

SYLLABUS

PUBHEHS/FDSCTE 6320

Global Health and Environmental Microbiology
Autumn 2020
3 credit hours
Online

COURSE OVERVIEW

Instructor

Instructor: Jiyoung Lee, Professor, Division of Environmental Health Science & Department of Food Science & Technology

Email address: lee.3598@osu.edu (preferred contact method)

Phone number: 614-292-5546

Office hours: Email to schedule an appointment

Office location: 406 Cunz Hall

Teaching Assistant

Molly Mills: mills.650@buckeyemail.osu.edu

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Class time

Monday 2:15 pm (synchronous portion: see Course Schedule)

8/31/2020 (2:15-3:15pm)

11/23/2020 (2:15-5:00pm)

11/30/2020 (2:15-5:00pm)

Prerequisites

Undergraduate-level microbiology or permission from the instructor

Course description

This course covers important topics in environmental health microbiology with a perspective on global application. The lectures are designed to provide basic understanding about microbial pathogens originated from various contamination sources, and their transmission via environmental matrices, such as water, air, soil, food and surfaces, and direct and indirect exposure pathways to humans. This course will also cover how exposures to pathogens and their metabolites affects health outcomes, such as diarrhea diseases, cancers, and gut microbiome disturbance in diverse populations. Emerging issues, such as pandemics, vector-borne diseases, wastewater-based epidemiology, urban microbiology, climate change, antibiotic resistance, health implications of nanotechnology, microbe-based alternative energy, will give insight for major environmental health concerns in the future at regional, national, and global settings.

Course learning outcomes

Upon successful completion of this course, students will be better prepared to:

- Summarize an overview of the impact of microbial contamination in environments on human health
- List current and emerging issue of infectious diseases in global settings
- Summarize the basic principles about infectious disease etiology, epidemiology, treatment, intervention and critical control points.
- List the common indicator organisms and federal guidelines about drinking water quality and recreational water quality
- Explain pathways of microbial transmission via water, air, soil, surfaces and food under various scenarios
- Explain techniques and other emerging tools for studying microbial pathogens and microbiome
- Discuss key aspects of the beneficial use of microbes for energy production, crop production, probiotics and removing contaminants
- Summarize emerging issues and future research about major infectious and protecting human and ecosystem health

HOW THIS ONLINE COURSE WORKS

Mode of delivery: This course is 100% online with a combination of synchronous (live) and asynchronous (Carmen only). The course is hosted on OSU's Carmen learning course management system (<https://carmen.osu.edu/>). For the synchronous and asynchronous dates, see the course schedule.

Pace of online activities: This course is divided into **weekly modules** that are released weekly. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

Credit hours and work expectations: This is a **3-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

Attendance and participation requirements: Because this is an online course, your attendance is based on your online activity and participation. The following is a summary of students' expected participation:

- **Participating in online activities for attendance: AT LEAST ONCE PER WEEK**
You are expected to log in to the course in Carmen every week. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Office hours:**
If students have general questions regarding the course, please communicate directly via Carmen or email to the instructor. Office hours are available by appointment and we will meet via Zoom.
- **Participating in questions & discussion forums:**
As part of your participation, you must respond to the prompt questions posted by the instructor in the discussion board. Discussion board will be used and a guide for creating quality discussion posts can be found in Carmen. You are encouraged to post your question early in the module, but it is understood that this may not always be possible. In addition to posting, you are required to respond to one or more of your classmates' posts. You are required to post your original reply first before seeing the posts of others. Everyone is expected to follow the discussion throughout the course.

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

This course does not require a specific textbook, but there is a highly recommended textbook (see below). Assigned supplemental readings, such as journal articles, digital video clips, and website contents/links, are required in most of the modules.

Recommended

- Pepper, I.L., Gerba, C.P., Gentry, T.J. 2015. Environmental Microbiology, 3rd edition, Academic Press, San Diego, CA.

Course technology

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** ocio.osu.edu/help
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu
- **TDD:** 614-688-8743

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration (go.osu.edu/video-assignment-guide)
- Recording, editing, and uploading video (go.osu.edu/video-assignment-guide)

Required equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required software

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

Carmen access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (go.osu.edu/add-device).
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (go.osu.edu/install-duo) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

GRADING AND FACULTY RESPONSE

How your grade is calculated

| ASSIGNMENT CATEGORY | POINTS |
|-------------------------------------|------------|
| Lecture self-checks quiz | 33 |
| Question & discussion participation | 22 |
| Homework | 5 |
| Term paper | 20 |
| Term paper presentation | 5 |
| Multiple choice exam | 15 |
| Total | 100 |

Assignments are due by Friday at 5pm each week. Assignments/activities are to be completed and turned in by the due dates as posted in Carmen. Some activities (such as self-checks) will be auto-graded and some activities (such as discussion participation) may be graded periodically or along with the finals.

