ENVENG 3200/6200 - Fundamentals of Environmental Engineering

3 credit hours

Autumn Semester 2022

Lecture: MWF, 9:10 to 10:05 am
Location: Page Hall 010
Instruction Mode: 100% In-Person (no Zoom, but recordings & slides/notes will be posted to Carmen)
Instructor: John J. Lenhart, Ph.D.
Email address: lenhart.49@osu.edu
Phone number: 614-688-8157
Office hours: MW, 2:00 – 3:00 in Hitchcock Hall 417A, or by appointment
Graduate Teaching Assistant: Yijing Liu (liu.8372); Office hours Tuesday 4 – 6pm (using Zoom)

Course overview

Course description

This course introduces students to the field of environmental engineering which entails the application of engineering and science principles to the protection and enhancement of the quality of the environment and to the enhancement and protection of public health and welfare. The course emphasizes the application of chemistry, physics and biology concepts to water quality, air quality, and water/wastewater treatment. Concepts of risk, sustainability and solid/hazardous waste management are also presented.

Course learning outcomes

Students shall demonstrate proficiency in the principal focus areas of environmental engineering, with an emphasis on:

1. The derivation of mass and energy balance equations and their application to analyze environmental engineering problems in air, land and water systems.
2. Developing quantitative and qualitative skills in the management of water quality, treatment of water, and the management and treatment of municipal wastewater.
3. Developing qualitative and quantitative understanding of the sources, fate, effects and control of air pollution.
4. Understanding principles of risk assessment, solid/hazardous waste management, pollution prevention, and sustainability.

ABET Program Accreditation and FE Exam

The subject matter of this course is important for students in both the Environmental and Civil Engineering programs and aspects of it are specifically included in the Fundamentals of Engineering (FE) exam needed to obtain engineering licensure in either discipline. For this reason, FE-style multiple choice problems will comprise portions of quizzes and exams.

The civil and environmental engineering programs are both accredited by ABET and this course contributes toward attaining ABET student learning outcomes as indicated in the following table.

ABET student learning outcomes	Course contribution		
	Some	Substantial	Significant
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	X		
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	X		
3. an ability to communicate effectively with a range of audiences		X	
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts		X	
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives		X	
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions			
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.		X	

How this course works

Mode of delivery: This course will be offered using in person lectures conducted using guided notes projected via a tablet. The notes will be annotated as the course proceeds. Student versions of the note sets will be available on Carmen approximately one week prior to each course session. Students should come prepared for each course with the notes to be covered that particular session.

Office Hours: I will hold in person office hours MW from 2:00 - 3:00 PM EST in my office (Hitchcock Hall 417A). Students are encouraged to utilize this time to meet with me to discuss topics related to the course material or environmental engineering in general. Office hours for the GTA will occur Th from 2:00 – 4:00 PM EST over Zoom. Links will be provided on Carmen.

Pace of course activities: As shown in the schedule, this course is organized on the basis of course topics. Guided note sets for these topics will be provided at least one week ahead of time on Carmen. The group project is scaffolded throughout the semester so the workload can be spread

over time. Students are expected to keep pace with weekly reading and assignment deadlines.

Credit hours and work expectations: This is a **3-credit-hour course**. According to Ohio State policy, 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) for a total of 9 hours to receive a grade of (C) average.

Guidelines on Obtaining Graduate Credit (ENVENG 6200): In order to get graduate credit, students must prepare a research paper consisting of a detailed application of the course material to a problem of the student's own devising. This paper can take the form of either (a) a proposal, (b) a manuscript draft, or (c) a literature review. The level of detail on the paper should correspond to that expected for an assignment taking 5 hr/week. This is a significant research effort that you should spend roughly 50 hours working on. You should submit a topic for review by the 4th week of the semester. Following acceptance of the topic, a comprehensive outline is due at the 10th week of the course and the written project submission is due the Friday of Exam week.

Course Materials and Technology

Textbooks

REQUIRED

Environmental Engineering: Fundamentals, Sustainability, Design, James R. Mihelcic and Julie Beth Zimmerman, 3rd Edition (John Wiley & Sons, 2021).

SUPPLEMENTAL/OPTIONAL

The following lists some additional texts in this area and students may find they provide a different, but not necessarily better, point of view of the material being covered.

Introduction to Environmental Engineering, P.A. Vesilind, S.M. Morgan and L.G. Heine (Cengage)

Introduction to Environmental Engineering, M.L. Davis and D.A. Cornwell (McGraw-Hill)

Introduction to Environmental Engineering and Science, G.M. Masters and W.P. Ela (Pearson/Prentice Hall)

Principles of Environmental Engineering and Science, M.L. Davis and S.J. Masten (McGraw-Hill)

Course technology

Carmen access

You will need to use BuckeyePass 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.
- 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 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.

