

CEE 365: ENVIRONMENTAL ENGINEERING PRINCIPLES

Lectures: MW 12:00 - 1:20pm
1200 EECS

Discussion Section: F 11:30am - 12:20pm
1200 EECS

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Office Hours: M 2:00-3:00pm in 181 EWRE
W 3:00pm-4:00pm in 181 EWRE

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Textbook: Environmental Engineering Science
by Nazaroff and Alvarez-Cohen
ISBN 0-474-14494-0

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Office Hours: Tu 3pm – 4pm in EWRE 153
Th 12pm-1pm in EWRE 153

1. GENERAL COURSE INFORMATION

Objectives. This course examines the basic physical, chemical, and biological principles that determine the fate of pollutants in environmental and engineered systems. We will also be introduced to the regulations that have been established to mitigate harmful effects of pollutants. The course is valuable as a prerequisite to more advanced courses in environmental engineering and an introduction to environmental constraints that are increasingly important to other engineering disciplines.

At the completion of the course, students should be able to:

- Work with environmental units of concentration, liquid flow rates, and mass flow rates.
- Given the rate of reaction and mass flow rate, compute the concentration of a pollutant in air or water and to develop mass balances for CMFRs and PFRs.
- Understand basic physical principles and processes involved in pollutant transport and removal.
- Understand the basic principles of aqueous chemistry and disinfection.
- Given the characteristics of a chemical, such as vapor pressure and solubility, determine equilibrium concentrations.

- Employ models to estimate the concentration of D.O. in streams and air pollutants downwind of a point source.
- Summarize the major U.S. environmental regulations.

Lecture Materials. Lectures material will be posted online the evening before class. Lecture materials have the outline of the lecture, and details will be filled in during the lecture. If you miss a class for any reason, it is your responsibility to get notes from a fellow classmate.

Textbook and Other Reading Assignments. Readings will be assigned and posted prior to nearly every class and discussion section. Much of the assigned text will be from our textbook, but other material will sometimes be posted.

2. DESCRIPTION OF COURSEWORK

Homework. I will assign homework assignments every other week throughout the semester. The homework sets will be graded and are essential for good performance on the exams. Working together on homework is encouraged, but each student should submit their own copy of the homework written in their own handwriting. Hard copies of homework assignments will be due in the course homework box in EWRE 173 by 12pm on the deadline. Solutions to homework will be posted immediately after homework is due so that students can use solutions to study for quizzes. For this reason, late homework submissions will not be accepted.

Homework problems should be solved on gridded engineering paper on only one side. Your work must be neat and legible and the paper should be stapled together and numbered. Clearly state the given information and any assumptions in solving the problem. Units must be specified on all numbers used in formulas, tables, sketches with dimensions and graphs. Graph axes must be clearly labeled. Use a pencil for your work. Sketches, graphs, and text should be large enough to easily read. Answers should be clearly marked (i.e., circled, boxed, or underlined). Please be conscious that the number of significant digits in all of your numbers reflects the significant digits in your given information. Short answer homework problems can be typed and printed. **You will be marked down for not following these homework guidelines.**

iClicker questions. To strongly encourage student participation in class, I will pose iClicker questions and problems on the material through my lectures. Participation points will be awarded for iClicker responses each class. At the end of the semester, **2 days of iClicker responses** will be discarded from each student's grades—this is for days you miss class and days you have problems with your i>clickers.

iClickers. The i>clicker audience response system (clickers) will be used daily in this class. Please purchase an i>clicker device. You will need to register your remotes on the course Canvas site (NOTE: this has to be done every year). See the i>clicker tab on the left hand side of the CEE 365 Canvas site to register.

iClickers are available for purchase from the Computer Showcase in the Michigan Union and Pierpont Commons. The cost for a new i>clicker is \$38 and the cost of used i>clickers is \$28 (while supplies last). At the end of the term, your clicker can be sold back to the Computer Showcase for \$18. i>clicker devices can be shared between students, but cannot be shared for the same class or for classes at the same time. Students can explore additional information about clickers at <http://blogs.lsa.umich.edu/ltc/instructors/>. *Please contact me if making this purchase is too much of a financial burden, and we can work together to find a solution.*

Friday lectures. Friday meeting times are mandatory. In these lectures, we will have section quizzes, conduct discussions/activities on major environmental regulations, and work through additional example problems.

