ENSC 461
ENERGY CONVERSION
Spring 2011

Instructor: Dr. Majid Bahrami   4372   Email: mbahrami@sfu.ca
T.A.   Ali Tamayol   4300   Email: ata42@sfu.ca

Course objective:

In this course we will analyze thermal systems and energy conversion devices on the basis of the laws of thermodynamics. A main goal is to understand the processes in a broad variety of energy converging devices. Some emphasis will be put on the study of the efficiency of these devices and efficiency improvements by changing the process details.

Textbook:

Thermodynamics: An Engineering Approach, Seventh Edition
Yunus A. Cengel, Michael A. Boles, McGraw-Hill, 2011.

Supplementary Books:

1) *Fundamentals of Engineering Thermodynamics*, 5th Edition

Michael J. Moran and Howard N. Shapiro, John Wiley and Sons Inc., New York, NY, 2004.

2) *Integration of Green and Renewable Energy in Electric Power Systems,* by Keyhani, Marwali and Dai, John Willey 2010.

3) *Alternative Energy Systems and Applications*, by B.K. Hodge, John Willey 2010.

4) *Environmentally Conscious Transportation,* by M. Kutz, John Willey 2008.

5) *Fuel Cell Systems Explained,* by J. Larminie and A. Dicks, John Willey 2003.

Other relevant book chapters and papers will be used.

Office Hours:

Open door.

Course Schedule:

Lectures: Tues 10:30 – 11:20, Thur 9:30 – 11:20; Room SUR 5380
Tutorial: Tues 9:30 – 10:20 pm; Room SUR 5380
Lab: LA01 – Mon, 8:30 – 10:20; LA02 – Fri, 2:30 – 4:20

Course Outline:

The following provide a list of topics to be covered in this course:

Week 1: Review
Week 2: Entropy and exergy
Week 3: Power cycles, Otto and Diesel
Week 4: Gas turbine power plants and air craft propulsion
Week 5: Liquid-vapor mixtures, vapor power systems
Week 6: Steam cycles
Week 7: Refrigeration cycles and heat pumps
Week 8: Mixtures, psychrometrics
Week 9: Psychrometrics charts and fundamentals of heating, ventilating, air conditioning (HVAC)
Week 10: Fundamentals of combustion
Week 11: Introduction on sustainable and renewable energy resources including: wind, wave energy conversion devices, and fuel cell technologies
Week12: Introduction on energy storage devices

Course Webpage:

http://www.sfu.ca/~mbahrami/ENSC 461.htm

Tutorials:

Selected problems will be solved and questions about lecture material or assignments will be answered in tutorials. Individual help will be given.

Laboratory:

There will be one laboratory exercise for this course. Lab information is posted on the website. Laboratory report requirements, background and a lab schedule will be made available in the second week of term. During the lab period, students will work in groups as assigned.

Experiment: Diesel Engine

Assessment:

Projects	20%
Lab Reports	5%
Midterm	30%
Final	45%

The midterm and final are <u>closed book examinations</u> of the course material. However, you are permitted to use a photocopy of unit conversion tables from the textbook plus a crib sheet consisting of one side of one 8 1/2× 11 sheet of paper. The preparation of a well-structured crib sheet will help during the testing of ENSC 461

but it will also help in the preparation for exams as you assign priority to what is and is not important.

Each week an assignment of 1 or 2 problems along with several suggested problems will be posted online. It is highly recommended that you work out the suggested problems and the assignments.

There will be at least two pop quizzes during the semester, with bonus marks. The pop quizzes will be selected from the assignments and the suggested problems posted on the course webpage.

The final numerical score will be transferred to a letter grade following the Letter Grading Scheme described in the University Calendar.

Project: Topics in Renewable/Sustainable Energy Conversion

An engineering design project will be assigned throughout the term.

- Projects must be completed in group. An engineering report should be prepared and the results should be presented in the class.
- All projects must be handed in immediately following the lecture period on the Due Date.
- No extensions will be granted.
- Failure to hand the project in on time will result in a grade of zero.

Assigned Date: TBA
Due Date: TBA
Grade: 20%