-term Exam	20%
Final Exam	20%
One-pager & presentation	20%

Assignments are listed on the course schedule and are due before the start of the next class period. Quizzes will be made available on Thursdays and are due on the following Tuesday before the start of class. There will be two mid-term exams and a final (the final will not technically be cumulative but will still depend on knowledge acquired throughout the semester). Your final project will be a one-pager and presentation (described below).

Undergraduate Regular Grading Scale:

A+	97-100%
A	93-96%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D	60-69%
F	<60%

One-pager and Presentation:

More than ever, it's important for students in the sciences to be able to communicate technical scientific information to diverse audiences with clarity and accuracy. This semester, students will work individually or in groups of two to prepare a **"one-pager,"** essentially a policy brief, on a topic of their choosing related to environmental microbiology and with an intended audience of relevant stakeholders (e.g. resource managers, policymakers, NGOs, students, the public). We will discuss this over the course of the semester but check out <https://writingcenter.unc.edu/policy-briefs/> for the general idea and structure of a policy brief. It is intended that you will select a subject relevant to this class that interests you and probe that subject deeply – become "experts" on that subject. You will need to decide early in the semester and provide the chosen topic to the instructor. With permission, you may change that subject later if needed, but that is not the best approach.

As evidence of that expertise each student group will write/design a one-page policy brief. The details of the one pager, including the grading rubric, will be discussed in class. Examples of the topics might include indicator organisms related to beach closures, a wastewater treatment process, biofuels, or policies to protect aquatic resources from microbial pathogens (e.g., mycobacteriosis in striped bass) or climate change (e.g., coral bleaching). You will also be required to present a **4-minute lightning talk** on your topic (allowing an additional 3 minutes to field questions). The one pager and presentation are worth 25% of your lecture grade so working on that diligently during the semester is important.

A required list of literature cited will also be provided by each student and included on the back side of the one-pager. Use Zotero (<http://www.zotero.org/>). Instruction is available in the library if needed. The literature cited may include references like newspaper articles and books, **but at least 3 sources need to be from the primary literature (i.e., scientific journals).**

ACADEMIC INTEGRITY

Mason is an Honor Code university; please see the Office for Academic Integrity (<https://oai.gmu.edu/>) for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously, and violations are treated gravely. The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. **Three fundamental principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students (and AI – see below), give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification.** No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person (or AI) without giving the person (AI tool) credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using the appropriate format for this class. Plagiarism is the equivalent of intellectual theft and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

Another aspect of academic integrity is the free play of ideas. Discussion and debate are encouraged in this course, with the firm expectation that **all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions.** When in doubt (of any kind) please ask for guidance and clarification.

Sharing of instructor-created materials, particularly materials relevant to assignments or exams, to public online “study” sites is considered a violation of Mason’s Honor Code. Some kinds of participation in online study sites violate the Mason Honor code: these include accessing exam or quiz questions for this class; accessing exam, quiz, or assignment answers for this class; uploading of any of the instructor’s materials or exams; and uploading any of your own answers or finished work. Always consult your syllabus and your professor before using these sites.

AI USE POLICY

Generative AI tools are increasingly becoming part of our everyday experience. They are helpful tools when used responsibly and very damaging when they are not. AI technology may be used in this course for assistance with assignments and projects but NOT for quizzes and exams. That said, students must be sure to disclose when and what type of AI tools are used, make sure to fact check the information provided by AI using other reliable sources (e.g., peer-reviewed scientific literature), and must put ideas/concepts provided into their own words (don’t just copy and paste). Misuse may be treated as a violation of academic standards.

BASIC COURSE TECHNOLOGY REQUIREMENTS

Activities and assignments in this course will regularly use the Canvas learning management system (<https://mymason.gmu.edu>) as well as web-conferencing software (Zoom). Therefore, a desktop or laptop computer with a functional camera,

microphone, and reliable internet access (consistent 1.5 megabits per second download speed or higher) are required to participate in this course. In an emergency, students can connect through a telephone call, but video connection is the expected norm. A mobile phone with a camera may also enhance student learning in terms of photographing lab activities and sharing them with the class.

