

EVPP 305 - Environmental Microbiology Essentials

Fall 2020

(Updated June 1)

Lecturer: Dr. Jennifer Salerno
Office: David King Hall 3024
Office Hours: Tuesdays, Thursdays, 10:00 a.m.-12:00 p.m.; or by appointment
Email: jsalerno@gmu.edu
Lecture Time: Tuesdays, Thursdays 12:00-1:15 p.m.
Lecture Location: James Buchanan Hall D023
Text: Brock Biology of Microorganisms (15th Edition)
Madigan et al.*

*Brock is a classic microbiology text with extensive coverage of everything you ever wanted to know about microbes. It also provides good introductory information on the topics that we will focus on in class. Most environmental microbiology texts assume you have completed an introductory micro 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.

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”). This approach hopefully provides a break from the intensity of specific lecture material. If you have a particular microbe (e.g. pathogen or disease) of interest let me know and we can put that into the mix. I will add topics to the syllabus as we move through the semester. The syllabus/schedule is subject to change depending on availability of guest speakers/etc. **Please be sure to regularly check BB for the updated syllabus/schedule.**

DATE	TOPIC
Aug 25	Introduction to Environmental Microbiology Ch1, pp1-2, 6-10; Ch20 pp616-617; Ch1, pp11, 18-23
Aug 27	Historical Roots of Environmental Microbiology Ch1, pp24-26 Under the Scope: Anthrax – <i>Bacillus anthracis</i> Ch29, pp884-885; Ch31, pp932-933
Sep 1	ASM Microbiology Case Studies
Sep 3	Microbiology of Chesapeake Bay/Potomac River Ch20, pp631-633 Under the Scope: Florida’s harmful algal blooms

- Sep 8** Review of Essential Chemistry, Biochemistry, and Macromolecules
Brock does not have this subject separately but look at:
Ch3, pp74-75, pp81-85
- Sep 10** Microorganisms: Microbial Domains, Prokaryotes, Eukaryotes,
Viruses
Ch13, pp364-376; Ch2, pp36-39
Under the Scope: *Vibrio vulnificus* (CDC web site)
- Sep 15** Prokaryote cytology
Ch2, pp36-64
Selection of Research Topic Discussed
- Sep 17** Prokaryote cytology cont., Eukaryote cytology
Ch2, pp36-64, and pp64-70
Under the scope: Hawaiian bobtail squid *Vibrio* symbiosis, pp714-715
- Sep 22** Microbial diversity
(Select topics from Ch16-18)
- Sep 24** Bacterial growth in culture and in nature
Ch5 pp137-152, pp158-164
- Sep 29** Microbial Metabolism: Fermentation and Respiration
Ch3, pp85-95, pp93-95, p93 (Fig. 3.22)
- Oct 1** Microbial Metabolism – Chemotrophy and Phototrophy
Ch3, pp 95, Ch14, pp393-406
- Oct 6** Review for Exam #1
- Oct 8** **Hour Exam #1**
- Oct 13** **No class – Fall Break**
- Oct 15** Environmental Microbiology Methods
Ch19, pp583-588, pp604-608
***One-pager Rough Draft Due end of week**
- Oct 20** Environmental Molecular Biology
Ch19, 591-603; Ch12, pp345-347
- Oct 22** Biogeochemistry of Carbon and Nitrogen
Ch21, pp651-659, Ch22, pp672-675
- Oct 27** Biogeochemistry of Nitrogen (contd.) and Sulfur

- Ch21, pp651-659
- Oct 29** **Guest lecture: Dr. Bob Jonas**
Blue holes and purple sulfur bacteria
- Nov 3** Review
- Nov 5** **Hour exam #2**
- Nov 10** Microbial Threats to the Environment:
Mercury Methylation
Ch21, pp666-670
- Nov 12** Coral Microbiome
Ch23, pp718-720
Reading: <https://www.annualreviews.org/doi/10.1146/annurev-micro-102215-095440>
- Nov 17** Wastewater, Drinking Water purification and indicator organisms
Ch22, pp680-689, Ch14 418-419; Ch32, pp939-940
- Nov 19** **Guest lecture: Dr. Al Torzilli**
The Fungi
- Nov 24** Vector borne and zoonotic pathogens
Ch31, pp919-931
Water borne pathogens and Global Change
Ch32, pp937-943
Fungi and Protist Diseases
Ch33, pp958-970, pp929-930, pp931-932
- Nov 26** **No class – Thanksgiving Break**
- Dec 1** Class presentations (2-minute lightning talks)
***One-pager Due**
- Dec 3** Review for final exam
- Dec 10** **Final Exam 10:30 – 1:15 p.m. in James Buchanan Hall D023**

LECTURE GRADING:

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

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%

Class Goals: Knowledge of microbiology is an essential part of an environmental education. Many environmentally important issues have a central microbial component (eg. biogeochemical cycling, xenobiotic biodegradation, wastewater treatment, drinking water and shellfish contamination, microbially enhanced environmental toxicity). 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 distribution and activity of microbes in natural and manmade 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.

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, 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 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 will be discussed in class. Examples of the topics might include – investigation of indicator organisms in the Potomac River in support of triathlons or a wastewater treatment process or policy to protect aquatic resources from microbial pathogens (Mycobacteriosis in striped bass?), or a zoonotic disease you might encounter in conservation science field trips. 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:

Attendance: Attendance at lectures is required. Exam material comes from the lectures so being there is very important.

Honor Code: EVPP 305 is governed by the GMU Honor Code. Students are expected to read and adhere to Honor Code. All individuals must do their own work on exams and research paper. **Academic dishonesty will not be tolerated.**

Below are some statements from Mason.

MASON ACADEMIC INTEGRITY STATEMENT:

GMU is an Honor Code university; please see the University Catalog 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. What does academic integrity mean in this course? Essentially this: 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.

Black Board: Information about the class will be made available on the Mason Black Board (BB) site. Since the EVPP306 laboratory sections will also have their own BB sites for interacting with the individual instructors.

GMU EMAIL ACCOUNTS

Students must activate their GMU email accounts to receive important University information, including messages related to this class.

OFFICE OF DISABILITY SERVICES

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. <http://ods.gmu.edu>

OTHER USEFUL CAMPUS RESOURCES:

WRITING CENTER: A114 Robinson Hall; (703) 993-1200;

<http://writingcenter.gmu.edu>

UNIVERSITY LIBRARIES "Ask a Librarian"

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

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

<http://caps.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.

OFFICE OF THE OMBUDSMAN: (703) 993-3306;

<http://ombudsman.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.

COMPLIANCE, DIVERSITY, AND ETHICS

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

TITLE IX COORDINATOR

<https://diversity.gmu.edu/title-ix/who-can-i-call>