

# ENVH 409/509 Microbiome And Environmental Health

Spring 2022

## CONTACT INFORMATION

**Instructors:** Roger Bumgarner, Associate Professor, Department of Microbiology  
Jerry Gangelosi, Professor Env. and Occ. Health Sciences

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**Office hours:** By appointment over Zoom, arranged via email

## Teaching Assistants

N/A

## Course times and locations

**Lecture:** T/Th, 2:30-3:50 Genome Sciences ([GNOM](#)) S060

## 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 in person. You should only register for this class if you can attend in person, or if 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.

- 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. To further clarify, immunocompromised refers to individuals with no/critically weakened immune response to the vaccines. Immune compromised is not the same as underlying health concerns which may lead to a more severe response to COVID. 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.

All UW students are expected to complete their [vaccine attestation](#) before arriving on campus. [Per President Cauce’s message March 8,](#) following changes to state and local health policies, masks will become optional inside most University facilities starting March 28, the first day of spring quarter. Masks

will continue to be required in clinical and other health-care settings and on public transportation, including UW shuttles. We strongly recommend wearing masks indoors during the first two weeks of spring quarter. Please monitor yourself daily for symptoms and stay home if you are sick. It's also strongly recommended to get tested after travel. Refer to the [UW Face Covering Policy](#) for the latest guidance and 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 206-616-3344.**

**Please check your email daily BEFORE coming to class.** If we need to conduct class remotely because the instructor or a guest speaker 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.

## COURSE DESCRIPTION

This course will present and review the current science behind understanding microbiome impacts on environmental public health. The course will define human, animal, and environmental microbiomes; describe the methods used to characterize these microbiomes, and discuss the impact of microbiomes on the health and well-being of human and animal populations. The course will also examine factors that have been suggested to modulate microbial populations, host-microbe interactions, and the dynamics of microbiome populations. This course will be of use to public health and health care professionals, microbiologists, civil and environmental engineers, environmental scientists, and those generally interested in understanding the health relevance of news reports on the microbiome.

## COURSE LEARNING OBJECTIVES

After completing this course, both undergraduate (409) and graduate (509) students will be able to will be able to:

- Recognize and differentiate the composition of human and environmental microbiomes;
- Discuss potential interactions between microbiomes;
- Describe the role of sampling in microbiome studies;
- Compare and contrast DNA/RNA sequencing approaches to characterize a microbiome;
- Discuss bioinformatics approaches to characterizing microbiome and metagenome sequence data;
- Explain the importance of metadata associated with a published microbiome;
- Recognize and list functional roles of microbiome in a state of good health and well-being for humans;
- Outline host-microbiome interactions and functional roles that impact health;

- Identify and characterize specific disease states (chronic, environmental, and infectious disease) associated with microbiome composition or function;
- Evaluate the weight of evidence to support connections between microbiome and health;
- Identify and categorize intrinsic and extrinsic factors that modulate a microbiome;
- Diagram the relationships between host, microbiome, and environmental factors.

In addition, graduate students (509) will be able to:

- Critically assess and evaluate the literature on a topic of interest relevant to the course.
- Synthesize the available research on a microbiome-related topic and develop a comprehensive review for a scientifically literate audience.

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

N/A

## REQUIRED TEXTBOOKS & READINGS

There is no required text book. Readings and course materials will be drawn from current research and new materials. All readings will be made available through the Canvas course site or handed out in class.

## GRADING

Points will be available according to the following percentage breakdown:

| Grading category                  | ENVH 409 | ENVH 509 |
|-----------------------------------|----------|----------|
| Reading and lecture comprehension | 20%      | 10%      |
| Quizzes                           | 70%      | 60%      |
| Class participation               | 10%      | 10%      |
| Critical review                   | N/A      | 20%      |
| Total                             | 100%     | 100%     |

Reading and lecture comprehension: This score will be comprised of grades on from a weekly assignment in which students are required to submit a multiple choice question that is based on the readings or lectures for that week.

There will be 5 bi-weekly quizzes consisting of ~ 5 questions/lecture.

Class participation is measured via PollEverywhere questions during lecture and class activities/discussions posted on Canvas.

Students registered for 509 will have the opportunity to complete an in-depth (but focused), critical review of the literature on a specific topic relevant to the course.

- Topics must be approved by the instructors.
- The review will consist of a 10-page (single spaced, 10 pt Ariel font, 1/2 inch margins) manuscript on the chosen topic. Critical Reviews should show synthesis and evaluation of the peer reviewed literature.
- Manuscripts must be formatted consistent with the Applied and Environmental Microbiology instructions for authors for a minireview (<http://aem.asm.org/site/misc/ifora.xhtml>).