Required technology skills

- Basic computer and web-browsing skills
- Navigating Carmen: for questions about specific functionality, see the Canvas Student Guide
- Ability to use Microsoft Word (or equivalent), Microsoft Excel (or equivalent), and Adobe Acrobat (or equivalent)
- Ability to scan and upload documents and images of your work
- A mobile device (smartphone or tablet) or landline to use for BuckeyePass authentication
  Ability to annotate notes electronically or on hard copy
- CarmenZoom virtual meetings

Required Software

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Full instructions for downloading and installation can be found at go.osu.edu/office365help.
- Microphone: built-in laptop or tablet mic or external microphone

Technology Help

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

Course Policies

Classroom Safety and Respect

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*). This may include wearing a face mask in any indoor space and maintaining a safe physical distance at all times. Non-compliance with these guidelines will result in a warning first, and disciplinary actions will be taken for repeated offenses.

Electronics

Unnecessary cell phone, laptop or tablet use unrelated to the course will not be tolerated.

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: Remember to write using good grammar, spelling, and punctuation in all course assignments. A more conversational tone is fine for non-academic topics or questions in class or during office hours. It is important to remain professional and respectful when emailing, particularly when doing so to the course instructor or GTA.

Tone and civility: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. We should all be committed to making the classroom a comfortable space for everyone. To do so, we must be respect each other and practice civility at all times. Disrespectful language including, but not limited to, sexist, racist, homophobic, or anti- ethnic slurs, or bigotry will not be tolerated.

Citing your sources: During academic discussions and in your writing make sure to 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. Use formal citations for the case study assignment.

Academic integrity

Policies for this course

Homework Assignments: You can (and are encouraged to) work with other students on homework assignments, but you must submit individual solutions. If you do work with others, make sure to indicate as much on your submitted assignments.

Quizzes and exams: You must complete the exams and quizzes yourself, without any external help or communication.

Group assignments: This course includes group work, namely the Case Study Assignment. I will strive to make guidelines and expectations for this assignment as clear as possible. Group members will assess

one another as part of this assignment and the results of this assessment will be factored into the overall group grade.

Reusing past work: In general, you are prohibited in university courses from turning in work from a past class or current course to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me. This includes assignments for graduate students.

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*, 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:

- The Committee on Academic Misconduct web pages (COAM Home)
- *Ten Suggestions for Preserving Academic Integrity (Ten Suggestions)*
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Copyright disclaimer

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

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. 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.

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 find yourself feeling isolated, anxious or overwhelmed, please know that there are resources to help: ccs.osu.edu. 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 go.osu.edu/wellnessapp.

Student Emergency Financial Support

The **Student Advocacy Center** staff members are continuing to serve students during normal business hours and are accepting online appointments.

The **Student Emergency Fund** is available to students who may otherwise be at risk of dropping out of college due to an unexpected financial emergency. If you, or a student you know, are experiencing an unplanned expense, the Student Emergency Fund may be an option. Their office is accepting applications and may be able to award up to $1,000 to eligible students. **Learn more and apply**.

The Together As Buckeyes emergency grants program, funded primarily by the federal Coronavirus Aid, Relief and Economic Security (CARES) Act, is available to all students — undergraduate, graduate and professional — through the Student Financial Aid office. To apply for a grant, students need to complete a one-page Emergency Request form and provide any supporting documentation. The Office of Student Financial Aid will process applications after determining eligibility based on each student's circumstances and guidance from the U.S. Department of Education.

The **Student Wellness Center** offers financial coaching through the Scarlet and Gray Financial nationally recognized peer financial coaching program. Through the program, students will learn about financial goal setting, banking basics, budgeting, credit education, debt repayment education and saving and retirement education. Learn more.

Food Assistance

It's a common idea that pervades American culture: when you're in college, it's simply a rite of passage to sustain yourself on cheap, unhealthy food. We disagree. We highly recommend OSU's **Buckeye Food Alliance** Lincoln Tower 150 food pantry (https://www.buckeyefoodalliance.org) and the MidOhio Foodbank (https://www.midohiofoodbank.org).

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 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.

- CarmenCanvas accessibility
- CarmenZoom accessibility

Grievances

If you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with me. Then, if necessary, take your case to the department chair, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23.

Grading and faculty response

Grading scale

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

How your grade is calculated

ASSIGNMENT CATEGORY	PERCENT
Homework	15
Quizzes	15
Midterm Exams (2 total)	40
Final Exam	20
Case Study Paper	10
Total	**100**

See attached schedule for due dates. Changes will be posted on Carmen.

Homework

Homework will be assigned on roughly a weekly basis and will reinforce and expand on the material and problems presented in the text and lecture. Students are encouraged to work together, but must submit individual solutions. Students working together on assignments should indicate in their submission that they are doing so and identify who they are working with. Assignments must be submitted electronically as a single PDF file to Carmen by midnight ET on the due date. Certain problems will require students follow a specific set of steps designed to help build problem solving skills. *Guidelines for this process will be provided on Carmen.*

Quizzes

There will be series of six quizzes that will be administered using Carmen following the attached schedule (any changes will be noted on Carmen). The quizzes will emphasize student's ability to recognize terms, theories, and concepts as well as their general understanding of the material. The quizzes will be open book and notes and must be completed in a given period of time.

