The Ohio State University College of Public Health
PUBHEHS 6320 (FDSTE 6320) – Global Health and Environmental Microbiology
3 credit hours – Autumn, 2017

Instructor: Jiyoungh Lee, PhD
Associate Professor
Division of Environmental Health Sciences
Department of Food Science & Technology

Office location: 406 Cunz Hall
1841 Neil Avenue
(phone) 292-5546

E-mail: lee.3598@osu.edu

Class Time and Location: M 2:15-5:00 pm at PAES A105

Instructor’s Office Hours: Email or call to schedule an appointment

TA Name, email, and office hours:
Igor Mrdjen, EHS PhD student
Office: Cunz Hall 400B
Email: mrdjen.1@buckeyemail.osu.edu
Office hours: by appointment

TA responsibilities: The TA assigned to the course will hold regular office hours and answer questions from students who need help with class material. The TA may assist with scoring homework and exams; however, final grades will be assigned by the professor. Any questions regarding grading should be directed to the professor and not the TA.

Portal description: Fundamentals and emerging issues of health significant microorganism (bacteria, viruses, protozoa) from water, air, soil and food, and their sources, transmission routes, treatments, detection methods, and study tools.

Course description: This course covers important topics in environmental microbiology with a perspective on global health. The lectures are designed to provide understanding about microbial pathogens originated from various sources of contamination and their transmission pathways in water, air, soil and food. This course will also cover environmental applications of molecular technology and other advanced tools. Emerging issues, such as health implications of nanotechnology, renewable energy, climate change and infectious disease, urban microbiology, and food safety will give insight for future environmental health concerns.

Class Format: This course is lecture-based. Small group discussions and brief presentations are incorporated throughout the course.

Course Objectives: After successfully completing the course, students will be able to:

1. Summarize an overview of the impact of microbial environmental contamination on human health
2. List water and wastewater sources of microbial contamination and associated diseases
3. List the common indicator organisms and federal guidelines about drinking water quality and
recreational water quality
4. Explain pathways of microbial transmission via water, air and food that are important in developed and developing countries
5. Outline sample collection and processing methods for the detection of bacteria, virus, and protozoa
6. Explain the molecular biological techniques and other emerging technologies for detecting microbial pathogens in environmental matrices
7. Explain key aspects of the beneficial use of microbes for energy production and a clean environment

Competencies in EHS for MPH students in EHS:
1. Outline the health threat that natural and anthropogenic contaminants in the environment can pose to population health.
2. Compare the fate, transport, and human uptake of chemical and biological agents.
3. Explain the physiological factors that influence human exposure and the uptake of chemical and biological environmental agents.
4. Identify and explain individual (e.g., genetic, physiologic and psychosocial) and community (social, built, economic, race) susceptibility factors that heighten the risk for populations for adverse health outcomes from environmental hazards.
5. Summarize the underlying mechanisms of toxicity resulting from exposure to environmental agents.
6. Describe federal and state regulatory programs, guidelines and authorities relevant to environmental and occupational health.
7. Access state, federal, and local resources for assessing environmental and occupational health.
8. Work with other public health disciplines (e.g., nurses, physicians, veterinarians, epidemiologists, biostatisticians) to address environmental and occupational health concerns.
9. Compare the principle components and influencing factors in the exposure continuum from source to disease.

Prerequisite: Microbiology 4000 or permission from the instructor


Grading:  
Class attendance 5%  
Homework (seminar summary) 5%  
Group discussion and participation 10%  
Exams 40%  
Term paper 30%  
Term paper presentation 10%

Term papers and presentation:  
Topics should be about environmental microbiology related to global health. The format is a student research competition proposal (e.g. NSF graduate fellowship, OARDC graduate students SEEDS). Term paper is due one week before the presentation. The term paper should start with a cover page that has the title of the project, the student’s name, email address, and department. In 200 words or less, provide an abstract describing your project. The project description should contain following components: 1) introduction that clearly introduces the topic of the project and why this work is important and how it will improve human health. Outline the goals and objectives of the project and the expected outcome; 2) rationale and significance that clearly states the justification behind the project, clarify the knowledge gap; 3) research methods that define problems and research questions, and describe approach and study design. It must include literature review and accurate citations. Pitfalls or limitations of the proposed research should be included. It should be with 1-inch margins in Microsoft
Word and 12-point font size. It has a 5-page limit. Budget is optional. Reference is not included in the page limit. Each person’s CV should be attached (1-page limit). The CV is not counted toward the 5-page limit. Everything should be combined in one file. The grade on the presentation is based upon showing full understanding about the chosen topic, critical and logical thinking, answering questions, and effective presenting skills. PowerPoint slides are required for 15 min presentation. Each person in the team should contribute equally and each role should be mentioned during the presentation.

Exams:
Four exams will be given in-class. They will test knowledge of basic concepts in a multiple choice, true/false, and short answer format. All the exams should be solo work and discussion with someone else is not permitted.

Homework:
Attend two seminars that are relevant to ‘environmental microbiology and health’ during the fall semester. Submit 1-page summary within one week of your attending. The summary should have two components: summary of the seminar (1/2 page) and your opinion about the seminar (1/2 page).