Section Quizzes. Six midterm quizzes are scheduled, with most during the Friday Discussion Section. Most quizzes will include a few short qualitative questions (e.g. multiple choice, fill in the blank, draw a diagram) and a quantitative problem with multiple parts. You will have the entire 50 minutes to take the quiz, although they will be designed to take 30 minutes. I will post the equations that will be provided on quizzes as well as a review guide. At the end of the semester, your lowest quiz score will be discarded from your overall grade. Cell phones will not be allowed to be on desks during the quizzes; therefore, you should bring a calculator without wifi access to all quizzes and the final exam.

For quizzes that are missed due to excused absences, there will be a single make-up quiz time on December 12 at 2pm. You may choose to either take the make-up quiz or use your missed quiz as your throw-out grade.

Final Exam. The final exam will be held on Tuesday, December 18, from 1:30 pm-3:30 pm. I will schedule an alternative exam time for students who have more than 2 exams scheduled on the 18th. The final exam will be multiple choice.

3. ETHICS, GRADING, AND REGRADING

Academic Integrity. The College of Engineering is a community in which personal responsibility, honesty, fairness, respect, and mutual trust are maintained. You are expected to practice the highest possible standards of academic integrity. Any deviation from this expectation will result in a minimum academic penalty of your failing the assignment, and will result in additional disciplinary measures. This includes, but not limited to, cheating, using unauthorized material during exams, using or copying another student's work, and any other form of academic misrepresentation. For a list of actions that constitute misconduct, and possible sanctions for those actions, please see the Code of Conduct at <http://www.lsa.umich.edu/academicintegrity/>.

Grading. As my ultimate goal is to help everyone learn the material and to earn an “A”, there is no curve in this class. The following table provides an approximate breakdown of points available throughout the semester.

	#/semester	Points
<i>Homework</i>	6	50 each
<i>Daily iClicker Questions</i>	~28	4 each
<i>Section Quizzes*</i>	6	100 each
<i>Final Comprehensive Exam</i>	1	200
Approximate Total		~1050

**At end of semester, lowest quiz score and homework score gets thrown out of total grade*

I want each student’s standing to be perfectly clear throughout the semester. I **therefore do not curve the grades.** At the end of the semester, the total earned points will be divided by the total offered points (see table above). Grades will be assigned based on the earned percentages: A+ 98.0-100%, A 92.0-97.9%, A- 90.0-91.9%, B+ 88.0-89.9, B 82.0-87.9%, B- 80.0-81.9, C+ 78.0-79.9, C 72.0-77.9%, C- 70.0-71.9, D+ 68.0-69.9, D 62.0-67.9%, D- 60.0-61.9, E <60.0%, X Missed Final, I Incomplete.

Regrading. I consider your grade to be extremely important and strongly encourage you to bring substantial errors (> 3%) in grading to my attention. However, **only written requests** for regrading will be considered and they must be submitted within one week of when I return the graded assignment/exam to the class. If you first approach me in person regarding your grade, I will not consider your request at all. Your written request must be brief, to the point, and accompanied by the original unaltered work under contention.

Missed Classes and Exams. Only excused absences (as defined by UM) will be considered for quiz and assignment make-ups.

4. DIVERSITY, EQUITY, AND INCLUSION

Commitment to Equal Opportunity. I am committed to a policy of equal opportunity for all persons and do not discriminate on the basis of race, color, national origin, age, marital status, sex, sexual orientation, gender identity, gender expression, disability, religion, height, weight, or veteran status. Please feel free to contact me with any problem, concern, or suggestion. I ask that all students treat each other with respect.

Accommodations for Students with Disabilities. If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make us aware of your needs, we can work with the Services for Students with Disabilities (SSD) office to help us determine appropriate academic accommodations.

SSD ([734-763-3000](tel:734-763-3000); <http://ssd.umich.edu>) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information you provide is private and confidential and w

Student Mental Health and Wellbeing. The University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at [\(734\) 764-8312](tel:734-764-8312) and <https://caps.umich.edu/> during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at [\(734\) 764-8320](tel:734-764-8320) and <https://www.uhs.umich.edu/mentalhealthsvcs>, or for alcohol or drug concerns, see www.uhs.umich.edu/aodresources.

For a listing of other mental health resources available on and off campus, visit: <http://umich.edu/~mhealth/>.