Midterm Exams

There will be two in-class midterm exams offered during this course as noted in the course schedule, with any changes indicated on Carmen. The exams will stress fundamental principles and questions may include short answer, derivations of important equations, and numerical solutions. The exams will be open book and notes and must be completed in a given period of time.

Final Exam

There will be a semi-cumulative final exam. It will emphasize new topics presented after the second midterm exam, supplemented with a selection of problems from the prior midterm exams. The format will follow that used for the midterm exams.

Team Case Study Assignment

Students will be organized into teams to conduct an open-ended evaluation of a contemporary environmental problem and its potential solution from the perspective of physical, chemical and biological processes and concepts of sustainability, risk, public policy, and economics. From this evaluation, students will first prepare a detailed outline, followed by a reference-supported investigative report (~5 pages). *Guidance on the case study assignment will be provided on Carmen.*

Late assignments

Assignments received after their due date will receive a deduction of 10% of the total possible points. Assignments submitted after that time, but before solutions are made available, will receive further deductions. No credit will be given for assignments submitted after solutions are made available. Legitimate excuses for missing deadlines should be presented prior to the actual deadline, not after.

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-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:** I will reply to emails within **24 hours on days when class is in session at the university**.

COURSE SCHEDULE

Week	*Dates*	*Topic*	*HW/Quiz/Exam*	*Reading*
1	Aug 24	Course Management / Introduction		Syllabus
	Aug 26	Background		Ch 1.1
2	Aug 29	Environmental Sustainability		Ch 1.2 – 1.6
	Aug 31	Environmental Measurements & Units		Ch 2.1 – 2.5
	Sept 2	Environmental Risk	HW 1 Due	Ch 6.1 – 6.5
3	Sept 5	*No Class – University Holiday*		
	Sept 7	Environmental Risk		
	Sept 9	Environmental Risk	Quiz 1	
4	Sept 12	Case Study Discussion	Grad Topic Due	Extra reading on Carmen
	Sept 14	Chemistry for Environmental Engineering	HW 2 Due	Ch 3.1, 3.3, 3.5-3.9, 3.11
	Sept 16	Chemistry for Environmental Engineering		
5	Sept 19	Environmental Engineering Physical Processes		Ch 4.1-4.2
	Sept 21	Environmental Engineering Physical Processes	HW 3 Due	
	Sept 23	Environmental Engineering Physical Processes	Quiz 2	
6	Sept 26	Evaluating Chemical Fate – Partitioning		Ch 3.6, 3.10, 5.6
	Sept 28	Biology for Environmental Engineering	HW 4 Due	Ch 5.2, 5.3.1, 5.4
	Sept 30	Biology for Environmental Engineering		
7	Oct 3	**Midterm Exam #1**		
	Oct 5	Water Quantity and Quality		Ch 7.1-7.4
	Oct 7	Water Quality		Ch 7.7-7.9, 7.10.1, 7.10.3
8	Oct 10	Water Quality		
	Oct 12	Water Quality	HW 5 Due	
	Oct 14	*No Class – University Holiday*	Quiz 3	
9	Oct 17	Evaluating Chemical Fate – Subsurface		Ch 4.4.1; 7.10.2
	Oct 19	Drinking Water Treatment	HW 6 Due	Ch 8
	Oct 21	Drinking Water Treatment		
10	Oct 24	Drinking Water Treatment		Ch 4.4.2
	Oct 26	Drinking Water Treatment	HW 7 Due	
	Oct 28	Wastewater Treatment	Quiz 4	Ch 9.1-9.12
11	Oct 31	Wastewater Treatment	Grad Outline Due	
	Nov 2	Wastewater Treatment	HW 8 Due	
	Nov 4	Wastewater Treatment		
12	Nov 7	Wastewater Treatment		
	Nov 9	**Midterm Exam #2**		
	Nov 11	*No Class – University Holiday*		
13	Nov 14	Wastewater Treatment		
	Nov 16	Solid/Hazardous Waste	HW 9 Due	Ch 10.1 – 10.3
	Nov 28	Solid/Hazardous Waste	Quiz 5	
14	Nov 21	Air Pollution		Ch 11.1-11.5, 11.7-11.8
	Nov 23	*No Class – University Holiday*		
	Nov 25	*No Class – University Holiday*		
15	Nov 28	Air Pollution		
	Nov 30	Air Pollution	HW 10 Due	
	Dec 2	Air Pollution	Quiz 6	
16	Dec 5	Air Pollution	HW 11 Due: Grad Paper Due	
	Dec 7	Review/Catch up	Case Study Paper Due	
17	Dec 12	**Final Exam: 10am – 11:45am**		