

EVPP 305 - Environmental Microbiology Essentials

Fall 2022

(Updated August 13)

COURSE INFORMATION

Instructor:	Dr. Esther Peters (replacing Dr. Jennifer Salerno this semester)
Lecture Time:	Tuesdays, Thursdays 12:00 – 1:15 PM
Lecture Location:	Planetary Hall 206
Office:	David King Hall 3050 or Zoom
Office Hours:	Thursdays, 10 AM – 12 PM or by appointment
Email:	epeters2@gmu.edu
Text:	Brock Biology of Microorganisms (16 th Edition) Madigan et al.*

*Brock is a classic microbiology text with extensive coverage of everything you ever wanted to know about microorganisms. It provides good introductory information on the topics that we will focus on in class. Most environmental microbiology texts assume you have completed an introductory microbiology class and omit a lot of the basics. The challenge of Brock is that it is very comprehensive, but not organized in a way that you can read it from front to back. Because of that, it will be important for you to work with the readings listed in the syllabus and look at the index for key words.

COURSE DESCRIPTION AND LEARNING OUTCOMES

Knowledge of microbiology is an essential part of an environmental education. Many environmentally important issues have a central microbial component (e.g., biogeochemical cycling, xenobiotic biodegradation, wastewater treatment, drinking water and shellfish contamination, 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 allied 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. Taken together, these courses will provide the foundation for further studies in microbial ecology, aquatic ecology, microbial metabolism, or applied/industrial 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.

On most lecture days we will focus on the listed topic for about 1 hour. For the final class time we will look at some topical and important microorganisms (“Under the Scope” or “Microbes in the Media”). This approach hopefully provides a break from the intensity of specific lecture material. If you have a particular microbe (e.g. symbiont, pathogen) or disease of interest let me know and we can put that into the mix. The syllabus/schedule may be subject to change depending on availability of guest speakers, extenuating circumstances, global pandemics, etc. **Please be sure to regularly check Blackboard for the updated course calendar.**

DATE	TOPIC
Aug 23	Introduction to Environmental Microbiology Ch1: 1.1, 1.4–1.6; Ch20: 20.1
Aug 25	History of Environmental Microbiology Ch1: 1.7, 1.11, 1.12, 1.13 Under the Scope: Anthrax – <i>Bacillus anthracis</i> Ch32: 32.8
Aug 30	Microbial Ecology of the Chesapeake Bay Ch20: 20.1, 20.9, 20.10 Under the Scope: Florida’s harmful algal blooms
Sep 1	Review of Chemistry, Biochemistry, and Macromolecules for Microbiology Brock does not have this subject separately but look at: Ch3: 3.2
Sep 6	Microbial Domains, Prokaryotes, Eukaryotes, Viruses Ch13: 13.1–13.6 Under the Scope: <i>Vibrio vulnificus</i> (CDC web site)
Sep 8	Prokaryote Cytology Ch2: 2.1–2.12 Selection of Research Topic Discussed
Sep 13	Eukaryote Cytology (Lex Berger) Ch2: 2.13–2.15 Under the scope: Hawaiian bobtail squid <i>Vibrio</i> symbiosis, Ch 23: 23.10
Sep 15	Microbial Diversity (Lex Berger) (Select Phyla from Ch16–18)
Sep 20	Bacterial Growth in Culture and in Nature Ch4

