

# ENGINEERED SYSTEMS AND SUSTAINABILITY

Civil and Environmental Engineering 11

Fall Semester 2022

**Course Description** An introduction to key engineered systems (e.g., energy, water supply, buildings, transportation) and their environmental impacts. Basic principles of environmental science needed to understand natural processes as they are influenced by human activities. Overview of concepts and methods of sustainability analysis. Critical evaluation of engineering approaches to address sustainability.

*Instructor:* Prof. Robert Harley [harley@berkeley.edu](mailto:harley@berkeley.edu)  
Office Hours: M/W 11:15 AM-12:30 PM in 667 Davis

*GSI:* Sumukhi (Sumu) Prasad [sumukhi\\_prasad@berkeley.edu](mailto:sumukhi_prasad@berkeley.edu)  
Office Hours: TBD

*Prerequisites:* Chemistry 1A and Math 1A

*Lectures:* MWF @ 9 AM 50 Birge Hall

## Topics Covered and Related Readings

Oceans & hydrologic cycle	Text 1.4, 5.2
Atmosphere & carbon cycle	Text 8.1-8.2, 8.6
Planetary energy balance & climate change	Text 1.4, 8.4-8.5, 8.8-8.10
Population growth & resource depletion	Text 3.2-3.5
Water supply systems	
Groundwater resources	Text 5.8-5.11
Safe drinking water: disinfection, other contaminants	
Dissolved oxygen & eutrophication	Text 5.6
Fossil fuels & combustion/heating value	Text 2.2-2.3
Pathways to carbon neutrality	
Carbon capture, utilization & storage (CCUS)	
Wind & solar power	Text 1.4
Nuclear power	Text 2.6
Electric grid	
Transportation systems and infrastructure	
Motor vehicles and air pollution	Text 7.8
Petroleum & bio-fuels	Text 7.8
Battery-electric vehicles	Text 7.8
Hydrogen production & fuel cells	Text 7.8
Buildings and energy use	Text 1.4
Indoor environment	Text 7.12
Building materials: steel, concrete, timber	
Waste management and resource recovery	Text 9.3, 9.5
Lifecycle assessment	Text 9.6
Uncertainty analysis	

**Textbook** G.M. Masters and W.P. Ela. *Introduction to Environmental Engineering and Science*, 3<sup>rd</sup> Edition. Good coverage of climate change, population growth, resource depletion, water quality, groundwater, and waste management.

## Expected Work and Grading

Homework will typically be due on Wednesdays by 11:59 PM (hand in your answers using gradescope). Homework may be submitted later in the week, with a 10% deduction for Thursday submissions and a 20% deduction for Friday submissions. Homework regrade requests must be submitted (by e-mail to the GSI) within seven days after homework scores are posted.

There will be two midterm exams that will take place during regularly-scheduled class periods at 9 AM on Wednesdays **September 28** and **November 9**.

A comprehensive final exam covering material from the entire semester will be held on **Thursday Dec 15<sup>th</sup> from 7-10 PM**. The final exam will be problem-solving oriented, similar in style to the questions on the homework assignments. Extra time will be allowed on all exams as appropriate, based on accommodation letters received from the Disabled Students Program. We cannot accommodate students with other final exams scheduled at the same time.

The weighting scheme that will be used for assigning final grades is 30% for homework, 20% for the midterm exams (2 @ 10% each), and 50% for the final exam.

## Course Policies

We are committed to creating a welcoming learning environment that supports a diversity of thoughts, perspectives and experiences, and respects your identities and backgrounds (including race/ethnicity, nationality, age, gender/gender identity, sexual orientation, family situation, religion, and ability). Please avoid disrespectful behavior and profanity during class-related interactions including lectures, office hours, study groups, e-mails, and chat messages. Please notify one of the instructors if there is anything that is making you feel unwelcome or uncomfortable, so that we know and can take appropriate action.

Everyone in the class is expected to adhere to Berkeley's honor code: "*As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others.*" You are encouraged to work together to discuss and understand course material, but all submitted written work for the homework assignments must be your own. For cases of homework copying, those involved (including the provider of answers as well as the copiers) will receive a score of zero for that assignment. You are welcome to study together in advance of exams, but you may not copy answers or collaborate with anyone during exams. Cheating on an exam will lead to a score of zero on that exam *and* a one-letter deduction on your overall grade in the class.