Environmental Microbiology 5155

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Please **email us through Carmen**. Office hours are by emailed appointment. Do not leave voice mails as they may not be received.

Teaching Assistant Dean Vik
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Lecture time/location: WF 9:35 – 10:55 am Biological Sciences Building 609

I. Course objective/goals: The course will cover how we study microbes in their environments, how they differ among environments, and some of the driving forces behind those differences. The course is divided into four modules, with the first, longest module introducing you to essential concepts and the latter three applying those concepts to a variety of real-world systems.

Module 1: Environmental microbiology foundational concepts & tools
Module 2: The human holobiont
Module 3: Microbial communities as architects of the biosphere
Module 4: Human-engineered microbial environments

The course **learning objectives** for this material are:

- Develop knowledge of foundational concepts and methods in environmental microbiology.
- Learn how to read primary literature in this area, extract essential information, interpret figures, summarize key points, and identify what parts you don't understand.
- Develop knowledge of how microbial communities and processes differ across a variety of habitats, both natural and human-made.
- Improve professional skills for a scientific career: communicating science in writing, via talks and posters, peer-evaluation, and team-based problem solving.

We feel strongly that your education must be facilitated by **you**, through readings, pre-class materials, solo and group activities, and classroom engagement. During this class, we will focus on critical analyses skills, engaging other scientists (from different backgrounds), and expressing ideas purposefully on paper and verbally. At the end of this course students will be able to evaluate environmental microbiology literature and understand the inherent assumptions and limitations. It is our hope that this class fosters teamwork, leads to investment in the material, and encourages you to think a bit differently than you did previously about the microbial world around, on, and within you.

II. Required materials:

1) The field of environmental microbiology is constantly evolving; as such this class doesn't require a more traditional textbook. Required material include papers & videos posted on course's website and handouts. **The major electronic access points for the course will be Canvas. You will be expected to access this site in order to prepare for class.** This includes posting lectures, reading assignments, and

turning in assignments. **Turn on your Canvas notifications to be sure you don't miss important announcements, schedule updates, etc.**

2) The Socrative app will be used to take attendance and for quizzes. It needs to be downloaded by the second week of class on an electronic device(s) of your choosing by August 29th: http://www.socrative.com/

III. Grading:

20% Exams
20% Final
15% Presentation
15% Poster
25% Homeworks, quizzes, problem sets, peer evaluations
5% Participation

Grading modifications for Graduate Students (students enrolled in section 15022; undergraduates are enrolled in section 15021)**.** For graduate students, you will do your presentation solo instead of in teams, and will have an additional take-home essay question for each exam, and for the final.

Final Exam. This is cumulative, and will be held Thursday Dec 13, 8:00am-9:45am, location TBA.

"Homework". Homework is varied and assigned via Carmen. Examples of homework include reading and analyzing primary literature, applying class learning to new problems, using online tools to uncover information about microbes and communities, etc.

Participation. Classes will often begin with a brief (<5 minute) quiz. Research shows that frequent low-value testing improves learning. These quizzes are not intended to surprise you, and will stem directly from the preparation for each class as identified in the syllabus. This will be given sharply at the start of class and will usually be taken on the app Socrative. In addition to helping you space out your studying and ensure you do required readings before class, quiz participation will be also used to track attendance. A total of 5% of your points will be given at the end of the course for attendance (showing up) and participation (in-class exercise worksheets) combined, representing a buffer in your grade that you control by showing up on time and prepared. (Your participation in group exercises manifests separately via your grade within each of those assignments.)

Presentation. Undergraduates will be assigned to groups composed of 3-4 people, graduates will present solo. You will present an oral presentation introducing the class to new scientific material on **the topic related to the human microbiome**. To assist you we will provide topics and a representative paper. You are not obliged to use this topic, and can choose another, as long as it is approved by the TA or instructor. You are expected to arrange a meeting with TA or instructor the week before your presentation to go over your slides. Details on the assignment & rubric will be posted by the start of the second module. Graduate student presentations will be the first day. Presentations should last 15 minutes with 5 minutes for question/discussion; exceeding your allotted time will result in deduction of points.

Posters. Undergraduates will be assigned to groups composed of 3-4 people, graduates will present solo. You will present a poster presentation introducing your peers to new scientific material on **the topic related to the microbes in food and industry**. Details on the assignment & rubric will be posted by the start of the third module.

Learning objectives write-ups. Early in the term and at the end of the term you will be required to complete short writing assignments (no more than 1 page single-spaced) self-evaluating your strengths and weaknesses in each of the areas covered by the 4 modules. At the start of the course you will evaluate your knowledge coming in, describe how these knowledge and training areas fit into your longer term research and career goals, and the areas you are most excited to learn about, and identify your strategy for succeeding in the course. We will read a summary of the biology of learning, and the science of study strategies, as foundational context for this. At the end of the course, you will reflect on which areas you advanced your knowledge and in what ways, and what learning strategies worked for you.

