

# UO Honors College 441H/431H: Microbes and Social Equity.

**Instructor: Dr. Sue Ishaq**

**Summer 2019**

## **Course Objectives:**

1. Introduce basic concepts of microbial ecology.
2. Review current literature on select topics on how humans influence microbial communities on ourselves, in environmental systems, and in the built environment.
3. Learn to review/critique scientific journal articles, distill findings while understanding limitations, and develop science communication skills via written assignments and in-class discussions.
4. The major initiative in the class will be a perspective piece intended for publication in a scientific journal, collaboratively written by students and the instructor.

**Class format:** In-class lectures will be used to introduce background information and basic concepts, largely in the first half of the class period, followed by guided (and graded) discussions.

**Readings:** All reading material will be provided as journal articles. Except where noted, students may skip the “Methods” sections. Concept checks provide basic background information for students and are optional (see end of syllabus).

**Assignments:** All assignments are available through Canvas. Homework will be assigned regularly and may be submitted online or in class. These will include written essays/discussion, article reviews, drawn concept network maps. All of the assignments will be used to create portions of the final project.

## **Final Project:**

Group version: The final objective for this course is for students and the instructor to co-author a manuscript with the intent to submit it to a scientific journal for publication. The manuscript will be a scientific literature review of relevant information on previous studies, as well as perspective based on discussions in class.

Each student who participates will be graded on a stand-alone portion writing during previous assignments, as well as for their review of other student’s work, and for their contributions/efforts to the collaborative paper which will incorporate all student contributions. Students who opt for this final project will be main authors on this publication, and the instructor will be last author. Submission to a journal for review will be performed by the instructor on the last day of class, once all contributing authors have agreed to the final version. The students will not be responsible for paying any costs associated with publishing. The students are required to supply an email address at which they can be contacted up to 6 months after the conclusion of the class to allow time for manuscript review. The students will not be required to perform any revisions after the conclusion of the class, but they must be reachable to approve any final version of the manuscript for publication.

Solo version: Students may opt not to participate in authoring the group paper, and instead submit their final project as a separate entity, with no penalty or difference in grading scale. The solo submission will not be used towards the group paper, and students may not choose to contribute to the group paper once the final project has been submitted. Students may use material they generated in assignments, but you may not submit it these in the exact same version – you will need to rewrite them in some way. Students will be graded on the quality of information and the effectiveness of their communication.

**Grading:** Discussion in class: 15pts, Homework: 50pts, Final Project: 35pts

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## Lecture Schedule:

Date	No.	Title, Objective, Assignments
M 6/24	Intro	Introduction to the course, explanation of the syllabus, expectations, course materials.
Introduction to Microbial Ecology Theory and Technology		
M 6/24	# 1	<i>"Intro to microbial communities"</i> An overview on different microorganisms, what it means to be a mammal, and microbiomes. ➤ <b>Reading:</b> Gilbert_2014_life in a world without microbes ➤ <b>Assignment (4 pts):</b> What is plagiarism? Due 6/25
T 6/25	# 2	<i>"A brief history of microbial technologies"</i> Three-hundred years of microbial theory and technology in one hour. ➤ <b>Discussion:</b> role of scientists in communicating science ➤ <b>Reading:</b> Robinson_2010_structure to function in HAM ➤ <b>Assignment (4 pts):</b> Different types of scientific writing. Due 6/26
Host-Associated Ecosystems		
W 6/26	# 3	<i>"Vaginal microbiome, pregnancy, birth mode"</i> The vaginal microbial community during pregnancy, the effect of birth method on the developing microbiome of infants, and effect of socioeconomic status on prenatal care. ➤ <b>Reading (pick 2):</b> <ul style="list-style-type: none"><li>○ Milcent_2018_prenatal care, socioeconomic, c-section</li><li>○ Mueller_2015_birth mode, maternal weight, gut microbes</li><li>○ Neu_2011_birth mode hygiene hypothesis</li><li>○ Rautava_2012_pregnancy_colonization_disease</li><li>○ Sandall_2018_birth mode and health outcomes</li></ul>
R 6/27	# 4	<i>"Breastmilk and the development of the neonate GI microbiome."</i> ➤ <b>Discussion:</b> should we rethink prenatal care? ➤ <b>Reading (pick 2):</b> <ul style="list-style-type: none"><li>○ Ballard_2013_human milk composition</li><li>○ Moossavi_2019_breastmilk_pumps</li><li>○ Parnanen_2018_breastmilk and AMR</li><li>○ Toscano_2017_breastmilk microbes and neonatal immune development</li></ul> ➤ <b>Assignment (12 pts):</b> Write a minimum 1-page, single-spaced essay on the importance of maternal microbes on offspring health and why this is a public health/social equity issue. Due 7/1. Include > 3 citations, and line numbers. You may choose any relevant, credible scientific article, review, or reference.
M 7/1	# 5	<i>"Effect of diet on the gut microbiome"</i> ➤ <b>Discussion:</b> Do we have the right to tell people what to eat? ➤ <b>Reading (pick 1):</b> <ul style="list-style-type: none"><li>○ Krajmalnik-Brown_2012_gut microbes nutrient harvesting</li><li>○ Singh_2017_influence of diet</li><li>○ Telle-Hansen_2018_diet and inflammation</li><li>○ Valdes_2018_diet and health</li></ul> ➤ <b>Assignment (3 pts):</b> Peer-review of someone else's essay. <b>Due 7/3.</b>
T 7/2	# 6	<i>"Diet and health"</i> With guest speaker Dr. Deb Johnson-Shelton (pending), presenting on obesity and schools ➤ <b>Discussion:</b> Food availability, public policy, and public health

