ENERGY AND PROCESS EFFICIENCY (CHE 510) Fall 2017

Thursday, 6:40 – 9:20 pm, Room RTH 109

Professor: Virgil Adumitroaie
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Teaching Assistant: Hyungwoo Choi
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Course Text: Alternative Energy Sources (Green Energy and Technology) by Efstathios E. Michaelides; Springer: 2012. ISBN-13: 978-3642209505

Course References: In addition to the above texts, some course material and in-class problems may come from the sources listed below.

Pre-requisites: Graduate status. This course is multi-disciplinary, and as such a maturity level in science and engineering is necessary, e.g. by having taken an undergraduate course in thermodynamics.

Course Objectives: This course covers engineering strategies that can be employed to improve energy efficiency and reduce economic costs. A discussion of various sources for power production includes conventional fossil fuels, synthetic fuels as well as hydroelectric, solar, wind, geothermal, biomass, and nuclear power. The environmental consequences of utilizing various energy sources for power production are discussed. The course objective is to provide students with an understanding of the fundamentals of energy conversion, focusing on the physico-chemical principles underlying the specific technologies and on application of these principles to practical analysis of energy systems, followed by a survey of operational principles of conventional and renewable energy systems. As appropriate, the economic and societal issues surrounding the adoption of new alternative energy technologies or expansion of the current conventional approaches will be discussed. Students will develop the ability to identify, formulate and solve simple to complex problems of energy conversion and storage.

Course Schedule: See below.

Course Assignments: See below.

Grading: As noted in the attached, there are 12 separate homework assignments, each of which is valued at 20 points (45% of grade). The midterm exam is 120 points (23%) and the final examination is 170 points (32%). The exams will be closed book and 4 pages of notes. You may bring a calculator, but not a laptop.

Under close guidance from the professor, the grader will grade all homework and exams. If dissatisfied with the grader's grading in a specific instance, the student may appeal to the professor to re-evaluate the grade. An appealed grade may be raised, lowered, or remain as originally scored. (Caution: The final grade in this course depends to significant extent on the graded assignments, and thus we take very seriously the academic integrity issue inherent in this activity. Do your own work.)

Class Participation: Attendance will be taken; it is expected that students will want to attend every class meeting. Active participation in the class will be noted, although there will be no explicit credit given for participation.

Office Hours: Prof. Adumitroaie is available for office hours on Thursday, by appointment, 5:30-6:30 pm in TBD. The TA, Hyungwoo Choi, is available TBD.

Homework: All written homework assignments are due at 11:59 pm on the dates indicated below and will be uploaded through the Blackboard Assignment link. Offsite students should upload their paper or fax hardcopy on the day of the class. All relevant reading assignments should be completed before coming to class. Include your name, date, course number and assignment number in your submitted homework.

Late homework will be accepted up to two days past due date with 2 points penalty per day. Homework turned in later than past due date + 3 days will not receive any credit. No homework will be accepted after the last class meeting.

Course schedule and assignments are summarized below. This syllabus is subject to change as announced in class.

DATE	WEEK	TOPIC(S)	HOMEWORK
Aug 24	1	Energy Demand and Supply. Reserves, Resources and Future Demand for Energy.	Assigned: #1
Aug 31	2	Environmental and Ecological Effects of Energy Production and Consumption. Sustainable Development.	Due: #1 (Friday) Assigned: #2
Sep 7	3	Economics of Energy Projects. Investment Appraisal Methods.	Due: #2 (Friday) Assigned: #3
Sep 14	4	Fundamentals of Energy Conversion Processes. Exergy: Availability.	Due: #3 (Friday) Assigned: #4
Sep 21	5	Elements of Atomic and Nuclear Physics. Nuclear Fission.	Due: #4 (Friday) Assigned: #5
Sep 28	6	Nuclear Reactor Types and Power Plants. Breeder Reactors.	Due: #5 (Friday) Assigned: #6
Oct 5	7	Fusion Energy. ''Cold Fusion,'' Other Myths and Scientific Ethics.	Due: #6 (Friday) Assigned: #7
Oct 12	8	**MIDTERM EXAM** Based on lectures 1 - 6	
Oct 19	9	Solar-Thermal Systems. Photovoltaics.	Due: #7 (Friday) Assigned: #8
Oct 26	10	Principles of Wind Power. Power Generation Systems.	Due: #8 (Friday) Assigned: #9
Nov 2	11	Geothermal Energy. Cooling Systems. Geothermal District Heating.	Due: #9 (Friday) Assigned: #10
Nov 9	12	Biomass. Biofuels. The Future of Biomass for Energy Production.	Due: #10 (Friday) Assigned: #11
Nov 16	13	Hydroelectric Power. Tidal Power. Ocean Thermal Energy Conversion. Energy Storage: Batteries.	Due: #11 (Friday) Assigned: #12
Nov 23	14	**No lecture.**	
Nov 30	15	Fuel Cells. Energy Conservation and Efficiency. The Use of the Exergy Concept.	Due: #12 (Friday)
Dec 7	16	**FINAL EXAM** Comprehensive	

Course References:

Alternative Energy Systems; B. K. Hodge; Wiley, New York: 2009. ISBN-13: 978-0470142509

Alternative Energy: Political, Economic, and Social Feasibility; Christopher A. Simon; Rowman & Littlefield, London, UK: 2006. ISBN-13: 978-0742549098

Energy Systems and Sustainability; Godfrey Boyle, Bob Everett, Janet Ramage Eds.; Oxford University Press, Oxford, UK: 2003. ISBN-13: 978-0199261796

Energy Science: Principles, Technologies, and Impacts; John Andrews and Nick Jelley; Oxford University Press, Oxford, UK: 2007. ISBN-13: 978-0199281121

Fundamentals of Renewable Energy Processes (2nd edition); Aldo da Rosa; Academic Press:2009. ISBN-13: 978-0123746399

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-13: 978-0262201537

Sustainable Energy - Without the Hot Air; David JC MacKay; UIT Cambridge Ltd., Cambridge, UK: 2009. ISBN-13: 978-0954452933

Academic Integrity. The Viterbi School of Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus (http://www.usc.edu/dept/publications/SCAMPUS/). Students are expected to be aware of and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course.

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.