

Environmental Engineering Fundamentals

UNIVERSITY OF CONNECTICUT
DEPT OF CIVIL AND ENVIRONMENTAL ENGINEERING
ENVE 2310 - SPRING 2021

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Office Hours: Mondays & Thursdays 3-4 PM or by appointment
(<https://uconn-cmr.webex.com/meet/ram15006>)

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Course Information:

ENVE 2310E is an introduction to the impacts of engineering on environmental systems. A problem-solving and case study approach will be used to investigate the fundamentals of water, air, and soil pollution. Concepts from aqueous chemistry, biology, and physics applied in a quantitative manner to environmental problems and solutions. Mass and energy balances, chemical reaction engineering. Quantitative and fundamental description of water and air pollution problems. Environmental regulations and policy, pollution prevention, risk assessment.

Grading:

| | |
|-------------------------|-----|
| Assignments | 20% |
| Exam 1 | 20% |
| Exam 2 | 20% |
| Final Exam | 15% |
| Discussion Board Posts | 8% |
| Mini Project | 7% |
| M5 Team Tech Assignment | 5% |
| Quizzes | 5% |

Course Objectives:

1. Describe environmental engineering systems using the language of environmental engineering practice.
2. Apply mass and energy balances to assess environmental systems in water, air and soil contexts.
3. Design components of systems for removing pollutants or preventing their generation or release.
4. Assess the appropriateness of an environmental engineering design outcome based on major environmental regulations.
5. Conduct a basic risk assessment to evaluate harm posed by chemical, physical, biological or radiological constituents.
6. Explain the global, environmental, economic, public policy and societal factors that contribute to the solution of contemporary environmental problems.

In addition, as a core course in both the Civil and Environmental Engineering programs at UConn, this course is evaluated by the ABET accreditation board. As such, we will cover two ABET Student Learning Outcomes. By the end of the course, students should have:

- 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
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Required Materials:

Environmental Engineering: Fundamentals, Sustainability, Design, 2nd Edition by James Mihelcic and Julie Zimmerman.
ISBN-13: 978-1118741498

Software/Technical Requirements (with Accessibility and Privacy Information)

The software/technical requirements for this course include:

- Computer Webcam
- HuskyCT/Blackboard ([HuskyCT/ Blackboard Accessibility Statement](#), [HuskyCT/ Blackboard Privacy Policy](#))
- [Adobe Acrobat Reader](#) ([Adobe Reader Accessibility Statement](#), [Adobe Reader Privacy Policy](#))
- Microsoft Office (free to UConn students through uconn.onthehub.com) ([Microsoft Accessibility Statement](#), [Microsoft Privacy Statement](#))
- Dedicated access to high-speed internet with a minimum speed of 1.5 Mbps (4 Mbps or higher is recommended).
- [Java](#) 8 or above
- A means of scanning and uploading your work. This can be a flatbed scanner or a smartphone. If you use a smartphone, you will be required to convert it to a PDF using a scanning app of your choice, such as CamScanner or GeniusScan, both of which have free versions available. Submitting a PDF instead of an image file will [make your work much easier to grade](#).

For information on managing your privacy at the University of Connecticut, visit the [University's Privacy page](#).

NOTE: This course has NOT been designed for use with mobile devices.

Help

[Technical and Academic Help](#) provides a guide to technical and academic assistance. This course is completely facilitated online using the learning management platform, [HuskyCT](#). If you have difficulty accessing HuskyCT, you have access to the in person/live person support options available during regular business hours through the [Help Center](#). You also have [24x7 Course Support](#) including access to live chat, phone, and support documents.

Accommodations for Illness or Extended Absences

Please stay home if you are feeling ill and please go home if you are in class and start to feel ill. If illness prevents you from attending class, it is your responsibility to notify your instructor as soon as possible. You do not need to disclose the nature of your illness, however, you will need to work with your instructor to determine how you will complete coursework during your absence.

If life circumstances are affecting your ability to focus on courses and your UConn experience, students can email the Dean of Students at dos@uconn.edu to request support. Regional campus students should email the Student Services staff at their home campus to request support and faculty notification.

Assignment Type Information:

Worksheets: are there to guide your learning and will be filled out after taking in readings or videos. They will be graded on a pass/fail basis.

Problem Sets: give you practice in using engineering tools to quantitatively solve problems. For each problem, 20% of the available points will be awarded for answering the question correctly. 40% of the points will be awarded for identifying the correct conceptual framework for solving the problem and 40% for your written work to use that conceptual framework to solve the question.

Midterm Exams: There will be two 50-minute exams. They will be comprised of multiple choice, T/F, short answer and problem-solving questions. You will be given an equation sheet ahead of time which will be available during the exam as a PDF. **For the problem-solving questions you will need to enter your numeric answer into the test itself and write your solutions out on a blank sheet of paper and upload them to a separate assignment entitled "Exam Work Upload" within 15 minutes of completing the exam.** After the exam, the instructor will adjust your scores for these problems based on your written solutions.

Final Exam: The final exam will be similar in format to the midterm exams. It will be cumulative, covering all the course, but with emphasis on Module 5 which is not covered in any midterm exam.

