ENGG*2030 – Traditional Energy Sources

School of Engineering
University of Guelph
Winter 2012

Instructor: David Lubitz, Ph.D., P.Eng. Room 2407, Thornbrough Building; Ext. 54387
e-mail: wlubitz@uoguelph.ca

Instructor Office Hours: 2:30 pm – 3:30 pm, Mondays and Fridays

GTA: Shawn Wasserman. Email: ewasserm@uoguelph.ca

Lecture Times: 1:30 pm – 2:20 pm, Mondays, Wednesdays and Fridays in MACK 223

Tutorial/Lab: Section *01: 3:30 pm – 5:20 pm, Wednesdays in THRN 1006
Section *02: 8:30 am – 10:20 am, Thursdays in THRN 1006

Some tutorials will be held in THRN 3403 instead of 1006. Announcements will be made in class when this occurs.

Note: Students must attend the tutorial in which they are registered.

Text: Energy Systems Engineering: Evaluation and Implementation.
Vanek, Francis M., and Albright, Louis. D. ©2008, McGraw-Hill.

Additional course notes will be provided electronically on Courselink

Exams: Midterm: Date TBD
Final: April 16, 7 pm to 9 pm

Prerequisites: CHEM*1040 General Chemistry I
ENGG*2120 Material Science
Or equivalent experience with consent of instructor

Course Restrictions: PHYS*3080 Energy

CALENDAR DESCRIPTION

ENGG*2030, Traditional Energy Sources, (3-2) W [0.5]

Traditional energy sources are studied from the standpoint of their historical development, the basic physical and chemical processes which underlie their use, to the infrastructure necessary for their exploitation. The maintenance of this infrastructure is examined along with estimated engineering lifetime. The course focuses on electric energy generated by both hydro and fossil fuel combustion, nuclear energy, fossil fuels, and locally used sources such as wood and peat.

Prerequisites: CHEM*1040, ENGG*2120

EVALUATION

- Projects 30%
- Assignments 10%
- Midterm 25%
- Final Exam 35%

Assignments

Assignments will be issued on a regular basis to assist students in mastering the course content. Assignments will typically consist of several questions related to recent course topics. A randomly selected portion of each assignment will be graded for contribution to the Assignment portion of the mark. (This means the entire assignment will not be marked. However, since the student will not know which part of the assignment will be marked, the entire assignment will need to be completed.) Solutions will not be posted, however the topics of the assignments will be discussed during tutorial sessions before assignments are due, and solutions will be discussed after an assignment has been submitted.

Project and Lab Reports:

Two projects will be completed during the term. They are:

- Personal energy audit (15%)
  - Each student will calculate their average daily energy usage, including energy consumption associated with the student's use of food, water, appliances, transportation, buildings and materials. A discussion will also be included of the relative magnitude of the energy used in different aspects of the student's life, and possible ways to reduce energy usage, with a focus on implementable solutions that have the greatest energy-saving impact.
  - This assignment will be completed in a series of component parts over the course of the semester. As each part is completed, it will be added to an overall report, and each iteration will be submitted. The overall report for this project will also be marked at the end of the semester.
- Energy conversion process case study (15%)
  - Each student will research the history, application and impact of a specific energy technology, policy or concept. Findings and analysis will be documented in a technical report *in HTML (web page) format*. Detailed instructions will be provided on the content and format of the technical report, and how to prepare the HTML files.
  - Draft versions of all technical reports will be posted on an internal web site, and each student will be assigned several reports to peer review. Review comments will be returned to authors and used to prepare a final version of the report for marking. A mark will be assigned to each student based on the quality of their reviews.
  - Final versions of reports will be marked and compiled in an electronic proceedings that will be distributed to all students in the course. No marking information will be included. Reports that do not meet a minimum standard for accuracy and quality will not be included in the proceedings.

Late Submissions

Reports or assignments submitted after the due date will be assessed a penalty of 10% of the report mark per day. (For example, an assignment submitted three days late will have the mark reduced 30%.) It is recommended to submit late assignments directly to the instructor, or to ask the SOE receptionist to time stamp the late assignment and put it in the instructor's mailbox. Time will accrue until it is in the instructor's possession. (e.g. if you slide the assignment under the instructor's door, it will be counted as received when the instructor retrieves it) or time stamped by the SOE receptionist. Assignments or reports will not be accepted more than five days late.

