ENE 505 Energy and the Environment
Fall 2013 Course Syllabus

Class | Wednesday | 6:40-9:20pm | RTH 109
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Professor | Matin Lackpour
Office
Phone | (818) 771-6756 Work — (661) 313-7112 Cell
Email | lackpour@usc.edu
Office Hours | Wednesdays 5:30-6:30 or by Appointment
Teaching Assistant
Email
Prerequisites | Graduate standing
Additional Supplemental material on weekly basis
Course Objectives | Students will learn basic theories of different sources of energy production, how they can be obtained, and how to perform feasibility studies related to the sources of energy, how to quantify, and evaluate any environmental impacts.
Learning Objectives | This course provides students with engineering knowledge and techniques for understanding, assessing, and mitigating environmental issues associated with energy production, efficiency rating, storage, transmission, integration in existing portfolio, and consumption.

Synopsis:

ENE 505 examines the scientific and engineering aspects of energy production, transformation, and consumption, investigates the energy flows in the Earth’s systems, and provides students with necessary engineering approaches and techniques for understanding, assessing, and remediating environmental problems associated with energy production, transformation, and consumption.

Course Outline and Schedule

**Week 1 8-28-13**
Introduction: Getting Power to the People (Energy and Environment)
Sources of energy
Renewable and non-renewable energy resources
Economics of energy production and consumption
Making global and local decisions on the structure of utilized energy sources
## Course Syllabus

### Week 2  
Global Energy Use and Supply  
9-4-13  
Renewable resources and fossil fuels  
Hydraulic, geothermal, wind, tidal, solar, biomass energies  
Oil, gas, coal, and oil shale energy production  
Environmental consequences of the fossil fuels production and utilization

### Week 3  
Thermodynamic Principles of Energy Conversion  
9-11-13  
Flue gases  
NOx formation and reduction  
Combustion emission control  
Thermodynamic fundamentals  
Natural gas combustion  
Coal combustion  
Estimating steam power

### Week 4  
Electrical Energy Generation, Transmission, and Storage  
9-18-13  
Electric Power Transmission  
Energy Storage  
Properties of Energy Storage

### Week 5  
Fossil Fueled Power Plants  
9-25-13  
Components  
Cycles  
Cogeneration  
Fuel Cell  
Statistical Techniques Part I

### Week 6  
Nuclear Energy  
10-2-13  
Fundamentals of nuclear power  
Nuclear power systems  
Comparing fission and fusion energies  
Nuclear power health effects  
Safety requirements for nuclear power plants  
Radioactive waste management and disposal

### Week 7  
Alternative Fuels and Advanced Technologies (Renewable Energy)  
10-9-13  
Liquefied petroleum gas  
Compressed natural gas  
Methanol fuel  
Ethanol fuel  
Hydrogen fuel  
Reformulated gasoline (RFG)  
Fuel cells  
Environmental effects of fuel cells

### Week 8  
Mid-term Exam  
10-16-13  
6:40 – 9:00 p.m.
Week 9  Transportation  
10-23-13  
Internal Combustion  
Power and Performance  
Fuel Efficiency  
Electric Drive Vehicles  
Vehicle Emission  

Week 10  Environmental Effect of Fossil Fuels Combustion  
10-30-13  
Acids deposition  
Atmospheric warming  
Coal ash treatment  
Waste management  

Week 11  Global Climatic Changes  
11-6-13  
Greenhouse gasses  
Greenhouse effect  
Characteristics of the present-day atmosphere  
Key points of the adiabatic theory  
Prognostic atmospheric temperature estimates  
Impact of anthropogenic factor on the Earth’s climate  
Influence of the World Ocean on the atmospheric content of carbon dioxide  

Week 12  Global Forces of Nature Driving the Earth’s Climate  
11-13-13  
Solar irradiation reaching the Earth  
Orbital deviations and the Earth’s mass redistribution  
The Earth’s degassing  
Global climatic cooling due to increase in atmospheric carbon dioxide content  
Inner sources of the Earth’s energy  
World Ocean  
Microbial activity at the Earth’s surface  
Global warming or global cooling?  

Week 13  Review of the Course  
11-20-13  
Key points of the course  
Topics for further studies  
Engineering principles of the effects comparison  
Making best possible decisions with resources available  
Student presentations  

Week 14  Statistical Techniques Part II  
11-27-13  
and student presentations  

Week 15  Student presentations  
12-4-13  

Week 16  Final Exam  
12-11-13  6:40 – 9:00 p.m.
Grading policy:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Participation</td>
<td>15%</td>
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<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Midterm Exam</td>
<td>20% (50% closed book)</td>
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<tr>
<td>Final Exam</td>
<td>20% (50% closed book)</td>
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<tr>
<td>Report</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Report and Presentation

- Reports should be approximately ten to fifteen pages and contain at least five references.
  - Single space, use an average font (11 or 12pt)
- **Due date:** November 20, 2013. You could submit the written Report by November 20, 2013.
- The subject of report should be approved by Lecturer.
- Each student in a group of no more than 4 students will present his/her report in the class (20 minutes presentation).

Statement for 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 (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

http://www.usc.edu/dept/publications/SCAMPUS/gov/.

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at:

http://www.usc.edu/student-affairs/SJACS/.