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		<p>➤ <b>Reading (pick 2):</b></p> <ul style="list-style-type: none"> <li>○ Davis_2016_gut microbiota and obesity</li> <li>○ Masangcay 2005 student lunch and graduation</li> <li>○ Menni_2018_microbes and arterial stiffness in women</li> <li>○ Zhao_2019_fiber and diabetes</li> </ul>
W 7/3	# 7	<p>“<i>Gut-brain axis</i>” With guest speaker Britt Gratreak (skype in), presenting on gut diversity and health in the homeless</p> <p>➤ <b>Reading (pick 1):</b></p> <ul style="list-style-type: none"> <li>○ Liang_2018_gut brain rethinking psychology</li> <li>○ Valles-Colomer_2019_neuroactive potential of gut microbiota</li> <li>○ Zheng_2019_gut microbes and schizophrenia</li> </ul> <p>➤ <b>Discussion:</b> Do we need to remove the distinction between physical health and mental health?</p>
R 7/4	# 8	<p>“<i>The loss of microbial diversity</i>” Loss of diversity in microbial diversity can be detrimental to hosts or natural ecosystems. Focus on low quality diet and problems for the host, and urbanization and loss of biodiversity.</p> <p>➤ <b>Discussion:</b> Do we have a right to microbes?</p> <p>➤ <b>Reading (pick 1):</b></p> <ul style="list-style-type: none"> <li>○ Bloomfield_perspective on allergy</li> <li>○ Clayton_2016_captivity primate microbiome</li> <li>○ Moeller_2014_human gut microbiome</li> <li>○ Morar_2019_concept of microbiome</li> <li>○ Scudellari_2017_cleaning up hygiene hypothesis</li> </ul> <p>➤ <b>Assignment (12 pts):</b> Write a minimum 1-page, single-spaced essay on the importance of microbes and gut health and why this is a public health/social equity issue. Due 7/8. Include &gt; 3 citations, and line numbers. You may choose any relevant, credible scientific article, review, or reference.</p>
actual		<p>“<i>The loss of microbial diversity</i>” Watch the pre-recorded lecture discussing: Loss of diversity in microbial diversity can be detrimental to hosts or natural ecosystems. Focus on low quality diet and problems for the host, and urbanization and loss of biodiversity.</p> <p>➤ <b>Reading (pick 1):</b></p> <ul style="list-style-type: none"> <li>○ Clayton_2016_captivity primate microbiome</li> <li>○ Moeller_2014_human gut microbiome</li> <li>○ Scudellari_2017_cleaning up hygiene hypothesis</li> <li>○ 8_Morar_2019_concept of microbiome</li> </ul> <p><b>Assignment (12 pts):</b> Write a minimum 1-page, single-spaced essay on the importance of microbes and gut health and why this is a public health/social equity issue. Due 7/8. Include &gt; 3 citations, and line numbers. You may choose any relevant, credible scientific article, review, or reference.</p>
Natural and Built Environments		
M 7/8	# 9	<p>“<i>Humans and microbiology of the built environment</i>” Indoor microbiology, and prisons.</p> <p>➤ <b>Discussion:</b> public spaces and enforced occupancy</p> <p>➤ <b>Reading (pick 2):</b></p>

