AME 577 – Survey of Energy and Power for a Sustainable Future - Fall 2012

Lecture: Thursday 6:40 - 9:20 pm, GER 309

Final exam: Thursday, Dec. 13, 7:00 - 9:00 pm

Instructor: David Clayton, Ph.D., P.E.
Email: davidcla@usc.edu
Office hours: Thursdays 5:15 – 6:00 pm; other times by appointment.

Recommended Preparation: BS in Aerospace Engineering, Mechanical Engineering, or Physics; AME Seniors

Course Description: A discussion of various energy sources used for power production including hydroelectric, solar, wind, geothermal, biomass, nuclear power, synthetic fuels, and conventional fossil fuels. The availability, sustainability, technical performance, and environmental consequences of utilizing such energy sources for power production are discussed. AME 577 is intended to be a survey course, but it will incorporate judgment based upon quantitative engineering calculations.

The most important lesson to be taken from this class is that suggestions regarding the availability of energy and power from sustainable sources must be made on the basis of *quantitative estimates*, and discussions of the utility of a proposed strategy must include *quantification* of the potential ramifications. For example, it is not sufficient to say that large solar farms can replace coal fired power plants to produce electricity in the US. The underlying questions are: To what extent is it possible to replace coal with solar power given the potential availability of suitable land for solar farms; how much benefit is to be gained, and what will this investment cost in terms of time, money and potential pollution? These are *quantitative* questions that must be answered. AME 577 will provide perspective and framework for making appropriate engineering judgments.

Texts:

- (REQUIRED) *Sustainable Energy: Choosing Among Options* by Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay, William A. Peters, MIT Press, Cambridge, MA, 2005, ISBN: 0262201534
- (OPTIONAL) *Sustainable Energy – without the hot air*, by David JC MacKay, UIT Cambridge, 2008, ISBN: 978-0954452933 [available free online: http://www.withouthotair.com/]

Exams and Grading:

Homework	25%
Midterm 1	25%
Research project	25%
Final exam	25%

- **NO LATE HOMEWORK WILL BE ACCEPTED, PERIOD, NO EXCEPTIONS**
- Your lowest homework score will be eliminated

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/.

AME 577 – Fall 2012 Schedule*

Week	Date	Topic(s)	Suggested Readings
1	8/30	Introduction, course motivation	
2	9/6	Energy basics, current supply & demand, local & global energy effects	**Chapter 1** *Sustainable Energy*
3	9/13	Power requirements; resources & reserves; Hubbert's Peak	**Chapter 2** *Sustainable Energy*
4	9/20	Thermodynamics review & combustion fundamentals	**Chapters 3 & 7** *Sustainable Energy*
5	9/27	Chemistry & physics fundamentals	**Chapters 3 & 7** *Sustainable Energy*
6	10/4	Climate change	**Chapter 4** *Sustainable Energy*
7	10/11	Nuclear power	**Chapter 8** *Sustainable Energy*
8	10/18	Electricity distribution/grid; syn-fuels & biofuels	**Chapters 10 & 17** *Sustainable Energy*
9	10/25	Energy management	
10	11/1	Solar energy; photovoltaics	**Chapter 13** *Sustainable Energy*
11	11/8	Batteries; energy storage	**Chapter 16** *Sustainable Energy*
12	11/15	Hydrogen storage; fuel cells	
13	11/22	THANKSGIVING (No class)	
14	11/29	Geothermal power; hydro power; solar thermal	**Chapters 11 & 12** *Sustainable Energy*
15	12/6	Waves/tidal power; wind power	**Chapters 14 & 15** *Sustainable Energy*
	12/13	**FINAL EXAM** (7:00 – 9:00 PM)	

* Schedule subject to change