Pathways to Sustainable Energy Syllabus

Department of Environmental Science

ENVS / SUST 4004 Fall 2025

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Dr. Wayne Groszko	wgroszko@dal.ca	Wed. 1–2 pm Wallace McCain Learning
Dr. Sue Molloy	sue.molloy@dal.ca	By appointment
TA - TBA	TBA	Tutorials

Course Description

In this interdisciplinary course, students will learn about energy efficiency and renewable energy from technical, economic, and political perspectives, with the goal of understanding and being able to contribute to the transition to zero-carbon energy systems. The Nova Scotia context will provide a focal point, and students will be encouraged to learn about energy systems and policies worldwide. Following a fundamental introduction to energy, the course will explore energy efficiency and renewable energy systems for buildings, electricity, and transportation. Students will gain technical skills in energy analysis, as well as engaging in a discussion of energy policies, program design, implementation, measurement, and evaluation. Industry experts in renewable energy and energy efficiency will be invited as guest lecturers.

Course Prerequisites

ECON 1101.03 or ECON 1102.03 or SUST 2001.06 and be a 4th year student or have permission from the instructor.

Student Resources

The course has two co-instructors and a tutorial assistant. Reach the instructors or the TA by email or on Teams with your questions or to set up an appointment, or in person with the instructor after each lecture or with the TA during tutorial time. The tutorials are optional times to ask questions or work on your Café Scientifique discussions or the course project.

Course Structure

Course Delivery

Blended – Mainly in-person lectures and guest speakers plus some synchronous and asynchronous recorded sessions.

- To access online components requires a computer with speakers, microphone, camera, high-speed internet access and web browser and software for Dal Brightspace.
- Online platforms to be used are Dalhousie Brightspace and Collaborate Ultra.
- Quizzes will be online in Brightspace.
- Course instructors can be contacted by email and Teams chat. In person meetings on campus are also possible, mostly on Mondays.
- All course times and due dates are in Atlantic Time.

If you are connecting to online resources from outside Canada, you are responsible for ensuring awareness and compliance with any applicable laws in the country where you are connecting.

Lectures

Mondays and Wednesdays from 11:35 to 12:55 in Room C202, Life Sciences Centre

Tutorials Optional

Tutorials are optional. There is no planned instructional content, but you can ask the TA questions, prepare for Café Scientifique, and work together on the course project. The instructor may not be present in person but can be reached remotely.
T01 is on Mondays from 13:35 to 14:25 in Room 302 of the Dunn Building
T02 is on Mondays from 16:35 to 17:25 in Room 302 of the Dunn Building

Course Materials

Course materials, including presentations and readings, will be available online through Brightspace (https://dal.brightspace.com). There is no printed textbook for the course.

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- Online platforms to be used are Dalhousie Brightspace and Collaborate Ultra.
- Course instructors can be contacted by email and Teams chat and after class.
- All course times and due dates are in Atlantic Time.

Assessment

Component	Weight %	Comments
Interview	5%	**One** ten-minute interview with the instructor, individually or in small groups, to understand your previous knowledge and experience and interests in sustainable energy. This is also an opportunity to prepare for your briefing note and your project. If an interview is not possible in person or online, a survey can be completed.
Lead two *Café Scientifique* presentations	30%	**Café Scientifique** is a participatory discussion on a technical topic. Peer-reviewed articles about sustainable energy will be assigned or chosen and you will lead the discussion with your colleagues about these articles and their implications.
Participate in *Café Scientifique* discussions	10%	**Ask great questions** in the Café Scientifique discussions in class. Participation will be evaluated based on questions asked and contributions made to understanding.
Briefing Note	15%	**Prepare a briefing note** on a specific energy-related policy or project for a government official to use. Interview at least one expert about the topic to prepare your briefing note.
Research project	30%	**Research project related to sustainable energy** – detailed instructions will be provided. Project can be individual or a group of up to 4 students. The report is due on the last day of class (December 3, 2025).
Presentation	10%	**Oral presentation of your research work.** Students presenting in a group will receive a group mark for the presentation format and content, and individual marks for delivery. Each student should contribute equitably to the presentation. To be in class on Nov. 24, Nov. 26, Dec. 1, 3, 2025.

Conversion of numerical grades to final letter grades follows the
Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

Late Submissions:

The final mark for a late submission that doesn't have an exception granted in advance will be reduced by 10% for each day that it is late.

Absence, Missed Assignments and Course Requirements:

Students shall use the Student Declaration of Absence form for missed academic requirements. It is the responsibility of students who miss a topic to ascertain what was missed, including announcements of tests and other information.

Course Policies related to Academic Integrity

This course is collaborative in its approach. Students are welcome to collaborate on research for assignments and projects, however for individual assignments the work you submit must be your own. Work is expected to be original and to include correct citations for information and quotes from other scholars. Plagiarism detection software will not be used in this course. If you use generative artificial intelligence and large language models (for example, ChatGPT) to generate draft text for assignments or reports, you are responsible for checking the accuracy and suitability of any generated text and editing the text accordingly.

Learning Objectives

Module 1: The Big Energy Picture

Students will gain an understanding of key physical concepts related to energy and the basic elements and processes involved in energy systems. The relationships between Students will also understand economic concepts related to energy, such as capital and operating expenses, cap and trade, carbon tax, demand side management, and feed-in-tariffs.

Module 2: Energy Efficiency and Demand Management

Students will gain a thorough understanding of energy efficiency applications in the residential and commercial sectors and a familiarity with key terminology used in the energy efficiency field. Today's energy efficiency upgrades such as lighting, heat pumps, ventilation and air conditioning, building envelope and heat recovery will be explained, along with high performance building systems such as Passive House and Net Zero Energy buildings. Students will learn how home energy assessment and building energy modelling works. Recent technologies in energy efficient transportation and demand management, such as smart controllers and bidirectional electric vehicle chargers, will be discussed.

Module 3: Renewable Energy

By the end of this module students will have a solid understanding of how the most deployable and upcoming renewable energy technologies work and will understand the advantages and disadvantages of each technology. They will understand the challenges involved in the transformation of energy systems and how those challenges can be addressed.

Supportive Course Content

Topic	Sub-Topics
The Big Energy Picture	
Introduction to Energy	Work, Energy, Power
Energy Systems	Electricity, Heat, Motive Power
Quantifying Energy	Energy and Power Calculations
Energy Economics and Policies	Rates, Tariffs, Incentives
Energy Efficiency and Demand Management	
Buildings	Residential & Commercial Buildings, Energy Assessments and Upgrades
Transportation	Electric and hydrogen vehicles, bidirectional charging systems.
Industrial Processes	Thermal and Electric Processes in Industry
Energy Efficiency Financing	Loans, Grants, Property Assessed Clean Energy Financing
Energy Storage	Batteries, Thermal Energy Storage, Hydrogen, Pumped Hydro Storage
Renewable Energy	
Solar Energy	Solar Electric, Solar Heating
Wind Energy	Onshore Wind, Offshore Wind
Hydro Power	Dams, Run-of-River, Hydro Storage
Ocean Energy	Tidal, Wave, Ocean Thermal Energy
Biomass Energy	Forest and Agricultural By-products, Algae as Energy Carriers

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding Mi'kmaq and Indigenous Relations (including the Elders in Residence program, Land Acknowledgements, Understanding Our Roots, and much more) can be found at: https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about/mission-vision-values/global-relations.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/campus_life/ssc.html).

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class

members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.