5. COURSE SCHEDULE

Below is the planned schedule for the semester. Monday and Wednesday meeting times are in white, Friday meeting times are in gray. I will do my best to stick to this schedule, but there may be unforeseen changes. I will announce on Canvas each time I update the syllabus.

Lecture Schedule

Date	Lecture Topic	Where material will be assessed
Sept. 5	The Flint Water Crisis: Drinking Water Treatment	Quiz 1
Sept. 7	No recitation	
Sept. 10	Combined Sewer Overflows: Wastewater Treatment	Quiz 1
Sept. 12	The Ann Arbor Dioxane Plume: Hazardous Waste Management and Subsurface Contamination	Quiz 1
Sept. 14	Spotlight on the Safe Drinking Water Act and Clean Water Acts	Final
Sept. 17	California's Battle with Air Quality: Air Quality Engineering	Quiz 1
Sept. 19	Pollutant Types, Properties, and Concentrations	Quiz 2
Sept. 21	Quiz 1	
Sept. 24	Equilibrium: Vapor Pressure and Henry's Law (i.e., Pollutant Partitioning Between Liquid and Air)	Quiz 2

Sept. 26	Equilibrium: Isotherms (i.e. Pollutant Partitioning Between Solids and Water and Solids and Air)	Quiz 2
Sept. 28	Example Problems on Equilibrium	Quiz 2
Oct. 1	Equilibrium: Solubility Products	Quiz 2
Oct. 3	Chemical Transformations: Acid Base Reactions	Quiz 3
Oct. 5	Quiz 2	
Oct. 8	Chemical Transformations: Kinetics	Quiz 3
Oct. 10	Chemical Kinetics Applied: Disinfection Processes	Quiz 3
Oct. 12	Problems on Chemical Transformations	Quiz 3
Oct. 15	Fall Break: No Class	
Oct. 17	Chemical Transformations: Redox Reactions and Oxygen Demand	Quiz 3
Oct. 19	Problems on Chemical Transformations	Quiz 3
Oct. 22	Review of Chemical Transformations	Quiz 3
Oct. 24	Materials Balance and Ideal Reactors	Quiz 4
Oct. 26	Quiz 3	
Oct. 29	Ideal Reactors with Nonconservative Constituents	Quiz 4
Oct. 31	Ideal Reactors with Nonconservative Constituents	Quiz 4
Nov. 2	Example problems with Ideal Reactors	Quiz 4
Nov. 5	Ideal Reactors with Non-Steady-State Conditions	Quiz 4
Nov. 7	Transport Phenomena: Advection, Diffusion, Dispersion	Quiz 5
Nov. 9	Quiz 4	
Nov. 12	Transport Phenomena: Particle Transport	Quiz 5
Nov. 14	Transport Phenomena: Mass Transfer at Boundaries and in Porous Media	Quiz 5
Nov. 16	Problems on Transport Phenomena	Quiz 5
Nov. 19	Wrap-up on Transport Phenomena	Quiz 5
Nov. 21	Water Quality Modelling (D.O. Sag Curve)	Quiz 6
Nov. 23	Thanksgiving Break: No Class	
Nov. 26	Quiz 5 and Water Quality Modelling (D.O. Sag Curve)	Quiz 6
Nov. 28	Air Quality Modelling (Gaussian Plume Dispersion Modelling)	Quiz 6
Nov. 30	Problems on Water and Air Quality Modelling	Quiz 6
Dec. 3	Air Quality Modelling: Line Emission Modelling	Quiz 6
Dec. 5	Spotlight on the Clean Air Act	Final
Dec. 7	Quiz 6	

Dec. 10	Environmental Engineering Beyond Water and Air Engineering	Final
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**Reading material will be announced at the beginning of each week on CTools

Homework Schedule

Assignment	Date Assigned	Date Due
1	Sept. 5	Wednesday, Sept. 19, 12pm
2	Sept. 19	Wednesday, Oct. 3, 12pm
3	Oct. 3	Wednesday, Oct. 24, 12pm
4	Oct. 24	Wednesday, Nov. 7, 12pm
5	Nov. 7	Wednesday Nov. 21, 12pm
6	Nov. 21	Wednesday, Dec. 5, 12pm

Homework solutions will be posted on Canvas by 2pm on the day they are due. No late homework submissions will be accepted. The lowest HW grade will be thrown out from your grade at the end of the semester.