ENGG*3250 Energy Management and Utilization
Winter 2014

UNIVERSITY of GUELPH

School of Engineering

(Revision 0: December 4, 2013)

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1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Syeda Humaira Tasnim, Ph.D., EIT
Office: THRN 2401, ext. 58973
Email: stasnim@uoguelph.ca
Office hours: Monday and Wednesday 11:30-12:30 @THRN 2401 or by appointment

1.2 Lab Technician

Technician: Mike Speagle
Office: RICH 3502, ext. 56803
Email: mspeagle@uoguelph.ca

1.3 Teaching Assistants

GTA	Email	Office Hours
Vidya Koripella	kvidya@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*3250 Courselink site. You are responsible for checking the site regularly.

2.2 Required Resources

Lecture notes and handouts

2.3 Recommended Resources

- B.L. Capehart, W.C. Turner, and W.J. Kennedy, **Guide to Energy Management**, 7th Edition, The Fairmont Press, 2012.
- F. Kreith and D.Y. Goswami, **Energy Management and Conservation Handbook**, CRC Press, 2008.
- Y. Cengel and A. Ghajar, **Heat and Mass Transfer: Fundamentals and Applications**, 4th Edition, McGraw-Hill, 2010.
- Y. Cengel and M. Boles, **Thermodynamics: An Engineering Approach**, 7th Ed., McGraw-Hill, 2011.
- ASHRAE Handbook – Fundamentals, American Society of Heating Refrigerating and Air-Conditioning Engineers
- C.P. Arora, **Refrigeration and Air Conditioning**, 3rd Ed., McGraw-Hill, 2008.

2.4 Additional Resources

Miscellaneous Information: Other information related to this course will be posted on the web page.

2.5 Communication & Email Policy

Please use lectures 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 <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

3 ASSESSMENT

3.1 Dates and Distribution

Lab (15%): Four experiments are designed to cover most of the basic aspects of Energy Management and Utilization. 'Lab Manual' will be available in courselink. The lab report is due one week after your last experiment. Detailed on lab will be posted on the course website

Project and presentation (15%): Due date for project submission is March 14

Midterm Exam (30%): Midterm Exam

Day: Monday
Date and Time: **24th February, 2014 (2:30 pm- 4:00 pm)**
Location: **THRN 3402**

Final Exam (40%): Final Exam

Day: Saturday
Date and Time: **12th April, 2014 (11:30am - 01:30pm)**
Location: TBA

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. See 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

Missed Midterm Exam: 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.

Passing Grades: The passing grade of this course is 50%.

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4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

ENGG*3250 Energy Management and Utilization W (3-2) [0.50]: This course introduces notions of energy conservation and efficiency, an integrated approach to energy auditing and examples of typical applications (examples include: steam generation and distribution, process or comfort cooling, pumping and compressed air, human needs for modern living, energy consumption in buildings and industry). It also covers pinch technology and its application for energy recovery in industry, and methods to achieve low energy buildings.

Co-requisite(s): ENGG*3430 (Heat and Mass Transfer)

4.2 Course Aims

The purpose of this course is to introduce the concepts and techniques of energy management, utilization, and conservation. The subjects that will be discussed are energy distribution, supply, and demand, energy pricing, scope of the energy problem and approaches to provide solutions; energy auditing; improving energy utilization in space conditioning, and steam, hot water and compressed air systems; energy saving opportunities in refrigeration and cooling systems; insulation; and electrical energy conservation. An interdisciplinary approach will be employed in this course to provide a wider understanding of the subject.

4.3 Learning Objectives

On successful completion of this course, you should be able to:

1. Identify inefficiencies in energy systems and their components
2. Characterize energy use - Energy Auditing
3. Characterize steam distribution, hot water, and compressed air systems
4. Analyze and design waste heat recovery systems
5. Determine energy conservation in space conditioning, refrigeration, and cooling
6. Familiar with conservation of electrical power
7. Conduct laboratory tests through collecting and analyzing data using the appropriate sensors and instruments and write clear, concise and professional laboratory reports

4.4 Graduate Attributes

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2, 3, 4, 5, 6	Exams, Project
2. Problem Analysis	1, 2, 3, 4, 5, 6	Exams, Project
3. Investigation	7	Labs
4. Design	-	-
5. Use of Engineering Tools	7	-
6. Communication	7	-
7. Individual and Teamwork	7	-
8. Professionalism	7	-
9. Impact of Engineering on Society and the Environ.	-	-
10. Ethics and Equity	7	-
11. Environ. Society, Business, & Proj. Management	-	-
12. Life-Long Learning	-	-

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 and tutorials. 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

Previous Courses:

ENGG*2230: Steady and unsteady state; 1st law and Bernoulli equation; fluid flow rate and friction; laminar and turbulent flows; non-dimensional parameters (e.g., Reynolds number)

