SYLLABUS
PUBHEHS/FDSCTE 7360

Water Contamination: Sources and Health Impact
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

Prerequisites

Undergraduate-level biology or permission from the instructor

Course description

Water contamination affects our health and daily life in various ways. It has been one of the biggest pollution problems for the past decades and is gaining new attention since we now face and expect extreme weather events more frequently due to climate change and the water resources are getting limited. The water contaminants include biological infectious agents,

chemical pollutants and other toxic agents that are transmitted primarily via water, but also air, soil, food and human activities. The lectures are designed to provide understanding about the sources of contamination, the pathways of transport, public health impacts and interventions. Emerging issues as well as fundamental issues will be discussed.

Course learning outcomes

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

- Provide an overview of the impact of water pollution on human health.
- Describe the environmental contaminants and associated diseases.
- List the common biological and chemical pollutants and federal guidelines about water-related pollution.
- Describe pathways of pollutant transmission via water and other related matrices.
- Outline biomonitoring, aquatic toxicity and other emerging contaminant issues.
- Describe the mitigation strategies for remediating water contamination.

HOW THIS ONLINE COURSE WORKS

Mode of delivery: This course is 100% online and all the components are asynchronous via Carmen only. The course is hosted on OSU's Carmen learning course management system (https://carmen.osu.edu/).

Pace of online activities: This course is divided into weekly modules that are released weekly (**Thursdays**). 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 are assigned reading materials, such as journal articles, digital video clips, and website contents/links, are required in most of the modules. See the details in the course schedule.

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	36
Question & discussion participation	26
Term paper (written)	20
Term paper (video)	18
Total	**100**

Assignments are due by following Wednesday 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.

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.

Quizzes are open-book and open-notes. Textbooks, lecture notes, journal articles and own notes can be used. Make-up quizzes 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 a quiz beyond the scheduled and already-extended time period. The exceptions may be made at the instructor’s discretion.

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' posted questions. 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 (written)

Topics should be about 'water contamination' issues that have 'human health impact'. The format is a high-quality newspaper or magazine article (e.g. New York Times, Scientific American, National Geographic). The term paper should include Cover Page that has title of the project, the student's name, email address, department, and an abstract. The abstract should have 150 words or less describing the summary of your project. Key words should be provided (5 max) at the end of the abstract. Main text should contain following components in the flow:

1) Start with **Introduction** that clearly introduces the topic of the project and why this work is important and how the issue that you are reporting affects water quality and human health significantly. In addition, highlights that it is an emerging concern.

2) **Approach** that describes how you searched the information and what approaches were made systematically. You should show that your writing is based on objective, reputable, and reliable sources.

3) **Main component that** identifies the contaminant(s), main causes and sources of the problem, transport, how exposure happens, health impact, and how to mitigate and solve it, etc.

4) One figure that summarizes the content of your project in a concise, pictorial form designed to capture the main theme, significant findings of your project.

It has a **3-page limit**. Proper literature review and accurate citations should be included in the written paper. Everything should be combined in one file in Word or PDF. It should be with 1-inch margins and 12-point font size. Cover page and references are not counted toward the 3-page limit.

Term paper (written) is due by 12/2/2020, midnight.

Term paper (video)

Video is ~5 min. The grade is based on showing full understanding about the chosen topic, critical and logical thinking, and effective presenting skills. A video file is required and should be uploaded at Carmen Dropbox by 5pm on 11/18/2020 and will be viewed by peers from 11/19/2020 by 11/25/2020. Entire class must watch the videos carefully and provide questions, honest feedback and evaluation for the presenters, and each presenter need to respond to questions during the 1-week period.

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.

Statement on Title IX

All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options at titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information on OIE, visit equity.osu.edu or email equity@osu.edu.

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined

as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

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. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand resources are available at go.osu.edu/ccsondemand. 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. The Ohio State Wellness app is also a great resource available at go.osu.edu/wellnessapp.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

The university strives to make all learning experiences as accessible as possible. 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; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online course requires use of CarmenCanvas (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 in the announcement section. Weekly module starts from each Thursday. Assignments are due by following Wednesday if any.