Final course grades are determined by points. The minimum percentages to achieve a given grade are as follows:

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<thead>
<tr>
<th>grade</th>
<th>87 B+</th>
<th>77 C+</th>
<th>67 D+</th>
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<tr>
<td>93 A</td>
<td>83 B</td>
<td>73 C</td>
<td>63 D</td>
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<tr>
<td>90 A-</td>
<td>80 B-</td>
<td>70 C-</td>
<td>60 E</td>
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Carmen:
Lecture notes and reading materials will be posted on Carmen. All news and instructions for homework, quizzes, midterm and term paper and other course-related information will be frequently posted on CourseHome of Carmen.

Class Policies:
Any unexcused absence will be counted in the Class Attendance grade. Cell phone usage is not allowed during the class unless it is cleared earlier for legitimate reasons. Computer can be used only for seeing the lecture notes.

Office of Disability Services:
Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities. If you believe you need accommodation and have not previously contacted the Office for Disability Services, I encourage you to do so (more information available at http://www.ods.ohio-state.edu/).

Academic integrity:
Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University, the College of Public Health, and the Committee on Academic Misconduct (COAM) expect that all students have read and understood the University’s Code of Student Conduct and the College’s Student Handbook, and that all students will complete all academic and scholarly assignments with fairness and honesty. The Code of Student Conduct and other information on academic integrity and academic misconduct can be found at the COAM web pages (http://oaa.osu.edu/coam.html). Students must recognize that failure to follow the rules
and guidelines established in the University’s *Code of Student Conduct*, the *Student Handbook*, and in the syllabi for their courses may constitute “Academic Misconduct.”

The Ohio State University’s *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the University, or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Please note that the use of material from the Internet without appropriate acknowledgement and complete citation is plagiarism just as it would be if the source were printed material. Further examples are found in the *Student Handbook*. Ignorance of the *Code of Student Conduct* and the *Student Handbook* is never considered an “excuse” for academic misconduct.

If I suspect a student of academic misconduct in a course, I am obligated by University Rules to report these suspicions to the University’s Committee on Academic Misconduct. If COAM determines that the student has violated the University’s *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

### Course Outline

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<tr>
<th>Week</th>
<th>Date</th>
<th>Topics &amp; Readings</th>
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<tbody>
<tr>
<td>1</td>
<td>8/28</td>
<td>1) Overview</td>
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<td></td>
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<td>Readings: Pepper et al. 2014. Environmental Microbiology, Chapter 1 - 2</td>
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<td>2</td>
<td>9/4</td>
<td>No class (Labor Day)</td>
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<td>3</td>
<td>9/11</td>
<td>2) Environmental transmission of pathogens: bacteria and protozoa</td>
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<td>Readings: Pepper et al. 2014. Environmental Microbiology, Chapter 22</td>
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<td>4</td>
<td>9/18</td>
<td>3) Wastewater treatment and wastewater reuse</td>
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<td>Readings: Pepper et al. 2014. Environmental Microbiology, Chapter 25 - 27</td>
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| 5    | 9/25 | **4) Environmental transmission of viruses**  
*Readings:* Pepper et al. 2014. Environmental Microbiology, Chapter 22  
**5) Rural and suburban water and wastewater systems & their public health impacts**  
*Readings:* Ohio Department of Health. 2013. Household sewage treatment system failures in Ohio  
| 6    | 10/2 | **6) Indicator organisms**  
*Readings:* Pepper et al. 2014. Environmental Microbiology, Chapter 23  
**Quiz 1: Lecture #1 - #5** |
| 7    | 10/9 | **7) Drinking water treatment and disinfection**  
*Readings:* Pepper et al. 2014. Environmental Microbiology, Chapter 28-29 |
| 8    | 10/16| **8) Foodborne illness & food safety of farm to fork food chain (Dr. Barbara Kowalcyk)**  
Biofuels and next generation energy using microbes


Renewable energy: scientific background & best options for maximizing sustainability and resilience (group discussion)


Video clips: 10 future energy sources, https://www.youtube.com/watch?v=uStFvcz9Or4

Electrifying Wastewater: Using Microbial Fuel Cells to Generate Electricity, https://www.youtube.com/watch?v=ZotwUJAb8R4

From U.S. Department of Energy (energy.gov)

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<td>b) Bioenergy: America’s Energy Future, <a href="https://www.youtube.com/watch?v=VskQZAvbjGE">https://www.youtube.com/watch?v=VskQZAvbjGE</a></td>
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<td><strong>11) Emerging &amp; re-emerging zoonotic diseases</strong> (Dr. Laura Pomeroy) <strong>Reading:</strong> <a href="http://www.promedmail.org/?p=2400:1000">http://www.promedmail.org/?p=2400:1000</a></td>
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<td>10</td>
<td>10/30</td>
<td>❖ <strong>Renewable energy: Best options for now and future</strong> (group presentation) <strong>12) Microbial source tracking</strong> <strong>Readings:</strong> Pepper et al. 2014. Environmental Microbiology, Chapter 14</td>
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<tr>
<td>12</td>
<td>11/13</td>
<td>❖ <strong>Group discussion about term projects</strong></td>
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<tr>
<td>13</td>
<td>11/20</td>
<td><strong>14) Global climate change and microbial infectious disease</strong> <strong>Readings:</strong> Pepper et al. 2014. Environmental Microbiology, Chapter 31</td>
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<td>Week</td>
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| 15   | 12/4 | Term paper presentation & discussion  
      |      | Quiz 4: Lecture #13 - #14 |