Discussion Board Posts: Most weeks you will be given a scenario or issue to think about and read about and asked to contribute to discussion board posts and respond to your peers. A grading rubric will be available for each of your posts.

Mini Project: Each student will pick a topic pertaining to environmental justice or a prevalent contaminant. Students will write a one-page(max) writeup on their topic and prepare one slide that they will submit by the end of the semester. A PowerPoint with all slides will be compiled and students will be tasked with reviewing the slides and talking about a contaminant and environmental justice issue (not including their own) on final exam.

Module 5 Team Technology Assignment: Students will select an environmental engineering related technology that can be used in resource-poor settings.

Quizzes: There will be short quizzes each week to check your comprehension of the online material. These quizzes will be due Friday by 11:59PM.

Grading Scale:

Final grades will be assigned based on the scoring system below. The numbers in the "Grade" column are preliminary. Based on the final grade distribution in the course, the Instructor may adjust these downward, but not upward.

| Grade | Letter Grade | GPA |
|--------|--------------|-----|
| 93-100 | A | 4.0 |
| 90-92 | A- | 3.7 |
| 87-89 | B+ | 3.3 |
| 83-86 | B | 3.0 |
| 80-82 | B- | 2.7 |
| 77-79 | C+ | 2.3 |

| Grade | Letter Grade | GPA |
|-------|--------------|-----|
| 73-76 | C | 2.0 |
| 70-72 | C- | 1.7 |
| 67-69 | D+ | 1.3 |
| 63-66 | D | 1.0 |
| 60-62 | D- | 0.7 |
| <60 | F | 0.0 |

Due Dates and Late Policy:

All assignments must be submitted on time. Each student will have 4 "late tokens", each of which allows an assignment to be submitted up to 48 hours late. Later than this is not possible since solutions will normally be posted 48 hours after due dates. Tokens can be used only on problem sets, worksheets, and case studies. They cannot be used for assignments due just before exams, since then the solution will be posted the moment the assignment is due. They cannot be used for discussion board assignments since late submissions would not be available for other students to comment on.

Course Outline:

The course will be organized by Module or topic. Each module will span over roughly 3 weeks.

| Module | Week & Date | Topics | | |
|-----------------------------|-------------|-------------------------------|---|--|
| 1: Mass & Energy Balance | 1 18-Jan | Mass balance | ENVE intro Mass balance intro Steady state CMFR at SS | Example problem Reaction |
| | 2 25-Jan | Reactions Non-steady state | Kinetics review SS-CMFR with rxn Non-SS CMFR PFR-SS | Example problem Distinguishing SS vs non-SS, CMFR vs PFR Energy balance |
| | 3 1-Feb | Energy balance | Energy balance intro Heat capacity Latent heat | Example problem Energy resources |
| 2: Energy and Air Pollution | 4 8-Feb | Energy resources | Impacts of fossil fuels Power generation Fossil and renewable resources | Energy & mass balance example Air pollutants |
| | 5 15-Feb | Air quality | Clean Air Act Criteria pollutants Greenhouse effect | AQI example Atmospheric temperature profiles |
| | 6 22-Feb | Atmospheric mixing | Lapse rate Atmospheric stability | Atmospheric mixing Water quality parameters |
| 3: Water and Wastewater | 7 1-Mar | Water quality | Scale of water usage Water quality parameters Water quality regulation | Water quality Processes in water treatment |
| | 8 8-Mar | Water treatment | Coagulation & flocculation Disinfection Disinfection byproducts | Water treatment Wastewater treatment processes |
| | 9 15-Mar | Wastewater treatment | Primary (settling) Secondary (aeration) Tertiary (nutrients) | Wastewater treatment Soil properties |

| Module | Week & Date | Topics | | |
|--|---|------------------------------------|---|---|
| 4: Soil and Hydrogeology | 10 22-Mar | Soil and groundwater contamination | Mitigating releases Regulation Subsurface flow | Subsurface contamination and regulation How to clean groundwater |
| | 11 29-Mar | Groundwater remediation | Types of contamination Remediation technologies | Remediation design Introducing risks |
| 5: ENVE Systems | 12 5-Apr | Risk | Cancer risks vs hazards Calculating cancer risk Acceptable risk | Determining acceptable risk Life cycle analysis |
| | Spring Break (April 11 - April 17) | | | |
| | 13 19-Apr | Sustainability | Life cycle analysis Green buildings | Green technologies Review |
| | 14 26-Apr | Review | | |
| Reading Week (April 29 – May 2) | | | | |

