



ENGG*3080 Energy Resources & Technologies

Fall 2019

Section(s): C01

School of Engineering

Credit Weight: 0.50

Version 1.00 - September 04, 2019

1 Course Details

1.1 Calendar Description

The challenges of changing the global energy system to reduce dependence on finite fossil energy sources, and transition to environmentally sustainable energy sources, are examined. The reserves, consumption, applications and environmental and human impacts of oil, coal and natural gas usage are examined. The fundamental principles, applications and status of a range of renewable energy sources and technologies will be covered to provide a solid background for further study of sustainable energy.

Co-Requisites: ENGG*3260

Restrictions: ENGG*2030

1.2 Timetable

Lectures:

Tuesday 1:00 PM – 2:20 PM MCKN 029

Thursday 1:00 PM – 2:20 PM MCKN 029

Laboratory:

Friday Sec 01 3:30 PM - 5:20 PM THRN 3404

Tuesday Sec 02 3:30 PM - 5:20 PM THRN 3404

Thursday Sec 03 3:30 PM - 5:20 PM THRN 3404

1.3 Final Exam

Date and Time: TBD. Location: TBD

2 Instructional Support

2.1 Instructional Support Team

Instructor: William Lubitz
Email: wlubitz@uoguelph.ca
Telephone: +1-519-824-4120 x54387
Office: THRN 1340
Office Hours: To be determined

Lab Technician: Michael Speagle
Email: mspeagle@uoguelph.ca
Telephone: +1-519-824-4120 x56803
Office: THRN 1102

2.2 Teaching Assistants

Teaching Assistant: Mohammadi Rouzbahani Hossein
Email: hmoham15@uoguelph.ca
Office Hours: By appointment

Teaching Assistant: Adam Epstein
Email: adam.epstein@uoguelph.ca
Office Hours: By appointment

3 Learning Resources

3.1 Required Resources

Course Website (Website)

<http://courselink.uoguelph.ca>

Course material, news, announcements, and grades will be regularly posted to the ENGG*3080 Courselink site. You are responsible for checking the site regularly.

Required Texts (Textbook)

This course will utilize a series of textbooks, all of which are available through the University of Guelph library as e-books at no additional cost to students. Students should download the following books in PDF format:

1. Duffie and Beckman. Solar Engineering of Thermal Processes (4th Ed.) John Wiley & Sons. 2013.
2. Podes, Ramchandra and Diouf, Boucar. Solar lighting. London, Springer. 2011
3. Wood, David. Small wind turbines: analysis, design, and application. New York, Springer. 2011.
4. Wagner and Mathur. Introduction to Hydro Energy Systems: Basics, Technology and Operation. Springer, 2011.

3.2 Recommended Resources

R.A. Dunlap, "Sustainable Energy," SI Edition, Cengage Learning, 2015. (Textbook)

F.M. Vanek, L.D. Albright, & LT. Agnenent, "Energy Systems Engineering: Evaluation and Implementation", 2nd edition, McGraw-Hill, 2012. (Textbook)

G.J. Aubrecht, "Energy: Physical, Environmental, and Social Impact," 3rd edition, Pearson, 2006. (Textbook)

G. Boyle, "Renewable Energy: Power for Sustainable Future," 3rd edition, Oxford, 2012. (Textbook)

3.3 Additional Resources

Lab Information (Lab Manual)

The lab manual and schedule for the laboratory exercises will be posted on Courselink. Be sure to read the appropriate lab section prior to attending the lab.

Assignments (Other)

An individual energy audit project will be posted on Courselink. This is an individual project. It is expected that students research and complete their projects on their own.

3.4 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.

4 Learning Outcomes

Sufficient and reliable supplies of energy are essential for a society to function. Some energy resources are inexpensive and reliable, but come with significant political and environmental concerns. Other energy resources are environmentally benign, but have geographic or dispatchability limitations. Harnessing and delivering the needed energy in a sustainable and reliable manner, particularly with a growing global population, is a pressing challenge for energy engineers.

This course highlights the fundamental principles of traditional (oil, coal, natural gas, and nuclear) and renewable energy resources (solar, wind, water, biomass and geothermal), technologies used to convert energy resources into useful forms of energy, and the potential social, economic, and environmental impact associated with using energy resources.