Mid-Term Exam:

The material covered will include the last lecture prior to the exam. The exam will be closed book. Permitted aids will be announced prior to the midterm. Failure to attend the exam will lead to a zero for that exam unless valid documentation is provided for medical or compassionate grounds.

Final Exam:

The final exam will cover the material presented for the entire course and will be closed book. Permitted aids will be announced prior to exam. Failure to attend the exam will lead to a zero for that exam unless valid documentation is provided for medical or compassionate grounds.

Lecture Topics

	Topic	# of Weeks
a.	Introduction & Energy Issues • introduction to course, definitions of energy and work, history of the concept of energy, energy conservation, energy conversion efficiency, exergy, energy balances	1.0
b.	Energy Fundamentals • survey of primary energy sources, infrastructure and uses, global energy use, case studies of energy supply and utilization, survey of current energy issues (peak oil, global warming, environmental impacts, matching of energy supply quality to use)	1.0
c.	Pre-Industrial Energy Supplies • human and animal power, wood, peat, waterwheels, wind mills, energy usage intensity	1.0
d.	Fossil Fuels • British coal, industrial revolution, development of petroleum industry, models of exploitation of finite resources.	2.0
e.	Electricity • history of electricity generation and supply, basic electricity concepts (Ohm's law, electromagnetism, generators), principles and energy balance of large scale generating plants (coal, nuclear, hydro)	2.5
f.	Energy Distribution • principles of electricity grids, principles of pipeline networks, transportation of energy by sea and land, energy cost of moving energy, case studies (oil, coal, liquefied natural gas).	1.5
g.	Energy Utilization and "Conservation" • Canadian energy usage by sector (residential, industrial, transportation), efficiency of energy utilizing processes, case studies (Lawrence Berkeley Labs, light bulbs, Energy Star, household heating), simple energy consumption models for transportation, and building heating and cooling.	1.0
h.	Embodied Energy • life cycle assessment, embodied energy, external costs, case studies (car, home), energy cost of food production	1.0

LEARNING OUTCOMES

The Canadian Engineering Accreditation Board is adopting an approach of reviewing engineering programs based on learning outcomes. The anticipated learning outcomes of this course are:

Graduate Attribute	Taught	Assessed	Graduate Attribute	Taught	Assessed
1. Knowledge Base	Y	Y	7. Communication	Y	Y
2. Problem Analysis	Y	Y	8. Professionalism	Y	N
3. Investigation	Y	Y	9. Environment and Society	Y	Y
4. Design	N	N	10. Ethics and Equity	Y	N
5. Engineering Tools	Y	Y	11. Project Management	N	N
6. Individual & Team Work	N	N	12. Life-long learning	Y	N

After completing this course, a successful student will:

- understand the different forms of energy used by modern society, the methods used to procure, distribute and utilize that energy, and the environmental, social and economic impacts of energy usage.
- have developed skills in identifying and solving energy-related engineering problems.
- when presented with a real world energy application, be able to identify the energy processes, perform an energy balance, calculate energy magnitudes, process efficiencies and costs, and clearly present the results.
- have practiced and improved skills in technical engineering writing, utilizing Excel for engineering analysis, and authoring documents in HTML.

SPECIAL CONSIDERATION

Students whose ability to attend lectures and tutorials, or complete assignments, are impacted by religious obligations or other commitments known in advance must inform the instructor at the beginning of the semester or as soon as the commitment is known. Consideration may not be granted without reasonable prior notification of such commitments. In the event of illness or other unforeseeable circumstances, students are to inform the instructor of the details of the illness or circumstance as soon as reasonably possible. Note that each case will be considered individually, and consideration will only be granted at the instructors discretion.

DISCLAIMER

The outline above is the course plan at the time this outline is distributed. The instructor reserves the right to change any or all of the above as the course progresses (including specifics of assignments, projects and exams), subject to University of Guelph Academic Regulations. In the event that subsequent information about assignments, projects or exams differ from this outline, the more recent information will supersede this outline.

ACADEMIC INTEGRITY

Assignments, projects and exams in this course are individual assignments. While students are encouraged to assist each other with learning and understanding the course concepts, and to utilize a range of information sources, each student must submit their own unique work for assignments, projects and exams. Proper referencing of sources in reports and assignments is essential: if you are unsure what this means, consult with the instructor *before* submitting your work. Any cases of suspected academic misconduct will be reported to the Director of the School of Engineering.

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the current Undergraduate Calendar and School of Engineering program guide for offences, penalties and procedures relating to academic misconduct.
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml