ENGG*4230 Energy Conversion
Fall 2014

School of Engineering

1 Instructional Support

1.1 Instructor

Instructor: Mohamed Boussoufi, Ph.D.
Office: THRN 2401
Email: mboussou@uoguelph.ca
Office hours: Fridays 10-11AM or by appointment

1.2 Lab Technician

Technician: Mike Speagle
Office: THRN 3502, ext. 56803
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1.3 Teaching Associate

	Email	Office Hours
Dr Mathias A. Leon	mleon@uoguelph.ca	TBA on Courselink

2 Learning Resources

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*4230 Courselink site. You are responsible for checking the site regularly.

2.2 Recommended Resources

It is not necessary to purchase a textbook in order to follow the course as notes will be provided. However, useful background reading includes:

1. Renewable Energy Resources , 2nd Edition (2006) Authors: John Twidell & Tony Weir; Publisher: Taylor & Francis
2. Renewable Energy-Power for sustainable future, 3rd Edition (2012) Edited by: Godfrey Boyle; Publisher: Oxford
3. Fundamentals of Renewable Energy Process, 2nd Edition (2009) Author: Aldo Vieira da Rosa; Publisher: Elsevier
4. Sustainable Energy: Choosing Among Options, Author: Jefferson W. Tester et. al 2005, MIT Press
5. S.C. Stultz and J. B. Kitto, Steam-its Generation and Use, Babcock and Wilcox 40th Edition
6. Prabir Basu, Cen Kefa, Louis Jestin, Boilers and Burners: Design and Theory, ISBN: 0387987037 Pub: Springer; 1st edition (December 17, 1999)
7. Prabir Basu, Scott A Fraser, Circulating Fluidized Bed Boilers: Design and Operations, ISBN: 075069226X Boston : Butterworth-Heinemann, 1991
8. Meherwan P. and Dr Boyce, Handbook for Cogeneration and Combined Cycle Power Plants, ISBN: 0791801691, Amer Society of Mechanical Engineers, January 2001
9. Rolf Kehlhofer, Rolf Bachmann, Henrik Nielsen and Judy Warner, Combined-Cycle Gas and Steam Turbine Power Plants, ISBN: 0878147365, Pennwell Pub; 2nd edition, August, 1999
10. Energy Conversion Edited by Yogi Goswami 2008

2.3 Additional Resources

Lecture Information: All the lecture notes are posted on the web page.

Lab Information: The handouts for all the lab sessions are within the lab section.

Miscellaneous Information: Other information related to the course such as tables, units, spreadsheets, learning aids, etc…are also posted on the web page.

2.4 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their mail.uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

3 ASSESSMENT

3.1 Dates and Distribution

Quizzes: 10%
Date: Wednesday, October 22(in class)
Date: Friday, November 21 (in class)

Labs: 20%
See section 5.3 below

Project: 20%
See section 5.3 below

Midterm test 1: 15%
Date: Monday, October 6-- 8:30- 9:30AM, in class

Midterm test 2: 15%
Date: Friday, November 7-- 8:30- 9:30AM, in class

Final Exam: 20%
Date: Wednesday, December 3—11:30AM-1:30PM, Room TBA on Webadvisor

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. Please see below for specific details and consult the undergraduate calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Passing grade: In order to pass the course, you must attend all laboratory sessions and obtain a grade of 50% or higher on the laboratory reports write-up.

Missed midterm tests: If you miss a test due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam. There will be no makeup midterm tests.

Lab Work: You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

Late Lab Reports: Late submissions of lab reports will not be accepted.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

The course introduces the technical criteria for the design of efficient energy conversion processes and systems. It covers review of boilers and cycles, fuel and combustion calculations, and fundamentals of both traditional and emerging energy conversion processes and systems for production of thermal, mechanical, and electrical energy. Topics include fossil, biomass, nuclear fuels, wind, solar, geothermal and fuel cells. Mechanisms for storing energy generated from each of these systems are also studied. The course also discusses conversion of automobile, renovation of old fossil fuel fired plant, co-firing of opportunity fuel, waste to energy technology, emission, and economics of energy projects.