Descriptions of major course assignments

Quiz

For each topic taught in this course, you will be required to view a pre-recorded lecture, slides, or video clip. To assess your level of understanding of the lecture contents, you will then be required to complete self-check quiz. Each quiz may contain multiple choice, short answer, true/false, and other question forms.

Question & discussion participation

As part of your participation, you must respond to the prompt questions posted by the instructor in the discussion board. Discussion board will be used and a guide for creating quality discussion posts can be found in Carmen. You are encouraged to post your question early in the module, but it is understood that this may not always be possible. In addition to posting, you are required to respond to one or more of your classmates' posts. You are required to post your original reply first before seeing the posts of others. Everyone is expected to follow the discussion throughout the course.

Term paper

Topics should be about environmental microbiology related to global 'health' impact. The format is a student research competition proposal (e.g. NSF graduate fellowship, OARDC graduate students SEEDS, NIH Individual research fellowship F32), but in a shorter form. Term paper is due by the presentation date (11/23/2020, 11/30/2020). 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.

On the second page and thereafter, 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. One figure is required in your main text that captures your study design, the significance of your proposed study in a graphical abstract form. It must include literature review and accurate citations. Pitfalls or limitations of the proposed research should be mentioned.

It should be with 1-inch margins in Microsoft Word and 12-point font size. It has a 5-page limit, including the cover page and the figure. Reference section 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 in Word or PDF.

Term paper presentation

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 10 min presentation + 10 min Q & A. Each person in the team should contribute equally if the work is done by a team and each one's role in contributing the project should be mentioned during the presentation. Each presentation will be given peer review evaluations and feedback.

Multiple choice exam

At the end of the course, a multiple-choice exam will be given. The questions are chosen from self-check quizzes.

Quizzes and exams are open-book and open-notes. Textbooks, lecture notes, journal articles and own notes can be used. Make-up exams will not be given except in case of a serious emergency situation since it has already provided some flexibility to the students. If so, students must contact the instructor before the event (or arrange for someone to do so) or as soon as possible. Students must show evidence that they are physically unable to participate it, such as a clear and specific doctor's note mentioning the date, exam, and reason. Generally speaking, no make-ups will be granted for personal reasons, such as travel, personal hardship, leisure, or to ease test week schedules, and no student will be permitted to take an exam beyond the scheduled and already-extended time period. The exceptions may be made at the instructor's discretion.

Late assignments

Late submissions will not be accepted unless there is a legitimate reason, such as illness and family emergency. Please refer to Carmen for due dates.

Grading scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Instructor feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-4357(HELP)** at any time if you have a technical problem.)

- **Grading and feedback:** For large weekly assignments, you can generally expect feedback within **7 days**.
- **Email:** In general, I will reply to emails within **24 hours on days when class is in session at the university**.
- **Discussion board:** In general, I will check and reply to messages in the discussion boards every **24hours on school days**.

OTHER COURSE POLICIES

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm does not always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Academic integrity policy

See **Descriptions of major course assignments**, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State's academic integrity policy

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 and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's *Code of Student Conduct* (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus 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. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this 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.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)
- Eight Cardinal Rules of Academic Integrity (go.osu.edu/cardinal-rules)

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Safe and Healthy Buckeyes:

Health and safety requirements: All students, faculty and staff are required to comply with and stay up to date on all university safety and health guidance (<https://safeandhealthy.osu.edu>), which includes wearing a face mask in any indoor space and maintaining a safe physical distance at all times. Non-compliance will result in a warning first, and disciplinary actions will be taken for repeated offenses.

Creating an environment free from harassment, discrimination, and sexual misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of

such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

This course adheres to The Principles of Community adopted by the College of Food, Agricultural, and Environmental Sciences. These principles are located on the Carmen site for this course; and can also be found at <https://go.osu.edu/principlesofcommunity>. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (<https://equityandinclusion.cfaes.ohio-state.edu/>). If you have been a victim of or a witness to a bias incident, you can report it online and anonymously (if you choose) at <https://studentlife.osu.edu/bias/report-a-bias-incident.aspx>.

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life Counseling and Consultation Services (CCS) by visiting ccs.osu.edu or calling (614) 292- 5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at (614) 292-5766 and 24 hour emergency help is also available through the 24/7 National Prevention Hotline at 1-(800)-273-TALK or at suicidepreventionlifeline.org.