STUDENT USE OF ELECTRONIC DEVICES

Please be respectful of your peers and your instructor and do not engage in activities that are unrelated to the class during meeting times.

COURSE RECORDINGS

Any synchronous meetings in this class will be recorded to provide necessary information for students in this class. Recordings will be stored on Canvas and will only be accessible to students taking this course during this semester.

PRIVACY

Student privacy is governed by the [Family Educational Rights and Privacy Act \(FERPA\)](#). Students must use their MasonLive email account to receive important University information, including communications related to this class. I will not be able to respond to messages sent from or send messages to a non-Mason email address.
<https://registrar.gmu.edu/ferpa/>

DIVERSITY AND INCLUSION

Diversity is one of George Mason University's core values (Mason Diversity Statement: <https://stearnscenter.gmu.edu/knowledge-center/general-teaching-resources/mason-diversity-statement/>). As instructors of this course, we seek to create a learning environment that fosters respect for all people. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age, and ability. We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own.

DISABILITY ACCOMMODATIONS

Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with your instructor. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu | Phone: (703) 993-2474

SEXUAL HARASSMENT, SEXUAL MISCONDUCT, AND INTERPERSONAL VIOLENCE

Clearly, none of the above will be tolerated in this course. George Mason University is committed to providing a learning, living and working environment that is free from discrimination and a campus that is free of sexual misconduct and other acts of interpersonal violence in order to promote community well-being and student success. We encourage students who have been sexually harassed, assaulted or subjected to sexual misconduct to seek assistance and support. [University Policy 1202: Sexual Harassment and Misconduct](#) speaks to the specifics of Mason's process, the resources, and the options available to students.

As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's [Title IX Coordinator](#) per [university policy 1412](#). If you wish to speak with someone confidentially, please contact the [Student Support and Advocacy Center](#) (703-380-1434) or [Counseling and Psychological Services](#) (703-993-2380). You may also seek assistance from [Mason's Title IX Coordinator](#) (703-993-8730; titleix@gmu.edu).

OTHER USEFUL GMU RESOURCES:

ACADEMIC ADVISING

<https://advising.gmu.edu/>

ASSISTIVE TECHNOLOGY INITIATIVE

<https://ati.gmu.edu/>

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): (703) 993-2380

<https://caps.gmu.edu/>

DISABILITY SERVICES

<https://ds.gmu.edu/>

INTERNATIONAL PROGRAMS AND SERVICES

<https://oips.gmu.edu/>

LEARNING SERVICES

<https://learningservices.gmu.edu/>

LESBIAN, GAY, BISEXUAL, TRANSGENDER, QUEER, AND QUESTIONING RESOURCES

<https://lgbtq.gmu.edu/>

OFFICE OF DIVERSITY, INCLUSION, AND MULTICULTURAL EDUCATION

<https://odime.gmu.edu/>

OFFICE OF THE OMBUDSMAN: (703) 993-3306

<https://diversity.gmu.edu/>

The Office of the Ombudsman is a confidential, impartial, informal and independent problem-solving and conflict resolution resource for all students of the George Mason University community.

POLICE CADET SAFETY ESCORTS: (703) 993-2810

<https://police.gmu.edu/programs-and-services/police-cadets/escorts/>

STUDENT HEALTH SERVICES

<https://shs.gmu.edu/>

STUDENT SUPPORT AND ADVOCACY CENTER

<https://ssac.gmu.edu/>

UNIVERSITY CAREER SERVICES

<https://careers.gmu.edu/>

UNIVERSITY LIBRARIES “Ask a Librarian”

<https://library.gmu.edu/ask>

UNIVERSITY WRITING CENTER: (703) 993-1200

<https://writingcenter.gmu.edu/>

UNIVERSITY POLICIES

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university affairs.

MASON NON-DISCRIMINATION POLICY

<https://universitypolicy.gmu.edu/policies/non-discrimination-policy/>

ADDITIONAL STUDENT SUPPORT RESOURCES

<https://stearnscenter.gmu.edu/knowledge-center/knowning-mason-students/student-support-resources-on-campus/>