Prerequisite(s): ENGG*3080, ENGG*3260
*Restriction(s):*ENGG*2050.

4.2 Course Aims

This course will introduce you to the basic language and concepts of energy, energy conversion and energy storage. Current and emerging technologies for conversion of thermal, mechanical, chemical, nuclear, solar and electrical energy will be discussed along with introduction to tools that may be used for comparing competing energy conversion technologies.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Compare competing energy conversion technologies on an economic and efficiency basis.
2. Assess the validity of energy conversion claims made in the media.
3. Analyze thermodynamic processes and power cycles (thermal and mechanical energy).
4. Have understood fully the basic principles of chemical, nuclear, solar, and wind energy conversion.
5. Be knowledgeable with the basic principles of energy storage.
6. Participate effectively in discussions involving energy-conscious decisions.

4.4 Graduate Attributes

4.5 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink/D2L but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7 Relationships with other Courses & Labs

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5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Monday	8:30 – 9:20AM	JTP 212
Wednesday	8:30 – 9:20AM	JTP 212
Friday	8:30 – 9:20AM	JTP 212

Laboratory:

Monday	9:30 - 11:20AM	THRN 3404

5.2 Lecture Schedule

Lectures	Lecture Topics
1-2	Fundamentals of Energy Conversion
3-4	Review of boilers and cycles
5-6	Fuel and Combustion Calculations
7-16	Design of Technologies for Solids Fuel Conversion
17-18	Emissions
19-20	Solar Energy
21-22	Wind energy
23-24	Geothermal Energy
25-27	Nuclear Power
28-30	Energy Storage
31	Revamping of Old Technologies with the Advanced Technologies

5.3 Laboratory Schedule

Laboratory activities are:

2 Design Projects

1. Biomass Combustion (Pellet Stove + Stoichiometric analysis)
2. Solar Home System
3.

4 Experiments

1. Pellet Stove
2. Bomb Calorimeter
3. Geothermal system
4. Battery storage
5.

3 RETScreen projects analysis

1. Solar PV
2. Wind
3. Biomass

Week	Activity	Groups
Week 1 - Sept 8th	Safety + lab time usage break down + Groups formation	All students
Week 2 - Sept 15th	Intro to RETScreen	All students
Week 3 - Sept 22nd	Intro to Stoichiometric & emission analysis, efficiency calculation, how to use Testo 350	All students
Week 4 - Sept 29th	Exp 1: Bomb Calorimeter + Biomass Combustion Design Project (Pellet Stove) + RETScreen (PV)	Group 1 + 2, 3, 4 + All students
Week 5 - Oct 6th	Exp 1: Bomb Calorimeter + Biomass Combustion Design Project (Pellet Stove) + RETScreen (Wind)	Group 2 + 1, 3, 4 + All students
Week 6 - Oct 13th	Thanksgiving - Holiday	
Week 7 - Oct 20th	Exp 1: Bomb Calorimeter + Biomass Combustion Design Project (Pellet Stove) + RETScreen (Biomass)	Group 3 + 1, 2, 4 + All students
Week 8 - Oct 27th	Exp 1: Bomb Calorimeter + Biomass Combustion Design Project (Pellet Stove) (+ RETScreen - questions)	Group 4+ 1, 2, 3 + All students
Week 9 - Nov 3rd	Solar Design project	All students
Week 10 - Nov 10th	Exp 2 & 3: Geothermal + Battery	Groups 1+2
Week 11 - Nov 17th	Exp 2 & 3: Geothermal + Battery	Groups 3+4
Week 12 - Nov 24th	Solar Design project - questions	All students

5.4 Other Important Dates

Thursday, September 4, 2014: First day of class
Monday, October 13, 2014 Holiday: no classes scheduled
Tuesday, October 14, 2014: Fall Study Break Day – no classes scheduled
Friday, October 31, 2014: 40th class day, last day to drop
Friday, November 28, 2014: Last day of class

6 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

If the laboratory rules are not followed, consequences will include removing student's access to the lab. If this results in lab work not being completed, the student will receive a grade of 0.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:
http://www.uoguelph.ca/registrar/calendars/index.cfm?index