David Wirt, wirt.9@osu.edu, is the CFAES embedded mental health counselor. He is available for new consultations and to establish routine care. To schedule with David, please call 614-292-5766. Students should mention their affiliation with CFAES when setting up a phone screening.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

The University strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. 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.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Canvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)
- Collaborative course tools

COURSE SCHEDULE

Refer to the Carmen course for up-to-date assignment due dates.

| Week | Dates (the week of) | Topics, Readings, Assignments, Deadlines |
|------|--|--|
| 1 | 8/31/2020 Synchronous (for the first hour 2:15-3:15pm) | Overview of the course and Introduction of Environmental Health Microbiology <u>Readings:</u> Pepper et al. 2014. Environmental Microbiology, Chapter 1 -2 <u>Assignments:</u> Carmen discussion participation and lecture self-check (due by 9/4/2020, 5pm) |
| 2 | 9/7/2020 | Environmental transmission of pathogens <u>Readings:</u> Pepper et al. 2014. Environmental Microbiology, Chapter 22 Meinhardt, P.L. et al. 1996. Epidemiologic aspects of human cryptosporidiosis and the role of waterborne transmission. <i>Epidemiologic Reviews</i> . 18:2:118-136. |

| Week | Dates (the week of) | Topics, Readings, Assignments, Deadlines |
|------|------------------------|---|
| | | <p><u>Assignments</u>: Carmen discussion participation and lecture self-check (due by 9/11/2020, 5pm)</p> |
| 3 | 9/14/2020 | <p>Pandemics: Previous pandemics and COVID-19</p> <p><u>Readings</u>: Andersen, K. G., Rambaut, A., Lipkin, W. I., Holmes, E. C., & Garry, R. F. (2020). The proximal origin of SARS-CoV-2. <i>Nature medicine</i>, 26(4), 450-452.</p> <p>Shi Z, Hu Z. A review of studies on animal reservoirs of the SARS coronavirus. <i>Virus Res</i>. 2008;133(1):74-87. doi:10.1016/j.virusres.2007.03.012</p> <p>Spanish Flu: a Warning from History by Cambridge University</p> <p>Past pandemics by CDC</p> <p>A Weekly Surveillance Summary of US COVID-19 Activity by CDC</p> <p>COVID-19 tracking by Johns Hopkins sars-cov-2</p> <p><u>Assignments</u>: Carmen discussion participation and lecture self-check (due by 9/18/2020, 5pm)</p> |
| 4 | 9/21/2020 | <p>Foodborne illness & food safety of farm to fork food chain</p> <p><u>Readings</u>:</p> <p>Scallan et al. 2011. Foodborne illness acquired in the US-Major pathogens. <i>Emerging Infectious Diseases</i>. 17(1):7-12</p> <p>Scallan et al. 2011. Foodborne illness acquired in the US-Unspecified agents. <i>Emerging Infectious Diseases</i>. 17(1):16-22</p> <p><u>Assignments</u>: Carmen discussion participation and lecture self-check (due by 9/15/2020, 5pm)</p> |
| 5 | 9/28/2020 | <p>Indicator organisms</p> <p>Readings: Pepper et al. 2014. <i>Environmental Microbiology</i>, Chapter 23</p> <p>O'Reilly, C.E. et al. 2007. A waterborne outbreak of gastroenteritis with multiple etiologies among resort island visitors and residents: Ohio, 2004. <i>Clinical Infectious Diseases</i>. 44:5-6-512</p> |

| Week | Dates (the week of) | Topics, Readings, Assignments, Deadlines |
|------|------------------------|--|
| | | <p><u>Assignments</u>: Carmen discussion participation and lecture self-check (due by 10/2/2020, 5pm)</p> |
| 6 | 10/5/2020 | <p>Wastewater treatment, wastewater reuse & public health issues</p> <p><i>Readings</i>: Pepper et al. 2014. Environmental Microbiology, Chapter 25 – 27</p> <p>Park, E, Mancl, K, Tuovinen, O, Bisesi, M, Lee, J. 2016. Ensuring safe reuse of residential wastewater: Reduction of microbes and genes using peat biofilter and batch chlorination in an on-site treatment system. <i>Journal of Applied Microbiology</i>. 121(6):17777-1788.</p> <p>Assignments: Carmen discussion participation and lecture self-check (due by 10/9/2020 5pm)</p> |
| 7 | 10/12/2020 | <p>Drinking water treatment and disinfection</p> <p><i>Readings</i>: Pepper et al. 2014. Environmental Microbiology, Chapter 28-29</p> <p><u>Assignments</u>: Carmen discussion participation and lecture self-check (due by 10/16/2020, 5pm)</p> |
| 8 | 10/19/2020 | <p>Microbiome in environments and hosts & its linkage to human health</p> <p><i>Readings</i>:</p> <p>Hoisington, AJ et al. (2015). The microbiome of the built environment and mental health. <i>Microbiome</i>, 3(1), 60.</p> <p>Lynch, SV et al. 2016. The human intestinal microbiome in health and disease. <i>New England Journal of Medicine</i>, 375(24), 2369-2379.</p> <p>Shreiner, AB et al. 2015. The gut microbiome in health and in disease. <i>Current opinion in gastroenterology</i>, 31(1), 69.</p> <p><u>Assignments</u>: Carmen discussion participation and lecture self-check (due by 10/23/2020, 5pm)</p> |

