

**ENGPHY 3ES3**  
**Introduction to Energy Systems**  
Undergraduate Studies  
Spring/Summer 2022  
Course Outline

**CALENDAR/COURSE DESCRIPTION**

A survey course on energy systems with emphasis on the analytic tools needed to evaluate them in terms of performance, resources and environmental sustainability, costs, and other relevant factors over their life cycles.

**PRE-REQUISITES AND ANTI-REQUISITES**

Prerequisite(s): Registration in Level II or above of an Engineering program  
Antirequisite(s): MECHENG 4O04 and CHEMENG 4A03

**INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION**

**Dr. Amin Ghobeity, P.Eng.**  
[ghobeita@mcmaster.ca](mailto:ghobeita@mcmaster.ca)

**Office Hours:**  
Virtual meetings by appointment

**TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION**

**Kenzie Lewis**  
[lewisk9@mcmaster.ca](mailto:lewisk9@mcmaster.ca)

**Office Hours:**  
by appointment

**COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION**

<http://avenue.mcmaster.ca/>

Instructor notes and slides will be posted on A2L.

Assignments will be assigned through A2L and only electronic submission thorough A2L will be required and accepted.

Important announcements (quiz reminders, assignment due dates, etc.) will be through A2L.

**COURSE INTENDED LEARNING OUTCOMES**

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

- Demonstrate an ability to define what the energy systems are.
- Demonstrate an ability to understand not only physics, chemistry and math on energy but also the relationship between economical and the environmental issues and energy systems.
- Demonstrate an ability to understand the uncertainty and the intra- and inter-generation gaps in the risks, and to demonstrate an ability to emphasize the engineers' ethics and responsibilities in the decision-making under the risks.
- Demonstrate an ability to identify the short- and long-term interactions between the technologies of energy systems and the environment and economy quantitatively and/or qualitatively.

**MATERIALS AND FEES**

**Required Texts:**

Energy Systems Engineering: Evaluation and Implementation,  
4<sup>th</sup> Edition (2021)

by Francis Vanek ,Louis Albright (Author), Largus Angenent

Also available in electronic/Kindle version:

[https://www.amazon.ca/Energy-Systems-Engineering-Evaluation-Implementation/dp/1260456404/ref=sr\\_1\\_1?qid=1650285695&refinements=p\\_27%3AFrancis+Vanek&s=books&sr=1-1&text=Francis+Vanek](https://www.amazon.ca/Energy-Systems-Engineering-Evaluation-Implementation/dp/1260456404/ref=sr_1_1?qid=1650285695&refinements=p_27%3AFrancis+Vanek&s=books&sr=1-1&text=Francis+Vanek)

**Recommended Additional Texts:**

Alternative Energy Systems by B.K. Hodge

Energy, Environment, and Sustainability by S. Moaveni

**Calculator:**

Any kind of calculator will be allowed for the exams and quizzes.

**Other Materials:**

Instructor notes and slides posted on A2L.

<b>COURSE FORMAT AND EXPECTATIONS</b>
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The course is organized as follows:

- 3-hr in-person lectures, 1-hr optional virtual tutorial tentative scheduled on Tuesdays 7-8pm
- 4 assignments
- 6 in-class quizzes (top 5 will be used for calculation of the final grade)
- 1 in-class midterm test
- 1 in-class final exam

<b>COURSE SCHEDULE</b>
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Date/Week	Topic	Readings
May 5	Introduction to energy systems	Chapter 1 Vanek
May 12	System-Level Analysis of Energy Systems (Efficiencies and Economics)	Chapter 2, 3 Vanek
May 19	Energy and Environment - Climate Change Models (CCM)	Chapter 4 Vanek
May 26	Energy and Environment (cont.) Fossil fuel power plant, steam power cycles	Chapter 5 &6 Vanek; Ch 5 Hodge
June 2	Fossil fuel power plants, steam power cycles (cont.) Fossil fuel power plants, gas power cycles	Chapter 5 &6 Vanek; Ch 5 Hodge
June 9	Fossil fuel power plants, gas power cycles (cont.) Nuclear power plants	Chapter 15 Hodge; Chapter 8 Vanek
June 16	Nuclear power plants (cont.)	
June 23	Midterm Exam	
June 30	Solar energy resource modeling Solar photovoltaics (PV)	Chapter 9, 10, 11 Vanek
July 7	Solar photovoltaics (PV) – Simulation and performance models, structural design considerations	Chapter 9, 10, 11 Vanek