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Summarize the fundamental principles of energy conversion from traditional energy sources such as oil, coal, natural gas, and nuclear, and alternative energy sources such as solar, wind, water, biomass, and geothermal.
2. Recognize the merits and limitations of each energy resource in terms of reliability and sustainability.
3. Explain how the performance of photovoltaic cells and wind turbines are affected by their ambient operating conditions.
4. Evaluate the social, economic, and environmental impacts of energy usage and generation from various energy resources and technologies.
5. Present, analyze, and discuss experimental data, analysis and synthesis in the format of written lab and project reports.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 2
3	Investigation	3, 6
3.3	Analyze and interpret experimental data	3, 6
3.4	Assess validity of conclusions within limitations of data and methodologies	6

#	Outcome	Learning Outcome
9	Impact of Engineering on Society and the Environment	5
9.1	Analyze the safety, social, environmental, and legal aspects of engineering activity	5

5 Teaching and Learning Activities

5.1 Lecture

Topics:	Introduction: Energy Systems & Sustainability
Topics:	History of energy system, introduction to solar energy.
Topics:	Solar energy systems.
Topics:	Wind Energy
Topics:	Wind turbine aerodynamics. Hydropower fundamentals.
Topics:	Hydraulic energy conversion systems. Fossil fuel resources.
Topics:	Tuesday Oct. 15: Holiday Thursday Oct. 17: Midterm exam.
Topics:	Combustion systems.
Topics:	Nuclear energy. Energy storage.
Topics:	Energy transport.

Topics: Energy applications: transportation.

Topics: Energy applications: buildings, heat pumps.

Topics: Energy applications: food and agriculture. Semester review.

5.2 Course Activity Schedule

Energy Audit Project

Each student will complete an individual energy audit project. Details are provided on Courselink. This is an individual activity.

Solar Lab

Solar energy labs will be held in Thorn 3404 concurrently with problem sessions. The table below summarizes when solar lab activities are performed and when the corresponding reports are due. All lab reports must be submitted for marking electronically in the Dropbox in Courselink. The GTA will be available during the lab time to answer questions. Additional lab information will be posted on Courselink.

Wind Energy Project

Students will complete an in-depth analysis project to assess the feasibility of location-specific wind turbine installations. This is a group project: each lab group will complete and submit one analysis and report. All project reports must be submitted for marking electronically in the Dropbox in Courselink. The GTA will be available during the lab time to answer questions. Additional project information will be posted on Courselink.

Table 1. Dates of major course assessment activities and due dates of corresponding deliverables.

Activity	Date(s)	Report Due Date(s)
Lab Safety, Group Formation	Sept. 17 - Sept. 20	
Energy Audit		Sat. Sept. 21 at 12:00 noon in Courselink Dropbox
Solar Energy Lab	Sept. 24 - Oct. 4	14 days after completion of lab in section (Oct. 8 to Oct. 18), due at the scheduled start of your lab section.
Midterm Exam	Oct. 17 in	

	lecture	
Wind Energy Project		Sat. Nov. 16 at 12:00 noon in Courselink Dropbox
Final Exam	TBD	

5.3 Other Important Dates

- Thursday, September 5, 2019: First day of class
- Monday, October 14, 2019 Holiday: No classes scheduled
- Tuesday, October 15, 2019: Fall Study Break Day – No classes scheduled
- Thursday, November 28, 2019: Make up for Study Day (Tuesday Schedule)
- Friday, November 29, 2019: Make up for Thanksgiving Day (Monday Schedule)
- Friday, November 29, 2019: Last day of class

6 Assessments

6.1 Marking Schemes & Distributions

Passing grade: Students must achieve at least 50% of the marks assigned to the individual assessments (the energy audit, midterm exam and final exam) in order for the other assessments to be counted in the final grade. If you do not achieve at least 50% of the marks assigned to the audit and exams, the weighting of the lab and project reports in your final grade will be zero. An overall final grade of 50% is required to pass the course.

Name	Scheme A (%)
Personal Energy Audit	10
Solar Lab	15
Wind Project	15
Midterm Exam	25
Final Exam	35
Total	100

6.2 Assessment Details

Personal Energy Audit (10%)**Due:** Sat, Sep 21, 12:00 PM, Submit to Courselink Dropbox**Learning Outcome:** 6**Solar Lab (15%)****Date:** , THRN 3404**Learning Outcome:** 3, 6

See Acitivity Schedule (Section 5.2) for lab schedule and report due dates.

Wind Energy Project (15%)**Date:** , THRN 3404**Learning Outcome:** 3, 6

See Acitivity Schedule (Section 5.2) for report due date.

Midterm (25%)**Date:** Tuesday October 17, 1:00 PM - 2:20 PM, in class, MCKN 029**Learning Outcome:** 1, 1, 2, 5**Final Exam (35%)****Date:** TBD, Room TBA on Webadvisor**Learning Outcome:** 1, 1, 2, 5

7 Course Statements

7.1 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 at 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: Students must achieve at least 50% of the marks assigned to the individual assessments (the project, midterm exam and final exam) in order for the labs to be counted in the final grade. If you do not achieve at least 50% of the marks assigned to the project and exams, the weighting of the lab reports in your final grade will be zero. An overall final grade of 50% is required to pass the course.

Lab Work: You must attend and complete all labs. If you must miss a lab due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab **prior** to your scheduled lab. Unless academic consideration is granted, failure to complete a lab will result in a mark of zero for that lab report.

The laboratory work is group based. You will need to organize yourselves into **groups of three (3) or four (4) within your lab section during the week of Sept. 17 to Sept. 21**. The sign-up sheets for lab groups will be available in the Sustainable Energy Lab in THRN 3404 during the introductory lab session. **You will not be allowed to conduct the labs unless you attend the safety session and sign a form indicating that you have done so.**

Each group will be responsible for conducting the labs and writing a single report for each lab. You will be equally responsible for your group's laboratory reports. Each group member must make a significant contribution to the writing of the lab report and sign the lab report cover page in order to receive a lab report mark. Lab reports will be marked and the marks posted on Courselink. **Note that clear communication is an essential part of completing the lab. Unclear or poorly presented material will not be considered during marking.** If you have questions about your mark, see the GTA responsible for that lab and they will discuss it with you.

Late Lab or Project Reports: There will be a late penalty of 20 %/day or part thereof for any late reports. Reports submitted more than 48 hours late will not be graded and a mark of zero will be assigned. That is, reports submitted within 24 hours after the initial due date will lose 20%, reports submitted between 24 and 48 hours after the initial due date will lose 40%, and reports submitted after 48 hours will receive a mark of zero and will not be evaluated. Lab reports are considered late if they are submitted after the specified time they are due.

7.2 Sustainable Energy Lab Safety

This section outlines some of the safety related procedures and information for use in the Sustainable Energy Lab in THRN 3404. Safety in the laboratory is critical. **You will not be allowed to conduct the labs unless you attend the safety session and sign a form indicating that you have done so.** If you have any concerns or comments related to safety in this laboratory you can reach Mike Speagle, at ext. 56803, in THRN 3502.

1. Be prepared. You should download and print a copy of the ENGG*3080 Lab Manual from Courselink. Be sure to carefully read the specific manual section before you go to perform each of the laboratory exercises.

2. You must do as instructed by the laboratory demonstrator. If you are not sure about something ask the demonstrator. Inform the demonstrator if you become aware of a potential hazard.
3. Food and beverages cannot be stored or consumed in this laboratory
4. Safety glasses are mandatory for all experiments. You will not be allowed to perform an experiment without them.
5. Proper footwear is mandatory for all the experiments. This means no open toed shoes or sandals.
6. The fire extinguisher, first aid kit, and phone are located at the front of the lab (THRN 3404). Dial ext. 52000 in case of emergencies.
7. All accidents should be reported to the demonstrator.

8 School of Engineering Statements

8.1 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 but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. 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 labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. 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.

8.3 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.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

9.6 Academic Integrity

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 encourages academic integrity. 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 or faculty advisor.

Undergraduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

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

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
