CEE 153: Introduction to Environmental Engineering and Science
(Alternative Title: Introduction to Environmental Engineering, Science and Sustainability)
CEE 153 (Undergraduate)
Quarter: Fall 2018; Lecture: Monday and Wednesday at 4:00–5:50 pm
Location: TBA

Course Description: This course introduces environmental engineering and science topics and provides quantitative tools to assess the severity of various environmental issues and estimate performance efficiencies of engineering systems to solve those issues. Students will learn environmental issues including water scarcity, water quality degradation, solid and hazardous waste, and air quality, and apply environmental science and engineering principles to develop sustainable solutions.

Instructor
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Prerequisites
Students are expected to have basic knowledge in college-level chemistry and familiarity with a spreadsheet program like Excel.

Enrollment/PTE
PTE number will be provided on the first week of class. There should be enough seats for everyone to get enrolled (based on historical data).

Text book

Additional study materials will be uploaded on the class website. Some of those materials are from the reference text books:

Learning Objectives
The overall course objective is to help students apply science and engineering tools to quantify extent of air, water, and soil quality degradation by anthropogenic activities and evaluate engineering designs to reduce environmental impacts. Students will:

- **Review** fundamental physical, chemical, and biological processes of contaminant transport and removal in different environmental compartments (soil, water, air, and biological systems such as plants).
- **Apply** the concepts of mass balance and reaction kinetics to evaluate the transport of contaminants in surface waters, groundwater, and air.
- **Design** natural and structural treatment systems to treat drinking water, wastewater, and stormwater.
- **Understand** fundamental principles behind technologies to recover resources (material and energy) from wastes.
- **Learn** the concept of sustainability and apply sustainable principles to optimize engineering designs.
- **Calculate** risk based on exposure to contaminated environment.
- **Develop** skills via classroom discussion on contemporary topics to engage in life-long learning on environmental sustainability.

ABET Goals
This course contributes to the following ABET outcomes:
(a) An ability to apply knowledge of mathematics, science, and engineering
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) knowledge of contemporary issues.

Grading
Letter grade.
Homework 20 %; Two quizzes 10 %; Midterm Exam 25 %; Final Exam 40 %; Class Participation 5%.

Course Format
Lecture, four hours; discussion, one hour (when scheduled); outside study, seven hours. Lectures supplemented with outside reading, homework, and exams.

Schedule
A list of topics and tentative schedule to cover those topics are provided here.
Lectures

Copies of all handouts, annotated slides, and lecture notes will be made available on the class website. The material for which students are responsible is defined by the content and scope of the lectures and class discussions. Students are not required to be familiar with subjects in the handout that are not mentioned on the lecture notes.

Homework

Homework assignments will be given on approximately a weekly basis and will be due on the date indicated. Homework must be turned in at the beginning of class. Late homework may not be accepted unless prior permission is granted. You are encouraged to work in groups because of the multidisciplinary nature of each assignment, but each student must turn in their own assignment.

Homework will be evaluated and returned with solutions as soon as possible. Each question will have 5 points.

5 Correct solution, both methodologically and numerically.
4 Correct general approach but with minor computational or table look-up errors, leading to erroneous final result.
3+ Given efforts: two wrong attempts.
2 One wrong attempt.
1 Lack of effort.

-5% (of total) for lack of clarity.

Discussion section

Attendance at discussion sections is optional, and you may attend any section you wish each week.

Exam

There will be one mid-term exam (two hours) and a final exam (three hours). All exams are closed book except for one summary sheet (A4 size, both sides). The exam books will be provided.

Quiz

At least two in-class quizzes (graded) with 10 multiple choice questions will be conducted. Demo quizzes (not graded) will be provided in each class for practice and teaching and learning assessment.

Class Participation

Students are required to participate in discussion in classroom and on online forum (Piazza or CCLE), post or comment on relevant news articles.
posted on Piazza, participate in polls and in-class activities (demo quizzes). Students can earn full 5% participation credit, if they have met all the following criteria: attended few in-class quiz (demo), posted at least one relevant news article or commented on one posted articles, and participated in discussion related environmental sustainability, homework, or questions on online forum.

**Contemporary Issues**

In each class, there will be discussion on a recent news articles related to environmental issues, solutions, and sustainability. Similar news articles will be posted on online forum for discussion among students.

The discussion forum will give students opportunity to learn from their peers and analyze complex environmental issues and solutions in the context of sustainability.

**Course expectation**

Exam, quizzes, and assignments will be oriented towards evaluating a student's understanding of the subject matter. Students are expected to synthesize material from lectures and read sections of handouts mentioned in the class notes. Students will do their independent research to complete the project, but they are required to work in a team. The classroom activities, assignments, and project report writing are intended to prepare students for real-world professional employment.

**Class website**

Slides, lecture notes, problem sets and solutions, handouts, and other material will be posted on CCLE [https://ccle.ucla.edu/](https://ccle.ucla.edu/) and Piazza [https://piazza.com/ucla/fall2017/cee153/](https://piazza.com/ucla/fall2017/cee153/)

**Cell phone policy**

Cell phone use in class is not permitted, unless required for class activity.

**Academic integrity**

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Details here: [http://www.deanofstudents.ucla.edu/Academic-Integrity](http://www.deanofstudents.ucla.edu/Academic-Integrity)


**Tentative Schedule**

**Week 1**

**Topics:**
- Introduction to Environmental Engineering and Science
- Concept of Sustainability (1.2-1.4)
- Environmental Measurements: Units (Chapter 2)

**Assignment Due**
- None

**Week 2**

**Topics:**
- Chemistry Fundamentals: acid-base chemistry (3.7) and redox (3.8)

**Assignment Due:**
- HW 1 out: Due

**Week 3**

**Topics:**
- Mass Balance: Fundamentals (4.1)
- Mass Balance: Reactor types (4.1) and reaction Kinetics (3.11)

**Assignment Due:**
- HW 2 out: Due
- **Quiz 1**

**Week 4**

**Topics:**
- Water quality: Surface water (7.7)

**Assignment Due:**
- HW 3 out: Due

**Week 5**

**Topics:**
- Water quality: Groundwater (7.10)

**Assignment Due:**
- HW 4 out: Due
Week 6
Topics:
- Water Treatment Processes (8.5-8.11)
- Reaction processes: volatilization, coagulation, adsorption, and precipitation.
Assignment Due:
- HW 5 out: Due

Week 7
Topics:
- Waste Water Treatment Design (9.3-9.9)
Assignment Due:
- Midterm

Week 8
Topics:
- Green Infrastructure (9.17)
- Solid Waste Management (10.2-10.3)
Assignment Due:
- HW 6 out: Due

Week 9
Topics:
- Air quality (11.4, 11.7, and 11.8)
Assignment Due:
- Quiz 2

Week 10
Topics:
- Environmental Risk (6.3-6.6)