

## ENV H 452/542: Environmental & Occupational Health Microbiology II: Detection and Control of Environmentally Transmitted Pathogens

Winter 2022

### Contact information

**Instructor:** John Scott Meschke (*he, him*), Professor, DEOHS

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**Office hours:** By Appointment

### Teaching Assistants

**Ivy Terry (*she, her*):** [ivy2@uw.edu](mailto:ivy2@uw.edu), office hours by appointment

### Course times and locations

First week will be held online via zoom:

<https://washington.zoom.us/j/91796523481?pwd=T1pVRlM2aTBqQW40Q1JpckxPczRUdz09>

Starting January 10th, class will be held in person in SOCC 301.

**Course canvas site:** <https://canvas.uw.edu/courses/1515804>

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## LAND ACKNOWLEDGEMENT

The University of Washington acknowledges the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

## COVID-RELATED EXPECTATIONS

Per UW policy, this class will be conducted online in the first week of the quarter and in person beginning the second week. Therefore, unless you meet the criteria for an accommodation from Disability Resources for Students (DRS) or a special arrangement approved by the SPH Office of the Dean that allows you to take the course remotely [[see student communications here](#)] you should only register for this class if you can attend in-person.

- Please contact UW Disability Resources for Students (DRS) directly if you feel you may be eligible for an accommodation based on your status as an immunocompromised individual or based on other diagnosed physical or mental health conditions that might prevent you from being able to take classes in-person.
- If you are a student enrolled in a program in SPH, and you are either living with an individual who is immunocompromised, OR you are unable to obtain a visa to travel to the US, you may be eligible for a “special arrangement” that will allow you to take this course remotely. Requests for special arrangements to take the class remotely should have been submitted to and approved by the Students and Academic Services team in the Office of the Dean before the beginning of the quarter. If you have questions about this type of arrangement, please reach out to Student and Academic Services by email at [sphas@uw.edu](mailto:sphas@uw.edu).

All UW students are expected to complete their [vaccine attestation](#) before arriving on campus and to follow the campus-wide face-covering policy at all times. You are expected to follow state, local, and UW COVID-19 policies and recommendations. If you feel ill or exhibit possible COVID symptoms, you should not come to class. If you need to temporarily quarantine or isolate per CDC guidance and/or [campus policy](#), you are responsible for notifying your instructors as soon as possible by email. **If you receive a positive COVID-19 test result, you must report to campus Environmental Health & Safety (EH&S) by emailing [covidehc@uw.edu](mailto:covidehc@uw.edu) or calling 206-626-3344.**

**Food are not allowed in the classroom. Drinks may be sipped by lifting or removal of your facemask for a brief moment, and immediate re-masking after drinking.**

**Please check your email daily BEFORE coming to class.** If we need to conduct class remotely because the instructor is complying with UW policies and unable to attend in person, we will send all registered students an email with a Zoom link for remote instruction. Thank you for your patience and support as we all transition together back to in-person learning!

## COURSE DESCRIPTION

This course will review environmental detection and control of pathogenic organisms. The first half of the course will cover methods of sample collection, processing and target detection. The second half will examine methods of decontamination and disinfection, as well as other engineered controls for environmentally transmitted pathogens. This course will be of use for public health and health care professionals, microbiologists, civil and environmental engineers, environmental scientists and bio-defense specialists.

## COURSE LEARNING OBJECTIVES

At the conclusion of this class, students should be able to:

- Outline the various types of sampling plan and define their appropriate use;
- Describe and distinguish the major methods of sample collection and processing from various environmental media;
- Categorize the various methods to detect environmentally transmitted pathogens;
- Explain the advantages and disadvantages of each type of detection methods;
- Identify major approaches to control and prevent environmentally transmitted pathogens
- Distinguish between sterilization, disinfection, and preservation methods
- Identify different classes of disinfectants and explain disinfection kinetics
- Describe several methods to decontaminate infectious wastes and acceptable biosafety practices in the laboratory
- Summarize the importance of clinical hygiene and institutional infection control practices
- Explain the principles of a multi-barrier approach to controlling microbial hazards

ADDITIONAL GRADUATE COURSE OBJECTIVES: At the conclusion of this class, students in the graduate section (ENVH 542) should be able to:

- Formulate, plan and recommend a sampling/detection strategy for detection of a selected pathogen or other microbial hazard in a specific environmental medium.
- Propose and communicate a control plan for microbial hazards in a specific scenario
- Anticipate and assess obstacles or barriers to implementation of both the sampling/detection strategy and control plan.