| Week | Dates (the week of) | Topics, Readings, Assignments, Deadlines |
|------|------------------------|--|
| 9 | 10/26/2020 | <p>Microbial source tracking</p> <p><i>Readings:</i> Pepper et al. 2014. Environmental Microbiology, Chapter 14</p> <p><u>Assignments:</u> Carmen discussion participation and lecture self-check (due by 10/30/2020, 5pm)</p> |
| 10 | 11/2/2020 | <p>Global climate change and microbial infectious disease</p> <p><u>Readings:</u> Pepper et al. 2014. Environmental Microbiology, Chapter 31</p> <p>Tirado, M.C. et al. 2010. Climate change and food safety: A review. Food Res Int. 43:1745-1765.</p> <p><u>Assignments:</u> Carmen discussion participation and lecture self-check (due by 11/6/2020, 5pm)</p> |
| 11 | 11/9/2020 | <p>Energy produced by microbes: best options for maximizing sustainability and resilience for US or other countries</p> <p><u>Readings:</u> Rittmann, B.E. 2008. Opportunities for renewable bioenergy using microorganisms. <i>Biotechnology & Bioengineering</i>. 100:2:203-212.</p> <p>Rittmann, B. E., et al. 2008. Pre-genomic, genomic and post-genomic study of microbial communities involved in bioenergy. <i>Nature reviews. Microbiology</i>. 6:8: 604.</p> <p>Schubert, C. 2006. Can biofuels finally take center stage? <i>Nature Biotechnology</i>. 24:7:777-784.</p> <p>Chu, S, and Majumdar, A. 2012. Opportunities and challenges for a sustainable energy future. <i>Nature</i>. 488:7411:294-303.</p> <p>Brown, V. 2006. Biogas: a bright idea for Africa. <i>Environmental Health Perspectives</i>. 114:5:A300-303.</p> <p>Watching: Electrifying Wastewater: Using Microbial Fuel Cells to Generate Electricity by The American Chemical Society</p> <p>Energy 101: Algae-to-Fuels by U.S. Department of Energy</p> <p>Bioenergy: America's Energy Future by U.S. Department of Energy</p> |

| Week | Dates (the week of) | Topics, Readings, Assignments, Deadlines |
|------|---|---|
| | | <p><u>Assignments:</u> Submit 1-page of homework, which has two components; summary of your reading and watching about bioenergy (1/2 page) and 'your' opinion and thoughts about the sustainable energy in the US or other country (1/2 page). Choose one country or region.</p> <p>(due by 11/13/2020, 5pm)</p> |
| 12 | 11/16/2020 | <p>Antibiotic resistance and public health concerns</p> <p><u>Readings:</u></p> <p>Fey, PD. et al. 2000. Ceftriaxone-resistant Salmonella infection acquired by a child from cattle. <i>New England Journal of Medicine</i>, 342(17):1242-1249.</p> <p>Rizzo, et al. 2013. Urban wastewater treatment plants as hotspots for antibiotic resistant bacteria and genes spread into the environment: A review, <i>Science of The Total Environment</i>, 447:345-360.</p> <p>Taubes G. The Bacteria Fight Back. <i>Science</i>, Vol. 321, No. 5887 (Jul. 18, 2008), pp. 356-361</p> <p><u>Assignments:</u> Carmen discussion participation and lecture self-check (Due by 11/20/2020, 5pm)</p> |
| 13 | 11/23/2020 Synchronous (2:15-5pm) | <p>Term paper presentation</p> <p><u>Assignments:</u> Carmen discussion participation & provide peer evaluation</p> |
| 14 | 11/30/2020 Synchronous (2:15-5pm) | <p>Term paper presentation</p> <p><u>Assignments:</u> Carmen discussion participation & provide peer evaluation</p> |