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		<ul style="list-style-type: none"> <li>○ Bick_2007_infection control prisons</li> <li>○ Hajat_2015_smog and socioeconomics</li> <li>○ Huttenen_2016 IAQ and student immune rxn</li> <li>○ Rossen_2012_zoning and health</li> <li>○ Tessum_2019_air pollution and racial inequity</li> <li>○ Wilson_2008_zoning and injustice</li> </ul> <p>➤ <b>Assignment (3 pts):</b> Peer-review of someone else's essay. Due 7/10.</p>
T 7/9	# 10	<p><i>"Access to natural environments and their microbes"</i></p> <p>A look at how environmental microbial diversity influences health, air quality, and how to improve our environmental microbial exposures.</p> <p>➤ <b>Discussion:</b> access to natural environments and their microbes</p> <p>➤ <b>Reading (pick 1):</b></p> <ul style="list-style-type: none"> <li>○ Ege_2011_env microbes and childhood asthma</li> <li>○ Ideno_2017_forest bathing</li> <li>○ Jatzlauk_2017_env microbes and asthma</li> <li>○ Leong_2018_biodiversity and socioeconomics</li> <li>○ Mills_2019_urban biodiversity and health</li> </ul>
W 7/10	# 11	<p><i>"Microbes, space, and equity"</i></p> <p>With guest speaker Elle Stapleton (confirmed for 7/10), presenting on how spatial distributions of environmental risks and amenities can help us understand equity and justice in landscape planning</p> <p><i>"Forest bathing"</i></p> <p>With guest speaker Dr. Gwynne Mhuireach (confirmed), presenting on forest bathing.</p> <p>➤ <b>Discussion:</b> Zoning, air and water quality, equity. Should companies be held accountable for antimicrobial resistance in the way that they are for oil or chemical spills?</p> <p>➤ <b>Readings (pick 1):</b></p> <ul style="list-style-type: none"> <li>○ Allaire_2018_drinking water violations</li> <li>○ Kumpel_2016_intermittent water supply</li> <li>○ Pandey_2014_Contamination Water Resources</li> <li>○ Stillo_2017_contaminated water health disparities</li> </ul>
R 7/11	# 12	<p><i>"Do we have a right to microbes?"</i></p> <p>A short presentation and discussion on rights to microbes, right to own microbes, microbes and social equity.</p> <p>In class, students will divide up into teams based on their chosen area of focus for the final paper: Diet, Developing Immune System, Vertical transmission, Water, Air, Built Environment.</p> <p>➤ <b>Readings (pick 1):</b></p> <ul style="list-style-type: none"> <li>○ Bjorkman_2006_bodily rights</li> <li>○ Hawkins_2011_who owns your poop</li> </ul> <p><b>Assignment (12 pts):</b> Write a minimum 3/4-page, single-spaced essay on the importance of microbes in urban systems and why this is a public health/social equity issue. <b>Sunday 7/14 at 10 am.</b> Include &gt; 3 citations, and line numbers. You may choose any relevant, credible scientific article, review, or reference.</p>
M 7/15	# 13	<p>In-class writing session in which we create an outline and discuss what we want the flow to be, based on things we've written.</p>

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T 7/16	#14	Class presentations and discussions ➤ <b>Reminder, draft essay due 5 pm tomorrow.</b>
W 7/17	# 15	In-class writing session in which we work on our written group essays. ➤ <b>Reminder, draft essay due 5 pm today.</b>
R 7/18	# 16	In-class writing session in which we combine our group essays into a single manuscript. <b>Final project (10 pts):</b> review and edit the combined manuscript which will be available as a google doc. Make edits in suggestion mode. All edits must be completed by <b>end of day 7/19.</b> Instructor will submit to a journal on 7/20.

**Concept check materials** – provided as basic background. Students are encouraged to review these as needed.

1. What is DNA, video (6 min): <https://www.youtube.com/watch?v=zwiBgNGe4aY>
2. “What are microbes?” (2min): <https://www.youtube.com/watch?v=Vj0cIgwPQI>
3. How the digestive tract works: <https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works>
4. History of microbial ecology (lecture): IMM\_2\_microbial\_ecology\_2019
5. Discovering DNA, related technology (lecture): IMM\_3\_DNAtechnology\_2018
6. DNA sequencing (lecture): IMM\_4\_Seq\_Technology\_2018\_CHCversion
7. Phylogeny (lecture): IMM\_5\_phylogeny\_diversity\_2018\_CHCversion
8. Vaginal microbiome (lecture): IMM\_17\_vaginal\_microbiome\_2019