## COUNCIL FOR EDUCATION OF PUBLIC HEALTH (CEPH) COMPETENCIES

N/a

## REQUIRED TEXTBOOKS & READINGS

The recommended text for this course is the Third Edition of Environmental Microbiology (Pepper, Gerba, and Gentry, Academic Press). Additional Readings and course materials will be available through the course webpage. The following texts and journals are recommended references for more in-depth detail on course topics:

### **Books-**

Manual of Environmental Microbiology, 4th edition, ASM Press

Disinfection, Sterilization and Preservation, 6th edition, LWW

Metcalf and Eddy's Wastewater Engineering: Treatment and Reuse, McGraw-Hill Water Quality and Treatment, 6th edition, AWWA

Bioaerosols Handbook, Lewis

### **Journals-**

Journal of Applied Microbiology Letters in Applied Microbiology

Applied and Environmental Microbiology Journal of American Water Works Association Journal of Water and Health

Journal of Food Protection

International Journal of Food Microbiology Water Science and Technology

Water Research Indoor Air

Emerging Infectious Disease

Journal of Clinical Microbiology

## GRADING

### **Graduate Students**

Introduction Video (5%): Each student is required to submit a 1-2-minute long introduction video. The video should indicate the student's name, what they like to be called, what degree program they are in, any experience they have that is relevant to the class, and what they hope to get out of the class.

Students that do not have the capacity to record a video (though most should on their phones) may submit a 1-2 page-long statement describing the same information. Videos/Statements will be due by the beginning of the third class period.

Quizzes (20%): Students will have the opportunity to complete 4 quizzes. Quizzes will be due at 5 pm on the day indicated in the course outline. Late quizzes may be penalized 10% of point value for each class period that they are late.

Midterm Exam (20%): Midterm exam will consist primarily of short answer questions, but may include multiple choice, and fill-in the blank questions as well. Exams will be conducted online. Exam will be open book and open note. Early or make-up exams will only be offered in case of emergencies or prior arrangement with instructor. Format for early and make-up exams will be left to the discretion of instructor.

Discussions (5%): Student may earn points by providing a posting to class discussion boards.

Sampling and Detection Strategy (10%): Students will prepare a 5-page report (including tables and figures, but not including references) detailing a sampling and detection strategy for a chosen microbiological hazard and environmental media. Reports should be single spaced. Students must get approval for hazard and media selection from TA.

Control Plan (20%): Graduate students will be expected to write and submit a detailed plan to control microbiological hazards in a specific scenario. Papers are expected to be as long as necessary to cover the topic, but should not exceed 10 pages of text single spaced (including tables and figures, but not including references). Additionally, students will be expected to present their plans in a 5-minute recorded video and respond to questions during a panel discussion in the last week of class. Students must get approval of microbiological hazard and scenario selection from TA.

Final Exam (20%): Final Exam will be offered on ONLINE during finals week. Final exam will be comprehensive and will consist of short answer multiple choice, true/false-explain, and problem solving questions. Exam will be open book and open note.

### **Undergraduate Students**

Introduction Video (5%): Each student is required to submit a 1-2-minute long introduction video. The video should indicate the students name, what they like to be called, what degree program they are in, any experience they have that is relevant to the class, and what they hope to get out of the class. Students that do not have the capacity to record a video (though most should on their phones) may submit a 1-2 page-long statement describing the same information. Videos/Statements will be due by the beginning of the third class period.

Quizzes (20%): Students will have the opportunity to complete 4 quizzes. Quizzes will be due at 5 pm on the day indicated in the course outline. Late quizzes may be penalized 10% of point value for each class period that they are late.

Midterm Exam (25%): Midterm exam will consist primarily of short answer questions, but may include multiple choice, and fill-in the blank questions as well. Exams will be conducted online. Exam will be open book and open note. Early or make-up exams will only be offered in case of emergencies or prior arrangement with instructor. Format for early and make-up exams is left to the discretion of instructor.

In the News and Discussions (15%): Student may earn points by providing an "In the News" article and a posting to class discussion boards.

Graduate Student Questions (10%): Undergraduates may earn points by watching graduate student control plan presentations and submitting a question for at least 5 of the presentations.

Final Exam (25%): Final Exam will be offered on ONLINE during finals week. Final exam will be comprehensive and will consist of short answer multiple choice, true/false-explain, and problem solving questions. Exam will be open book and open note.

### **Grading Criteria**

Grades will be assigned according to the point distribution below.

%	Gradepoint
>95%	4

94	3.9
93	3.8
92	3.7
91	3.6
90	3.5
89	3.4
88	3.3
87	3.2
86	3.1
85	3
84	2.9
83	2.8
82	2.7
81	2.6
80	2.5
79	2.4
78	2.3
77	2.2
76	2.1
75	2
74	1.9
73	1.8
72	1.7
71	1.6
70	1.5
69	1.4
68	1.3
67	1.2
66	1.1
65	1

### **Late assignment policy**

It is essential that assignments are turned in on time to facilitate grading in a timely manner. Late assignments without prior approval may be penalized 10% per class period late.