July 14	Wind energy resource modeling	Chapter 7 Vanek Chapter 4 Hodge
July 21	Wind turbines Solar-thermal, Bioenergy, Fuel Cells, Tidal Energy	Instructor notes
July 28	Project Presentations	Instructor notes
Aug 5	Final Exam	

<b>ASSESSMENT</b>
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Component	Due Date	Weight
Quizzes (6 @ 5% each*)	In class (dates below)	25%
Assignments (4 @ 5% each)	Posting dates below	20%
Project (Report and Presentation)	July 29	10%
Midterm Exam	June 23	20%
Final Exam	August 5	25%
Total		100%

\* We will have a total of 6 quizzes, but your quiz with lowest grade or missed due to an approved MSAF will be eliminated from calculation of the final grade.

The following table provides a tentative timetable for various evaluation components of the course:

Date	Evaluation
May 13	Quiz 1
May 20	Assignment 1 posted
May 27	Quiz 2
June 3	Assignment 2 posted
June 10	Quiz 3
June 24	Midterm Exam
July 1	Projects Assigned; Assignment 3 posted
July 8	Quiz 4
July 15	Quiz 5, Assignment 4 posted;
July 22	Quiz 6
July 29	Project Reports Due Thursday August 29; Group Project Presentations
Aug 5	Final Exam

<b>ACCREDITATION LEARNING OUTCOMES</b>
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The Learning Outcomes defined in this section are measured for Accreditation purposes only and will not be directly taken into consideration in determining a student's grade in the course.

Outcomes	Indicators
1. Can demonstrate the competence in physics, chemistry and mathematics which relates to system, economic, sustainability analysis in energy systems.	1.2 Quiz, Assignment, Exams

2. Can demonstrate the competence in engineering which relates to system, economic, sustainability analysis in energy systems	1.3 Quiz, Assignment, Exams
3. Can demonstrate an ability to assess the options from a sustainability engineering perspective, which emphasizes environmental stewardship and long-term economic development.	9.3 Quiz, Assignment, Exams
4. Can demonstrate an ability to draw the politically reasonable, economically feasible, technologically sound, socially acceptable, environmentally fruitful conclusions which are completely supported by solid evidence.	13.5 Quiz, Assignment, Project, Exam

For more information on Accreditation, please visit: <https://www.engineerscanada.ca>

#### EQUITY, DIVERSITY, AND INCLUSION

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your Instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Engineering Physics is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the [Equity and Inclusion Office](#).

#### PHYSICAL AND MENTAL HEALTH

For a list of McMaster University's resources, please refer to the [Student Wellness Centre](#).

#### ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

The following illustrates only three forms of academic dishonesty:

1. plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. improper collaboration in group work.
3. copying or using unauthorized aids in tests and examinations.

#### AUTHENTICITY / PLAGIARISM DETECTION

**Some courses may** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either

directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

#### COURSES WITH AN ON-LINE ELEMENT

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

**Some courses may** use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

#### CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities](#) (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

#### ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact [Student Accessibility Services \(SAS\)](#) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities](#) policy.

#### COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

1. It is the students' responsibility to regularly check the course webpage (A2L) for updates and announcements.
2. Quiz and assignments submitted late are marked as zero unless an extension is granted prior to the assessment's due date.

**Missed Evaluation Policy Due to an Approved McMaster Student Absence Form (MSAF) - see the following sections regarding general detailed institutional policy. The following provides decisions on approved MSAF:**

- If a **quiz** is missed due to an approved MSAF, then the other 5 quizzes will be used for calculation of the final grade in quiz category.
- If the **midterm** is missed due to an approved MSAF, then the weight of the missed evaluation will be distributed among the final exam and the quizzes.
- An **assignment** submission due date missed due to an approved MSAF will be extended by 3 days.

#### SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

1. **Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:**
  - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
  - Students may submit requests for relief using the MSAF once per term.
  - An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
  - The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
  - The MSAF cannot be used for academic work that has already been completed attempted.
  - An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
  - The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration* above.
2. **For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:**
  - Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate **supporting documentation**.
  - If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

#### ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

#### COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

<b>EXTREME CIRCUMSTANCES</b>
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The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.