

# The University of Southern California

## ENE 505: Energy and the Environment

**Semester:** Fall 2017

**Location:** OHE 136

**Day/Time:** T/Th 3:30-4:50pm

**Course Content Access:** <https://courses.uscdcn.net/d2l/login> (USC email login)

**Instructor:** Prof. Kelly Sanders, Ph.D

**Office Phone:** (213) 821-0095

**Email:** [ktsanders@usc.edu](mailto:ktsanders@usc.edu)

**Office Location:** KAP 200B [Second floor, Kaprielian Hall]

**Office Hours:** 2– 3pm on Wednesdays or by appointment

**Teaching Assistant:** Angineh Zohrabian

**Office Location:** KAP B40 (Basement)

**Office Hours:** Mondays 2-3 PM

**Email:** [azohrabi@usc.edu](mailto:azohrabi@usc.edu)

**Teaching Assistant:** Mo Chen

**Office Location:** KAP B40 (Basement)

**Office Hours:** Thursdays 11-12pm

**Email:** [chen921@usc.edu](mailto:chen921@usc.edu)

### **Course Scope and Organization:**

This multidisciplinary course is intended to give graduate students an introduction to quantitative concepts related to energy and the environment. The course is lecture-oriented and will provide students with a working knowledge of the critical issues facing energy extraction, cultivation, transformation, transportation, consumption, disposal, environmental impacts and policy. Topics related to energy history, economics and current events will be incorporated throughout.

The course is split into seven modules:

- Module 1: Energy Basics and Fundamentals
- Module 2: Primary Energy Sources
- Module 3: The Power Sector
- Module 4: The Transportation Sector
- Module 5: Other End-use Sectors
- Module 6: Energy and the Environment
- Module 7: Energy Policy and Societal Issues

Class lectures and assignments are designed to promote students' mastery of energy issues and their relationship to our physical, regulatory and societal environments. Upon the conclusion of the class, students will be expected to demonstrate proficiency in the following areas:

- 1) **Technical Retention:** Demonstrate a technical mastery of energy jargon, (definitions, measurement, forms, units), primary energy sources (production, transportation, transformation), energy infrastructure (prime movers, pollution controls, delivery), consumption, and environmental impacts.
- 2) **Critical Thinking:** Demonstrate an ability to critically evaluate topics at the intersection of energy and the environment.
- 3) **Analytical Assessment:** Demonstrate an ability to perform a novel analytical assessment of an original research question related to energy and the environment.
- 4) **Communication:** Accurately, effectively, and creatively communicate energy topics to a broader audience.

### **Grades and Assignments:**

A brief overview of assignments and expectations are included here. Full project descriptions and rubrics will be disseminated during class lecture.

Assessment	Percentage of Final	Purpose of the Assessment
Exam I	20%	Technical Mastery of Modules 1 - 4
Exam II	20%	Technical Mastery of Modules 5 - 7
Group Research Paper	25%	Analytical Assessment, Critical Thinking
Group Video Project	15%	Communication
Homework	20%	Critical Thinking

### **Exams:**

- Exams will be a mixture of multiple choice, true and false, and short answer type- problems
- Exam material will be closed-notes and cover class lecture and class slides

### **Group Project:**

- Groups will be assigned by Professor
- Ph.D. students are able to petition to do an individual research related project, if desired, by submitting a signed statement from their Faculty Advisor
- Working professionals taking the DEN class are able to submit a petition on company letterhead to do an individual research project, if desired

#### Research Paper Component:

- Students will be expected to write an analytical paper on a topic of their choice that integrates the theme of energy and the environment
- Grades will reflect quality of analysis and research, quality of writing, quality of citations, and the overall professionalism of report
- **Plagiarism will not be tolerated. Any incidence of plagiarism will be reported to the university and will be grounds for class failure.**

#### Video Project Component:

- Students will create a video on a topic of their research project (2-3 minute video)
- Tone should not be ideological, hateful or political. It should also not be an endorsement for a company or product. Rather, tone should remain, objective, analytical, and instructional
- Videos will be graded on technical accuracy, audio and visual clarity, and creativity

### **Homework:**

- Homework assignments will assess required reading comprehension and/or quantitative concepts

### **Class Resources:**

Students will not be required to purchase a text book. All material subject to assessment will be provided by Professor. Class notes reflect the aggregation of material across many text books, scientific journals, governmental documents and industry reports. Some recommended texts for students desiring supplemental reading include:

- Smil, V. (2003) *Energy at the Crossroads*, ISBN 0-262-19492-9.
- Tester et al. (2005) *Sustainable Energy: Choosing Among Options*, ISBN 0-262-20173-4.

## **Academic Responsibilities:**

### **Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. Your letter must be specific as to the nature of any accommodations granted. DSP is located in STU 301 and is open 8:30 am to 5:30 pm, Monday through Friday. The telephone number for DSP is (213) 740-0776.