### **Student responsibilities**

Students are expected to arrive on time and be ready to start right at 9:30 AM.

If students must miss a class due to illness, the instructors should be notified as soon as possible. Students should notify instructors of any other absence in advance to discuss possibility of make up work.

Students are expected to come to class prepared (keep up with the readings and video lectures).

Above all, ask questions.

## COURSE SESSION SCHEDULE

	Date	Discussion Topic	Instructor	Recorded Lectures		Due
M	January 3rd	Introduction/Sampling of Environmental Media	Meschke			
<b>Module 1 - Sampling</b>						
W	January 5th	Discussion: Sampling Purpose and Plans	Meschke	Sampling Plans	Meschke	
F	January 7th	Discussion: Sampling Method Performance and Controls	Meschke	Sampling of Food	Meschke	Introductory videos
M	January 10th	Discussion: Sampling Logistics	Meschke	Sampling for Bioaerosols	Meschke	
W	January 12th	Case Study: Beach Sampling	Meschke	Sampling of Surfaces	Meschke	
F	January 14th	Case Study: Bioaerosol Sampling	Meschke	Sampling of Waterborne Microbes	Meschke	Quiz 1
M	January 17th	Holiday-MLK Day- <b>NO CLASS</b>				
W	January 19th	Case Study: Wastewater Surveillance	Meschke			
F	January 21nd	Drop in Office Hours	Meschke/Terry			GS: Hazard and Media Selection
<b>Module 2 - Detection and Characterization</b>						
M	January 24th	Discussion: Rapid Antigen Tests	Meschke	Microscopy/Immunoassays	TBD	
W	January 26th	Discussion: Methods of Quantification	Meschke	Culture/Biochemical Assays	TBD	
F	January 28th	Discussion: Understanding the Results	Meschke	Molecular Methods of Detection	TBD	Quiz 2
M	January 31st	Guest Lecture: Sequence Analysis	Beck	High Throughput Sequencing Methods	TBD	GS: Sampling/Detection Plan
W	February 2nd	Case Study: Sequencing of Variants from Wastewater	Meschke			
F	February 4th	Drop in Office Hours	Meschke			<b>Midterm Exam</b>
<b>Module 3 - Personal Controls</b>						
M	February 7th	Discussion: Covid-19 Vaccines and Treatments	Meschke	Antimicrobial Use/Vaccination	TBD	
W	February 9th	Case Study: Hand Hygiene Shortages	Meschke	Handwashing/Antisepsis	TBD	
F	February 11th	Case Study: Respiratory PPE	Meschke	PPE	TBD	
<b>Module 4 - Disinfection</b>						
M	February 14th	Discussion: Disinfection Testing and Labeling	Meschke	Principle of Disinfection, sterilization and Preservation	Meschke	
W	February 16th	Discussion: The "N-list"	Meschke	Disinfection Classes (Chemical and Physical)	Meschke	GS: Hazard and Scenario Selection
F	February 18th	Case study: Disinfectant Mists and Fogs	Meschke	Kinetics of Disinfection	Meschke	Quiz 3
M	February 21st	Holiday-President's Day- <b>NO CLASS</b>		Decontamination of Infectious Wastes	Meschke	
<b>Module 5 - Media Specific Controls</b>						
W	February 23rd	Discussion: Multibarrier Controls for Water	Meschke	Water and Wastewater Treatment	Meschke	
F	February 25th	Case Study: Water Reuse	Meschke	HVAC Controls/Filtration of Air/BSCs	Meschke	
M	February 28th	Discussion: Snake Oil -Air Cleaners	Meschke	Household and Public Surfaces	Meschke	
W	March 2nd	Discussion: Disinfectants in our Food?	Meschke	Control and Prevention of Foodborne Disease	Meschke	GS: Control Plan Videos
F	March 4th	Case Study: PCR Product Contamination	Meschke	Clinical Hygiene/Institutional Infection Control	Meschke	Quiz 4
M	March 7th	Case Study: Facility Controls	Meschke	Laboratory Design/Biosafety Practices	Meschke	
W	March 9th	<i>Graduate Student Panel</i>	Meschke			
F	March 11th	Drop in Office Hours/Course Review	Terry			GS: Control Plan Reports
	March 14th-17th	<b>Final Exam</b>				Final Exam

### Communication Skills

Communication through writing and speaking is an important transferable skill for all career pathways. Establishing a strong foundation in communication skills will help you be successful throughout your future course work and career. Therefore, this course includes assignments with the goal to help you identify areas of strength and improvement in your communication. If you feel that you could benefit from additional opportunities to improve your writing skills in particular, a list of resources at the UW and others accessible online can be found on the SPH website

at <https://sph.washington.edu/sites/default/files/inline-files/Writing-Resources-4.3.19.pdf>.