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
1	8/27 -	**Course Overview & Introduction of Water** Readings: Reynolds, K.A., Mena, K.D. and Gerba, C.P., 2008. Risk of waterborne illness via drinking water in the United States. In *Reviews of environmental contamination and toxicology* (pp. 117-158). Springer New York. Levin, RB, et al. 2002. U.S. Drinking Water Challenges in the Twenty-First Century. *Environ Health Perspect.* 110 (Suppl.1):43-52. Ford, T. 2006. Emerging issues in water and health research. *J Wat Health.* 4 (Supp):59-65. Assignments: Carmen discussion participation and lecture self-check (due by 9/2/2020, 5pm)
2	9/3 -	**Water contaminants and problems: US and worldwide** Readings: National Primary Drinking Water Regulations: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations Contaminant Candidate List (CCL): Final CCL4 Chemical Contaminants List https://www.epa.gov/ccl/chemical-contaminants-ccl-4 Final CCL4 Microbial Contaminants List https://www.epa.gov/ccl/microbial-contaminants-ccl-4 Piperata, B, Lee, S, Mayta, A, Cary, A, Vilchez, S, Oruganti, P, Garabed, R, Wilson, W, Lee, J. 2020. Characterization of the gut microbiome of Nicaraguan children in a water insecure context. *American Journal of Human*

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
		Biology. 32(1):e23371. Schwarzenbach, R. P., Egli, T., Hofstetter, T. B., von Gunten, U. Wehrli, B. (2010). Global Water Pollution and Human Health. Annu. Rev. Environ. Resour. 35:109-136. Wu, C. et al. 1999. Water pollution and human health in China. *Environmental Health Perspectives*. 107:251-256. Aldhous P. The world's forgotten crisis. Nature. 422 (20 March 2003):251. Clarke, T. Delta blues. Nature. 422 (20 March 2003): 254-256. Video: Water Crisis (Cape Town) Assignments: Carmen discussion participation and lecture self-check (due by 9/9/2020, 5pm)
3	9/10 -	**Endocrine disruptors: Sources and Health Impact** Readings: Melnick, R. et al. 2002. Summary of the National Toxicology Program's report of the endocrine disruptors low-dose peer review. Environ Health Perspect. 110: 427–431 World Health Organization. State of the Science of Endocrine Disrupting Chemicals – 2013. Ed. Bergman, A. et al. Gee, R. H. et al. 2015. Considerations of endocrine disrupters in drinking water. In *Endocrine Disruption and Human Health* (pp. 319-341). Assignments: Carmen discussion participation and lecture self-check (due by 9/16/2020, 5pm)
4	9/17 -	**Agricultural runoff and urban runoff & storm water management (bioretention)** Readings: U.S. Geological Survey (USGS) website - Runoff: http://ga.water.usgs.gov/edu/runoff.html - Surface runoff: http://ga.water.usgs.gov/edu/watercyclerunoff.html - Urban runoff: http://ga.water.usgs.gov/edu/urbanrun.html

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
		Gaffield, S. J., R. L. Goo, L. A. Richards, and R.J. Jackson. 2003. Public health effects of inadequately managed stormwater runoff. Am J Public Health 93:1527–1533. Tsihrintzis, V.A. and R. Hamid. 1997. Modeling and management of urban stormwater runoff quality: a review. Water Resources Management 11:137-164 Lefevre, G.H., Novak, P.J., Hozalski, R.M., 2012. Fate of naphthalene in laboratory-scale bioretention cells: implications for sustainable stormwater management. Environ. Sci. Technol. 46, 995–1002. Davis, A.P., Hunt, W.F., Traver, R.G., Clar, M., 2009. Bioretention Technology: Overview of Current Practice and Future Needs. J. Environ. Eng. 135, 109–117. US EPA, Water: Best Management Practices, Bioretention, http://water.epa.gov/polwaste/npdes/swbmp/Bioretention-Rain-Gardens.cfm Assignments: Carmen discussion participation and lecture self-check (due by 9/23/2020, 5pm)
5	9/24 -	**Recreational water: contamination sources, pathogens and health impact** Readings: US Environmental Protection Agency. 2012. Recreational Water Quality criteria. EPA 820-F-12-058, Office of Water, Office of Research and Development. Washington, Washington, D.C. Marion, J, Lee, C, Lee, CS, Lemeshow, S, Wang, Q, Buckley, T, Saif, L, Lee, J. 2014. Integrating Bacterial and Viral Water Quality Assessment to Predict Swimming-Associated Illness at a Freshwater Beach. *PLoS One.* 9:11:e112029. Lee, CS, Lee, C, Marion, JW, Wang, Q, Saif, L, Lee, J. 2014. Occurrence of Human Enteric Viruses at Freshwater Beaches during Swimming Season and Its link to Water Inflow. *Science of the Total Environment*. 472:757-766. Assignments: Carmen discussion participation and lecture self-check (due by 9/30/2020, 5pm)
6	10/1 -	**OSU's Mirror Lake Jump as an example of extreme recreational water event** **Wastewater treatment, wastewater reuse & public health issues** Readings: Marion, J, Burrowes, V, Lee, C, Lee, J. 2015. Changes in Microbial Water Quality Associated with an Extreme Recreational Water Event in Ohio,