**GRADING SCALE:** Numerical grades will typically be distributed according to the following scale:

| %   | GP  | %   | GP  | %   | GP  |
|-----|-----|-----|-----|-----|-----|
| 96% | 4   | 86% | 3   | 76% | 2   |
| 95% | 3.9 | 85% | 2.9 | 75% | 1.9 |
| 94% | 3.8 | 84% | 2.8 | 74% | 1.8 |
| 93% | 3.7 | 83% | 2.7 | 73% | 1.7 |
| 92% | 3.6 | 82% | 2.6 | 72% | 1.6 |
| 91% | 3.5 | 81% | 2.5 | 71% | 1.5 |
| 90% | 3.4 | 80% | 2.4 | 70% | 1.4 |
| 89% | 3.3 | 79% | 2.3 | 69% | 1.3 |
| 88% | 3.2 | 78% | 2.2 | 68% | 1.2 |
| 87% | 3.1 | 77% | 2.1 | 67% | 1.1 |
|     |     |     |     | 66% | 1   |

It is expected that most students will perform at a level of ~3.5.

### **Grading Criteria**

#### **Late assignment policy**

Late assignments are accepted but may be penalized 10% for each day late. Late penalties can be waived due to illness or at the discretion of the instructors.

### **Student responsibilities:**

1. Come to class, please try to let us know ahead of time if you cannot make it.
2. Arrive on time.
3. Turn in assignments on time.
4. Come to class prepared (keep up with reading).
5. Be courteous (no newspapers, no audible personal electronic devices).
6. Food and drinks are welcome (but keep it quiet).
7. Refrain from unnecessary talking.
8. ASK QUESTIONS.
9. Try to remain awake (at least no snoring please).
10. Let us know how I am doing. If we are moving too fast, not being clear, or otherwise not getting the message across, we need to know.

## COURSE SESSION SCHEDULE (SUBJECT TO REVISION)

Include dates of class meetings and corresponding topics, preparatory work, instructor (if multiple for class), due dates, etc.

| Date   | Topic  | Instructor           |
|--|--|----------------------|
| <b>Module 1: What is a microbiome?</b>                 |  |                      |
| Tue. 3/29  | Introduction to the course and the human microbiome  | Bumgarner, Cangelosi |
| Thur. 3/31   | Introduction to the human microbiome   | Cangelosi            |
| Tues. 4/5  | Environmental Microbiomes  | Cangelosi            |
| <b>Module 2: How to characterize a microbiome</b>      |  |                      |
| Thur. 4/7  | PCR and DNA sequencing   | Bumgarner            |
| <i>Mon. 4/11 – Quiz #1 covering lectures 1-4</i>       |  |                      |
| Tues. 4/12   | Sequencing targets and transcriptomes  | Bumgarner            |
| Thur. 4/14   | Study design, sampling and sample processing   | Bumgarner            |
| Tues. 4/19   | 16S and downstream analysis methods  | Bumgarner            |
| Thur 4/21  | Interpreting shotgun metagenomics data   | Bumgarner            |
| <b>Module 3: Role of Microbiomes in human health</b>   |  |                      |
| <i>Mon. 4/25 – Quiz #2 covering lectures 5-8</i>       |  |                      |
| Tues. 4/26   | Establishment, changes and stability of the human microbiome                                   | Bumgarner            |
| Thur. 4/28   | Direct health effects - gut microbiome   | Cangelosi            |
| Tues. 5/3  | Diet, nutrition, and microbiome  | Lampe                |
| Thur. 5/5  | The vaginal microbiome   | Fredricks            |
| <i>Mon. 5/9 – Quiz #3 covering lectures 9-12</i>       |  |                      |
| Tues. 5/10   | The gut microbiome and enteric disease   | Levy                 |
| Thur. 5/12   | The oral microbiome  | Mc Lean              |
| Tues 5/17  | The skin microbiome  | Bumgarner            |
| Thurs 5/19   | Pharmaceutic and Xenobiotic metabolism   | Cui                  |
| <i>Mon. 5/23 – Quiz #4 covering lectures 13-16</i>     |  |                      |
| <b>Module 4: What factors modulate the microbiome?</b> |  |                      |
| Tues. 5/24   | Host factors and genetics  | Cangelosi            |
| Thur. 5/26   | Indirect health effects - Behavioral, Neurological, and Mental Illness                         | Cangelosi            |
| Tues 5/31  | Impacts of global environmental change   | Cangeloso            |
| Thur. 6/2  | No class meeting use this time to prepare for Monday's quiz. Review/office hours are available | Bumgarner/Cangelosi  |
| <i>Mon. 6/6 - Quiz #5 Covering lectures 17-19</i>      |  |                      |
| <i>Wed. 6/8 – 509 students – review paper is due</i>   |  |                      |

## **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 via the online form found here: <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](#).