### IMPORTANT POLICIES & RESOURCES

#### Academic Integrity

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity.

The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington [Student Conduct Code \(WAC 478-121\)](#). We expect you to know and follow the university's policies on cheating and plagiarism, and the [SPH Academic Integrity Policy](#). Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington [Community Standards and Student Conduct](#).

### **Access and Accommodations**

Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at [disability.uw.edu](http://disability.uw.edu).

### **Religious Accommodations**

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy \(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/\)](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form \(https://registrar.washington.edu/students/religious-accommodations-request/\)](https://registrar.washington.edu/students/religious-accommodations-request/).

### **Inclusion & Diversity**

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, we are expected:

1. To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
2. To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
3. To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program's director.



## Classroom Climate

We are co-creators of our learning environment. It is our collective responsibility to develop a supportive learning environment for everyone. Listening with respect and an open mind, striving to understand others' views, and articulating your own point of view will help foster the creation of this environment. We engage our differences with the intent to build community, not to put down the other and distance our self from the other. Being mindful to not monopolize discussion and/or interrupt others will also help foster a dialogic environment.

**The following guidelines can add to the richness of our discussion:**

- We assume that persons are always doing the best that they can, including the persons in this learning environment.
- We acknowledge that systematic oppression exists based on privileged positions and specific to race, gender, class, religion, sexual orientation, and other social variables and identities.
- We posit that assigning blame to persons in socially marginal positions is counter-productive to our practice. We can learn much about the dominant culture by looking at how it constructs the lives of those on its social margins.
- While we may question or take issue with another class member's ideology, we will not demean, devalue, or attempt to humiliate another person based on her/his experiences, value system, or construction of meaning.
- We have a professional obligation to actively challenge myths and stereotypes about our own groups and other groups so we can break down the walls that prohibit group cooperation and growth.

[Adapted from Lynn Weber Cannon (1990). Fostering positive race, class and gender dynamics in the classroom. *Women Studies Quarterly*, 1 & 2, 126-134.]

We are a learning community. As such, we are expected to engage with difference. Part of functioning as a learning community is to engage in dialogue in respectful ways that supports learning for all of us and that holds us accountable to each other. Our learning community asks us to trust and take risks in being vulnerable.

**Here are some guidelines that we try to use in our learning process:**

- LISTEN WELL and be present to each member of our group and class.
- Assume that I might miss things others see and see things others miss.
- Raise my views in such a way that I encourage others to raise theirs.
- Inquire into others' views while inviting them to inquire into mine.
- Extend the same listening to others I would wish them to extend to me.
- Surface my feelings in such a way that I make it easier for others to surface theirs.
- Regard my views as a perspective onto the world, not the world itself.
- Beware of either-or thinking.
- Beware of my assumptions of others and their motivations.
- Test my assumptions about how and why people say or do things.
- Be authentic in my engagement with all members of our class.

## Pronouns

We share our pronouns because we strive to cultivate an inclusive environment where people of all genders feel safe and respected. We cannot assume we know someone's gender just by looking at them. So we invite everyone to share their pronouns.

### **Bias Concerns**

The Office of the Dean has a [student concern policy](#), a faculty concern policy and standard HR procedures for staff concerns. Our 2018 climate survey states that most people in SPH do not report bias incidents because they do not know where to go. Students are encouraged to report any incidents of bias to someone they feel comfortable with, including instructors, advisers or department staff. They can email [dcinfo@uw.edu](mailto:dcinfo@uw.edu) for immediate follow up. Bias concerns can be anonymously and confidentially reported at this link <https://sph.washington.edu/about/diversity/bias-concerns>. Data is collected by the Assistant Dean for EDI and the Director of Program Operations for Student and Academic Services and tracked for resolution and areas are identified for further training.

### **Sexual Harassment**

Sexual harassment is a form of harassment based on the recipient's sex that is characterized by:

1. Unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature by a person who has authority over the recipient when:
  - Submission to such conduct is an implicit or explicit condition of the individual's employment, academic status, or ability to use University facilities and services, or
  - Submission to or rejection of the conduct affects tangible aspects of the individual's employment, academic status, or use of University facilities.
2. Unwelcome and unsolicited language or conduct that creates an intimidating, hostile, or offensive working or learning environment, or has the purpose or effect of unreasonably interfering with an individual's academic or work performance.

If you believe that you are being harassed, or have observed harassment, you can report it to SPH using the [bias concerns link](#). The University also has designated offices to help you: [SafeCampus](#); [Office of the Ombud](#); [Title IX Investigation Office](#); and [University Complaint Investigation and Resolution Office](#).