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
		United States. *Water Quality, Exposure, and Health.* 7:4:491-501. Lee, CS, Lee, J. 2010. Evaluation of new *gyrB*-based real-time PCR system for the detection of *B. fragilis* as an indicator of human-specific fecal contamination. *Journal of Microbiological Methods.* 82:3:311-318. Assignments: Carmen discussion participation and lecture self-check (due by 10/7/2020, 5pm)
3	10/8 –	**Flint Water Crisis & Beyond** Readings: Hanna-Attisha, M., LaChance, J., Sadler, R. C., & Champney Schnepp, A. (2016). Elevated blood lead levels in children associated with the Flint drinking water crisis: a spatial analysis of risk and public health response. American Journal of Public Health, 106(2), 283-290. Pieper, K. J., Tang, M., & Edwards, M. A. (2017). Flint water crisis caused by interrupted corrosion control: Investigating “ground zero” home. Environmental Science & Technology, 51(4), 2007-2014. Masten, S. J., Davies, S. H., & Mcelmurry, S. P. (2016). Flint water crisis: what happened and why? Journal of American Water Works Association, 108(12), 22-34. Assignments: Carmen discussion participation and lecture self-check (due by 10/14/2020, 5pm)
8	10/15 -	**Ground Water Issues** Readings*:* US EPA. Ground Water Contamination https://www.epa.gov/sites/production/files/2015-08/documents/mgwc-gwc1.pdf Wasserman, Gail A., et al. 2014. A cross-sectional study of well water arsenic and child IQ in Maine schoolchildren. *Environmental Health* 13.1:23. Well Water Should Be Tested Annually to Reduce Health Risks to Children https://www.niehs.nih.gov/news/newsroom/releases/2009/may26/index.cfm Assignments: Carmen discussion participation and lecture self-check (due by 10/21/2020, 5pm)

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
9	10/22 -	**Water and Energy: Hydraulic fracturing and its impact on water quality** *Readings:* Kerr RA. (2010) Natural Gas From Shale Bursts Onto the Scene. Science 328: 1624-1626. http://www.sciencemag.org/content/328/5986/1624.full.pdf Vengosh, A, Warner, N, Jackson, R, Darrah, T. (2013) The effects of shale gas exploration and hydraulic fracturing on the quality of water resources in the United States. Peocedia Earth and Planetary Science 7:863-866. Gregory,K.B., Vidic,R.D. and Dzombak,D.A. (2011) Water Management Challenges Associated with the Production of Shale Gas by Hydraulic Fracturing. Elements 7, 181-186. http://wp.cedha.net/wp-content/uploads/2012/11/Water-Management-Challenges-Associated-with-the-Production-of-Shale-Gas-by-Hydraulic-Fracturing.pdf Ohio Department of Natural Resources. The facts about hydraulic fracturing. http://oilandgas.ohiodnr.gov/portals/oilgas/pdf/Facts-about-HFracturing.pdf Ohio EPA. 2012. Drilling for natural gas in the Marcellus and Utica Shales: Environmental regulatory basics http://www.epa.ohio.gov/portals/0/general%20pdfs/generalshale711.pdf Ohio EPA. 2012. Sources of water for hydraulic fracturing fluids Assignments: Carmen discussion participation and lecture self-check (due by 10/28/2020, 5pm)
10	10/29 -	**Freshwater harmful algal blooms & cyanotoxins: causes, health impact, monitoring, guidelines & mitigation** Readings: Harmful algal blooms: Information for public water systems (Ohio EPA) http://epa.ohio.gov/ddagw/HAB.aspx Public Water System HAB Response Strategy http://epa.ohio.gov/Portals/28/documents/habs/PWS_HAB_Response_Strategy.pdf Zhang, F, Lee, J, Liang, S, Shum, CK. 2015. Cyanobacteria Blooms and Non-alcoholic Liver Disease: Evidence from a County Level Ecological Study in the United States. *Environmental Health.* http://www.ehjournal.net/content/14/1/41/abstract