### **Academic Integrity**

The University, as an instrument of learning, is predicated on the existence of an environment of integrity. As members of the academic community, faculty, students, and administrative officials share the responsibility for maintaining this environment. Faculties have the primary responsibility for establishing and maintaining an atmosphere and attitude of academic integrity such that the enterprise may flourish in an open and honest way. Students share this responsibility for maintaining standards of academic performance and classroom behavior conducive to the learning process. Administrative officials are responsible for the establishment and maintenance of procedures to support and enforce those academic standards. Thus, the entire University community bears the responsibility for maintaining an environment of integrity and for taking appropriate action to sanction individuals involved in any violation. When there is a clear indication that such individuals are unwilling or unable to support these standards, they should not be allowed to remain in the University.” (Faculty Handbook, 1994:20)

Academic dishonesty includes: (Faculty Handbook, 1994: 21-22)

- Examination behavior – any use of external assistance during an examination shall be considered academically dishonest unless expressly permitted by the teacher.
- Fabrication – any intentional falsification or invention of data or citation in an academic exercise will be considered a violation of academic integrity.
- Plagiarism – the appropriation and subsequent passing off of another’s ideas or words as one’s own. If the words or ideas of another are used, acknowledgment of the original source must be made through recognized referencing practices.
- Other Types of Academic Dishonesty – submitting a paper written by or obtained from another, using a paper or essay in more than one class without the teacher’s express permission, obtaining a copy of an examination in advance without the knowledge and consent of the teacher, changing academic records outside of normal procedures and/or petitions, using another person to complete homework assignments or take-home exams without the knowledge or consent of the teacher.

The use of unauthorized material, communication with fellow students for course assignments, or during a mid-term examination, attempting to benefit from work of another student, past or present and similar behavior that defeats the intent of an assignment or mid-term examination, is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tensions accompanying examinations. Where a clear violation has occurred, however, the instructor may disqualify the student’s work as unacceptable and assign a failing mark on the paper.

### **Return of Course Assignments**

Returned paperwork, unclaimed by a student, will be discarded after a year and hence, will not be available should a grade appeal be pursued following receipt of his/her grade.

Week	Date	Day	Module Name	Lecture Title	Topics Covered	
1	8/22/2017	TU		Introduction of the Course	Introduction to class, syllabus	
	8/24/2017	TH	Module 1: Energy Basics and Fundamentals	Energy Fundamentals	Important definitions, energy forms and sources, thermodynamics introduction, energy units and notation	
2	8/29/2017	TU			Energy Trends and Transitions	Timeline of energy breakthroughs and transitions, current trends in energy use in the US and the world
	8/31/2017	TH	Module 2: Primary Fuel Sources	Fossil Fuels	Conventional Fossil Fuels: Coal	
3	9/5/2017	TU		Fossil Fuels	Conventional Fossil Fuels: Coal and Natural Gas	
	9/7/2017	TH		Fossil Fuels	Conventional Fossil Fuels: Natural Gas and Petroleum	
	9/12/2017	TU		Fossil Fuels	Conventional Fossil Fuels: Petroleum	
4	9/14/2017	TH		Fossil Fuels	Unconventional Fossil Fuels with focus on Hydraulic Fracturing and its environmental Impacts	
	9/19/2017	TU		Fossil Fuels	Finish Unconventional Fossil Fuels; Start Bioenergy (Biomass, Biogas, and Biofuels)	
5	9/21/2017	TH		Bioenergy	Bioenergy (Biomass, Biogas, and Biofuels)	
	<b>9/26/2017</b>	TU		Module 3: The Power Sector	Nuclear Electricity	Uranium extraction, fission vs. fusion, generation technologies, environmental and security concerns
9/28/2017		TH			Thermoelectric Power	Overview of power sector and thermal power cycles; Begin Renewables
7	10/3/2017	TU			Thermoelectric Power	Overview of power sector and thermal power cycles; Begin Renewables
	10/5/2017	TH	Non-thermoelectric Renewable Electricity Generation		Hydropower, wind turbines, Photovoltaics, wave/tidal power, salinity gradients, etc.	
8	10/10/2017	TU	The Electricity Grid		Transmission: AC vs DC, Power Markets, Energy Storage, Smart Grid	
	10/12/2017	TH			End of Life Materials Management	Energy and resource management: landfilling, recycling, composting, and waste-to-energy
9	10/17/2017	TU	EXAM 1		EXAM 1	MODULES 1-3

	10/19/2017	TH		Conventional Methods of Transportation	Current trends, vehicle standards, fuel economy standards, technologies
10	10/24/2017	TU	Module 4: Transportation and End-use Sectors	Alternative Fuels and Vehicles for Transportation	Electric cars, plug-in hybrids, flex-fuel vehicles, fuel cells, compressed natural gas, hydrogen, etc.
	10/26/2017	TH		The Built Environment	Building energy consumption, HVAC, lighting, energy efficiency
11	10/31/2017	TU		Agricultural Sector	Energy and agriculture, lifecycle energy usage, energy and dietary preferences
	11/2/2017	TH	Module 5: Energy and the Environment	Environmental Impacts: Water	Water quantity and quality impacts of energy production, energy-water nexus
12	11/7/2017	TU		Environmental Impacts: Water/Air	Continue Water; Start Air
	11/9/2017	TH		Environmental Impacts: Air	Overview of emissions and pollutants, combustion, and health impacts
13	11/14/2017	TU		Impacts: Global Climate Change	The science, trends, and impacts of global climate change
	11/16/2017	TH		Environmental Impacts: Land and Biodiversity	Land, wildlife, and soil impacts of energy production
14	11/21/2017	TU	Module 6: Energy Policy, and Societal Issues	Energy & Environmental Policy	Federal environmental policies affecting energy production, transportation, and consumption
	11/23/2017	TH		Thanksgiving	No Class
15	11/28/2017	TU		Video Presentations	Video Presentations
	11/30/2017	TH		EXAM 2	EXAM 2