Sep 22	Microbial Metabolism: Fermentation and Respiration Ch3: 3.6–3.9
Sep 27	Microbial Metabolism – Chemotrophy and Phototrophy Ch3: 3.11; Ch14: 14.3–14.6
Sep 29	Review Session
Oct 4	Midterm Exam #1
Oct 6	Environmental Microbiology Case Studies
Oct 11	NO CLASS – FALL BREAK – MONDAY CLASSES MEET TODAY
Oct 13	Environmental Microbiology Methods Ch19: 19.1-19.2; 19.9–19.12 *One-pager Rough Draft Due end of week
Oct 18	Environmental Molecular Biology Ch19: 19.6–19.8; Ch12: 12.7
Oct 20	Virtual Guest Lecture: Manuela Dal Forno Lichen Ch23: 23.1
Oct 25	Biogeochemical Cycles of Carbon, Nitrogen, and Sulfur Ch21: 21.1, 21.3, 21.4, 21.9
Oct 27	Review Session
Nov 1	Midterm Exam #2
Nov 3	Microbial Threats to the Environment: Mercury Methylation Ch21: 21.8
Nov 8	The “Good” Microbes: Coral Microbiome and Symbiosis Ch23: 23.13 Reading: https://www.annualreviews.org/doi/10.1146/annurev-micro-102215-095440
Nov 10	Wastewater, Drinking Water Purification and Indicator Organisms Ch22: 22.6–22.10; Ch33: 33.1, 33.2
Nov 15	Microbial Fungi Ch18
Nov 17	Vectorborne and Zoonotic Pathogens Ch32: 32.1–32.
Nov 22	Waterborne Pathogens and Global Change Ch33: 33.3–33.5 (continued on next page)

Fungi and Protist Diseases
Ch34: 34.1–34.7

- Nov 24** **NO CLASS – FALL HOLIDAY**
- Nov 29** Class presentations (2-minute lightning talks)
***One-pager Due**
- Dec 1** Class presentations (continued)
Review for final exam
- Dec 8** **Final Exam 10:30 AM–1:15 PM**

PARTICIPATION AND MAKE-UP WORK

While participation is not part of your grade, **attendance at in-person synchronous class sessions is important because we will use this time to for class discussions, to go over project ideas, and for in-class activities.** If a schedule conflict arises preventing you from attending class, please just let me know. Synchronous classes will be recorded and posted on Blackboard. If you anticipate being unable to turn in an assignment on time, please contact me. I recognize that “life happens” (we are in the middle of a pandemic after all!) and with ample notice, I can offer flexible solutions that are reasonable.

ASSIGNMENTS AND GRADING

First Mid-term Exam	25%
Second Mid-term Exam	25%
Final Exam	25%
One-pager/presentation	25%

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 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 to become "experts" on that subject. You will need to decide early in the semester and provide a statement of the 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 2-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 in the one-pager. Use Zotero (<http://www.zotero.org/>). Instruction is available in the library. 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). I want to see that you can use the tool to help with your research and writing. You can get individual help in the library if you need it.

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 main concern is that you act as professionally as possible and do not mistakenly act in manner that could be interpreted negatively. 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 and rather simple 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, 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 without giving the person 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. A simple listing of books or articles is not sufficient. 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.

What does academic integrity mean in this course specifically? When you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous 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.

BASIC COURSE TECHNOLOGY REQUIREMENTS

Activities and assignments in this course will regularly use the Blackboard learning system (<https://mymason.gmu.edu>) as well as web-conferencing software (Blackboard Collaborate / 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 synchronous 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 Blackboard 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.

GENDER IDENTITY AND PRONOUN USE

If you wish, please share your name and gender pronouns with us and how best to address you in class and via email. You may also choose to update your chosen name and pronouns here: <https://registrar.gmu.edu/updating-chosen-name-pronouns/>

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).

SAFE RETURN TO CAMPUS STATEMENT

All students taking courses with a face-to-face component are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (<https://www2.gmu.edu/safe-return-campus>). Similarly, all students in face-to-face and hybrid courses should complete the Mason COVID Health Check (<https://www2.gmu.edu/mason-covid-health-check>). The COVID Health Check system uses a color code system and students will receive either a Green or Yellow email response. **Only students who receive a "green" notification are permitted to attend courses with a face-to-face component.** If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.

Students must follow Mason's current policy about facemask-wearing. As of August 21, 2022, **facemasks are NOT required in all indoor settings**. If this policy changes, you will be informed; however, students who prefer to wear masks either temporarily or consistently will always be welcome in the classroom.

OTHER USEFUL GMU RESOURCES:

ENVIRONMENTAL SCIENCE AND POLICY ADVISING (Undergraduates)

Dr. Diego Valderrama

<https://science.gmu.edu/academics/departments-units/environmental-science-policy/advising>

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/>

CENTER FOR CULTURE, EQUITY, AND EMPOWERMENT

<https://ccee.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/>