IV. Academic integrity. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentaffairs.osu.edu/csc/

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu.

V. Communication: Students are responsible for announcements made in class, available on the course's Carmen site, or sent by e-mail. Late assignments will not be accepted without prearrangement with TA or instructor. Assignment due dates will be explicitly noted and followed, including turned in at the start of class or via Canvas at an assigned time.

VI. Athletes, religious creed, and other accommodations:
Check the course schedule and contact Dr. Rich & Dr. Sullivan over Carmen to arrange missed classes at least two weeks ahead of time.

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

ENVIRONMENTAL MICROBIOLOGY SYLLABUS

Date	Lead Instructor	Topic	Class notes	Items Due
MODULE 1: FOUNDATIONAL CONCEPTS & TOOLS				
W Aug 22	CS	Intro to eMicro	Guest lecture Dr. Christine Sun	Getting started: 1. Turn on Carmen notifications 2. Download & set up Socrative https://www.socrative.com/apps.html
F Aug 24	DV	Communities and sampling	In class diversity exercise led by TA Dean Vik	1. Do online Carmen entry "quiz" 2. Review exercise instructions on Carmen before class
W Aug 29	VR	Tree of life, phylogenetics, single-gene approaches		1. Review syllabus before class. 2. Complete "Learning objectives" write-up, assignment posted on Carmen.
F Aug 31	VR	Cultivation, microscopy, *in situ* physiological measurements		1. Read "Phylogeny Reading_2018" before class 2. *Optional reading*, recent NYTimes article on the birth of the 3 domains, and Carl Woese: https://www.nytimes.com/2018/08/13/magazine/evolution-gene-microbiology.html 3. Begin reading 2 metagenomics papers, posted on Carmen
W Sep 5	MS	Metagenomics & 'gene ecology'		Continue reading 2 metagenomics papers.
F Sep 7	MS	In-class paper review: 1st metagenomes	In class paper discussion	Come to class having answered your assigned paper Q, turned in on Canvas, & brought to class
W Sep 12	VR	Metatranscriptomics, -proteomics, and -metabolomics		**Assignments hereafter posted on Carmen, will be updated on syllabus as we go**
F Sep 14	MS	Sequencing methods and data analysis tools, MAGs, inferring metabolisms		
W Sep 19	VR	Experimental design in eMicro / Methods review		
F Sep 21	MS	Tools in viral ecology		
W Sep 26	MS/VR	**Exam #1**	**Exam #1**	**Exam #1**
MODULE 2: THE HUMAN HOLOBIONT				
F Sep 28	MS	Intro to Human microbiome		
W Oct 3	MS	Human microbiome: Gut and obesity		
F Oct 5	MS/VR	Human microbiome: Pathogens & therapeutics		
W Oct 10	MS/VR	Presentations Day 1	Presentations	
F Oct 12		Fall Break	NO CLASS	
W Oct 17	MS/VR	Presentations Day 2	Presentations	
F Oct 19	MS	Presentations Day 3	Presentations	
MODULE 3: ARCHITECTS OF THE BIOSPHERE				
W Oct 24	VR	Microbes & biogeochemical cycles, & redox		
F Oct 26	VR	Air microbiology		
W Oct 31	VR	Soil microbiology		Jess Greene's TED talk
F Nov 2	VR	Marine microbiology		
W Nov 7	VR	Extreme environments, Partnerships…	Design a microbe?	"nutritional interactions are fundamental to microbial community function" - Michiko Taga, UC Berkeley
F Nov 9	MS	Viruses in the environment		
W Nov 14	VR	**Exam #2**	**Exam #2**	**Exam #2**
MODULE 4: HUMAN-ENGINEERED MICROBIAL ENVIRONMENTS				
F Nov 16	VR	Microbes as key **allies** in food production: bread, beer		Anne Madsen's TED talk
W Nov 21		Thanksgiving	NO CLASS	
F Nov 23		Thanksgiving	NO CLASS	

W Nov 28	MS	Microbes as key **allies** in food production: cheese making		
F Nov 30	MS/VR	Poster session 1 – putting microbes to work: livestock, antibiotics, industrials…	Half the class presents posters, other half reviews	
W Dec 5	MS/VR	Poster session 2 – putting microbes to work	Class swaps	
		Final Thursday Dec 13 8:00am-9:45am		

Due to the dynamic nature of this class, this **syllabus is subject to revision as the semester proceeds**. Announcements will be made on Carmen. Students are responsible for being aware of any changes.