ENGG*2400: Modeling of engineering systems

MATH*2270: Solving differential equations

ENGG*3260: System and control volume; work and heat and their interaction with the boundary and direction; energy efficiency and effectiveness of systems; thermodynamic losses;

Current Courses:

ENGG*3430: Foundation for application of heat transfer in various types of systems

Follow-on Courses:

ENGG*3370: Foundation for analysis of thermo-fluid systems

ENGG*3470: Foundations of energy balances, thermal flow, thermal properties; Mass transfer through fluid flows (convection), thermal fluid properties

ENGG*3830: Foundations of heat and mass balance and bioreactor design

ENGG*4230: Foundations for design of energy conversion processes

ENGG*4300: Foundations for design of food engineering process

ENGG*4330: Foundation for performance analysis of combustion systems

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures

Monday	10:30 am – 11:20 am	MACK 230
Wednesday	10:30 am – 11:20 am	MACK 230
Friday	10:30 am – 11:20 am	MACK 230

Laboratory

Monday	02:30 pm - 04:20 pm	THRN 3402

5.2 Lecture Schedule

The following table contains the tentative schedule of lecture topics.

Lectures	Lecture Topics	References	Learning Objectives
Week 1	Overview	Lecture Materials in courselink	1,2,3,4,5,6
Week 2	Energy conservation in Buildings	Lecture Materials in courselink	1,2,3,4,5,6
Week 3	Energy conservation in Buildings	Lecture Materials in courselink	1,2,3,4,5,6
Week 4	Steam distribution systems	Lecture Materials in courselink	1,2,3,4,5,6
Week 5	Hot water and compressed air systems	Lecture Materials in courselink	1,2,3,4,5,6
Week 6	Energy saving opportunities for fired heaters and boilers	Lecture Materials in courselink	1,2,3,4,5,6
Week 7	Characterizing energy use - Energy Auditing	Lecture Materials in courselink	1,2,3,4,5,6
Week 8	Heat recovery	Lecture Materials in courselink	1,2,3,4,5,6
Week 9	Insulation	Lecture Materials in courselink	1,2,3,4,5,6
Week 10	Energy saving opportunities in refrigeration and cooling	Lecture Materials in courselink	1,2,3,4,5,6
Week 11	Conservation of electrical power	Lecture Materials in courselink	1,2,3,4,5,6
Week 12	Review	-	

5.3 Tutorial and Lab Experiment Schedule

All labs and tutorials are scheduled at THRN 3402 (Monday, 02:30 pm - 04:20 pm). This is a two hours lab session. Lab hours will be distributed between solving selected problems and conducting lab experiments.

Week	Activity	References
1	-	
2	Problem solving	Lecture (week 1)
3	Lab Experiment 1	Online Lab Manual
4	Problem solving	Lecture (week 2 and 3)
5	Lab Experiments 2 and 3 and Problem Solving	Online Lab Manual, Lecture (week 4 and 5)
6	Lab Experiments 2 and 3 and Problem Solving	Online Lab Manual, Lecture (week 4 and 5)
7	Midterm Exam	
8	Problem solving	Lecture (week 6 and 7)
9	Lab Experiment 4 and Problem Solving	Online Lab Manual, Lecture (week 8)
10	Lab Experiment 4 and Problem Solving	Online Lab Manual, Lecture (week 8)
11	Project Seminar Presentation	
12	Problem solving	Lecture (week 9,10 and 11)

5.4 List of Lab Experiments

Experiment	Topic	Due
1	Thermal conductivity measurements of glass and insulating materials	One week after last lab session
2	Blower door testing to measure the air tightness of buildings	One week after last lab session
3	Infrared scanning to detect thermal defects and air leakage in building envelopes	One week after last lab session
4	Comparison of energy flow measurements between single and double pane windows	One week after last lab session

5.5 Other Important Dates

Monday, 6th January, 2014: Winter 2014 Semester Starts

Monday, 6th January, 2014: First lecture of Energy Management and Utilization course

Monday, 17th February, 2014 to Friday, 21st February, 2014: Winter Break

Friday, 7th March, 2014: 40th class day – Last day to drop one semester courses

Friday, 4th April, 2014: Classes conclude

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 access to the lab. If these results in lab work not being completed, the student will receive a grade of 0.

All students must require a basic safety related training. Complete the online **WHMIS** (Workplace Hazardous Materials Information System) training before the first lab experiment session. Visit Environmental Heath and Safety website (https://www.uoguelph.ca/ehs/node/975) for registration and additional information. Your GTA and Lab Technician may ask you to show them a copy of the WHMIS completion certificate anytime during your lab session.

6.1 Specific for ENGG3250:

You must read safety rules posted on the door of the Sustainable Energy Lab (THRN3402). You also read the manual carefully, follow the safety rules, and wear safety glasses during lab time.

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.csd.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