Course Deadlines

| | | | | | | | |
|--------|---|--------|--|---------|---|--------|---|
| Week 1 | M | 18-Jan | Syllabus Quiz & DB Intro Practice Assign. Submission Week 1 Quiz | Week 8 | M | 8-Mar | Week 7 Worksheet |
| | T | 19-Jan | | | T | 9-Mar | |
| | W | 20-Jan | | | W | 10-Mar | |
| | R | 21-Jan | | | R | 11-Mar | |
| | F | 22-Jan | | | F | 12-Mar | |
| Week 2 | M | 25-Jan | Week 2 Problem Set Week 2 Quiz | Week 9 | M | 15-Mar | Week 8 Worksheet Mini Project Slide Draft Week 9 Quiz |
| | T | 26-Jan | | | T | 16-Mar | |
| | W | 27-Jan | | | W | 17-Mar | |
| | R | 28-Jan | | | R | 18-Mar | |
| | F | 29-Jan | | | F | 19-Mar | |
| Week 3 | M | 1-Feb | Week 3 Problem Set Mini Project Topic Submission Week 3 Quiz | Week 10 | M | 22-Mar | Week 9 Problem Set Module 3 Problem Set Week 10 Quiz |
| | T | 2-Feb | | | T | 23-Mar | |
| | W | 3-Feb | | | W | 24-Mar | |
| | R | 4-Feb | | | R | 25-Mar | |
| | F | 5-Feb | | | F | 26-Mar | |
| Week 4 | M | 8-Feb | Week 4 Problem Set Week 4 Quiz | Week 11 | M | 29-Mar | Week 10 Problem Set Mini Project Final Week 11 Quiz |
| | T | 9-Feb | | | T | 30-Mar | |
| | W | 10-Feb | | | W | 31-Mar | |
| | R | 11-Feb | | | R | 1-Apr | |
| | F | 12-Feb | | | F | 2-Apr | |
| Week 5 | M | 15-Feb | Week 5 Case Study Week 5 DC Replies Week 5 Quiz | Week 12 | M | 5-Apr | Week 11 Case Study Exam 2 Week 12 Quiz |
| | T | 16-Feb | | | T | 6-Apr | |
| | W | 17-Feb | | | W | 7-Apr | |
| | R | 18-Feb | | | R | 8-Apr | |
| | F | 19-Feb | | | F | 9-Apr | |
| Week 6 | M | 22-Feb | Week 6 Worksheet Mini Project Writeup Outline Week 6 Quiz | Week 13 | M | 19-Apr | Week 12 Problem Set Risk Ranking Assignment Week 13 Quiz |
| | T | 23-Feb | | | T | 20-Apr | |
| | W | 24-Feb | | | W | 21-Apr | |
| | R | 25-Feb | | | R | 22-Apr | |
| | F | 26-Feb | | | F | 23-Apr | |
| Week 7 | M | 1-Mar | Week 7 Problem Set Module 2 Problem Set Exam 1 Week 7 Quiz | Week 14 | M | 26-Apr | Tech Assignment Slides Tech Assignment Comments |
| | T | 2-Mar | | | T | 27-Apr | |
| | W | 3-Mar | | | W | 28-Apr | |
| | R | 4-Mar | | | R | 29-Apr | |
| | F | 5-Mar | | | F | 30-Apr | |

Student Authentication and Verification

The University of Connecticut is required to verify the identity of students who participate in online courses and to establish that students who register in an online course are the same students who participate in and complete the course activities and assessments and receive academic credit. Verification and authentication of student identity in this course will include: Secure access to the learning management system using your unique UConn NetID and password.

Student Responsibilities and Resources

As a member of the University of Connecticut student community, you are held to certain standards and academic policies. In addition, there are numerous resources available to help you succeed in your academic work. Review these important [standards, policies and resources](#), which include:

- The Student Code
 - Academic Integrity
 - Resources on Avoiding Cheating and Plagiarism
- Copyrighted Materials
- Netiquette and Communication
- Adding or Dropping a Course
- Academic Calendar
- Policy Against Discrimination, Harassment and Inappropriate Romantic Relationships
- Sexual Assault Reporting Policy

Students with Disabilities

The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or <http://csd.uconn.edu/>.

Blackboard measures and evaluates accessibility using two sets of standards: the WCAG 2.0 standards issued by the World Wide Web Consortium (W3C) and Section 508 of the Rehabilitation Act issued in the United States federal government.” (Retrieved March 24, 2013 from [Blackboard's website](#))

Resources for Students Experiencing Distress

The University of Connecticut is committed to supporting students in their mental health, their psychological and social well-being, and their connection to their academic experience and overall wellness. The university believes that academic, personal, and professional development can flourish only when each member of our community is assured equitable access to mental health services. The university aims to make access to mental health attainable while fostering a community reflecting equity and diversity and understands that good mental health may lead to personal and professional growth, greater self-awareness, increased social engagement, enhanced academic success, and campus and community involvement.

Students who feel they may benefit from speaking with a mental health professional can find support and resources through the [Student Health and Wellness-Mental Health](#) (SHaW-MH) office. Through SHaW-MH, students can make an appointment with a mental health professional and engage in confidential conversations or seek recommendations or referrals for any mental health or psychological concern.

Mental health services are included as part of the university's student health insurance plan and also partially funded through university fees. If you do not have UConn's student health insurance plan, most major insurance plans are also accepted. Students can visit the **Student Health and Wellness-Mental Health located in Storrs on the main campus in the Arjona Building, 4th Floor**, or contact the office at (860) 486-4705, or <https://studenthealth.uconn.edu> for services or questions.