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
		Lee, J, Lee, S, Jiang, X. 2017. Cyanobacterial Toxins in Freshwater and Food: Important Sources of Exposure to Humans. Annual Review of Food Science and Technology. 8:281-304. http://www.annualreviews.org/doi/abs/10.1146/annurev-food-030216-030116 Cheung, MY. Liang, S, Lee, J. 2013. Toxin-producing Cyanobacteria in Freshwater: A Review of their Problems, Impact on Drinking Water Safety, and Efforts for Protecting Public Health. Journal of Microbiology. 51:1:1-10. Zhang, F, Hu, C, Shum, CK. Liang, S, Lee, J. 2017. Satellite remote sensing of drinking water intakes in Lake Erie for cyanobacteria population using two MODIS-based indicators as a potential tool for toxin tracking. Frontiers in Marine Science. 4:124. Gorham, T, Jia, Y, Shum, CK, Lee, J. Ten-Year Survey of Cyanobacteria Blooms in Ohio's Waterbodies Using Satellite Remote Sensing. Harmful Algae. 66:13-19. Marion, J. Lee J, Wilkins J, Lemeshow S, Lee C, Waletzko E, Buckley T. 2012. *In Vivo* Phycocyanin Flourometry as a Rapid Screening Tool for Predicting Elevated Microcystin Concentrations at Inland Beaches. *Environmental Science & Technology.* 46:8:4523-4531. Carmichael, W. et al. 2016. Health impacts from cyanobacteria harmful algae blooms: Implications for the North American Great Lakes. *Harmful Algae.* 54:194-212. Ibelings, B. et al. 2014. Current approaches to cyanotoxin risk assessment and risk management around the globe. *Harmful Algae.* 40:63-74. Paerl, H. et al. 2016. Mitigating cyanobacterial HABs in aquatic ecosystems impacted by climate change and anthropogenic nutrients. *Harmful Algae*. 54:213-222. Toxic Lake: The Untold Story of Lake Okeechobee Assignments: Carmen discussion participation and lecture self-check (due by 11/4/2020, 5pm)
11	11/5	**Climate Change: impact on water quality, quantity & climate-water-food nexus**

Week	Dates (2020)	Topics, Readings, Assignments, Deadlines
		Readings: Khan, AE. et al. Drinking water salinity and maternal health in coastal Bangladesh: Implications of climate change. Environ Health Perspect. 119(9):1328-1332. Patz, JA. et al. 2000. The potential health impacts of climate variability and change for the United States: executive summary of the report of the health sector of the U.S. National Assessment. Environ Health Perspect.108(4):367–376. Patz JA, Vavrus SJ, Uejio CK, McLellan SL. 2008. Climate change and waterborne disease risk in the Great Lakes region of the U.S. Am J Prev Med. 35(5):451-8. Ge, C, Lee, C, Lee, J. 2012. The Impact of Extreme Weather Events on Salmonella Internalization in Lettuce and Green Onion. *Food Research International* 45:2:1118-1122. Ge, C, Lee, C, Nagle, E, Li, J, Kleinhenz, M, Gardner, D, Lee, J. 2014. Impact of phytopathogen infection and extreme weather events on internalization of *Salmonella* Typhimurium in lettuce. *International Journal of Food Microbiology.*168-169:24-31 Assignments: Carmen discussion participation and lecture self-check (due by 11/11/2020, 5pm)
12	11/12 -	**Issues Related to Drinking Water Distribution System** Readings: Ashbolt, N. 2015. Microbial Contamination of Drinking Water and Human Health from Community Water Systems. *Curr Envir Health Rpt.* 2: 95-106. Assignments: Carmen discussion participation and lecture self-check (due by 11/18/2020, 5pm)
13	11/19 -	**Term paper presentation (video)** Assignments: Term paper video (submit by 11/18/2020 5pm) & Carmen discussion participation & provide peer evaluation (due by 11/25/2020, 5pm)
14	11/26 -	**Term paper (written)** Assignment: finalization based on feedback & submission (due by 12/2/2020. 5pm)