

ENERGY AND SUSTAINABILITY GEOG/ENST 3431 Fall 2020

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Description

Energy is a keystone to human society; its availability has a powerful influence on the way we live our lives. The goal of this course is to illuminate how and why we make use of the energy sources available to us, and to appreciate the consequences that our energy use has on the environment around us. In addition to reviewing the basic terms and concepts required to understand energy on a physical basis, the course will examine the nature of world energy resources and the changing patterns of their distribution, production and consumption.

Course Text

Reisser, Wesley and Colin Reisser (2019). *Energy Resources: From Science to Society*. New York: Oxford University Press USA.

Students will be assigned readings to complete *before each lecture*. Readings chosen from the academic literature will be available through either the Library or MyCourseLink.

Evaluation Scheme

Midterm Examination	30%	October 27
Research Project	20%	November 26
Final Examination	50%	TBA

There will be one midterm test, plus a final examination. Both will be in an open-book format. Each student will complete a research project culminating in an expository paper of no more than 1200 words.

Lecture Times

Tuesday: 5:30 – 7:00 pm

Thursday: 5:30 – 7:00 pm

GEOG/ENST 3431 Course Schedule

(subject to changes as necessary)

Date	Reading	Topic
September 8		Introduction
September 10	Chapter 1	Physics of Energy
September 15	Chapter 2	Consumption and Efficiency
September 17	Chapter 3a (pp. 33-47)	Coal
September 22	Chapter 3b (pp. 48-66)	Heat Engines
September 24	Chapter 4a (pp. 71-85)	Oil
September 29	Chapter 4b (pp. 86-101)	Unconventional Oil
October 1	Chapter 5a (pp. 102-117)	Natural Gas
October 6	Chapter 5b (pp. 118-130)	Electricity
October 8	Chapter 6a (pp. 131-142)	Radiation and Decay
October 13		Study Week
October 15		Study Week
October 20	Chapter 6b (pp. 143-159)	Nuclear Generation
October 22	Chapter 7a (pp. 161-176)	Hydroelectricity
October 27		Midterm
October 29	Chapter 7b (pp. 177-189)	Electricity Transmission
November 3	Chapter 8	Wind Power
November 5	Chapter 9	Solar Power
November 10	Chapter 10	Biofuels
November 12	Chapter 11	Geothermal Energy
November 17	Chapter 12	Hydrogen
November 19	Chapter 13	Engines and Transportation
November 24	Chapter 14	Pollution
November 26	Chapter 15	Global Warming
December 1	Chapter 16	Geopolitics
December 3	Chapter 17	Energy and Sustainability

Learning Outcomes

Knowledge

- Identify the major renewable and non-renewable energy sources and their past, current, and future applications
- Calculate energy efficiency and other relevant quantities using appropriate units of measurements and physical equations
- Connect the production of energy to physical processes such as electrical induction, heat engines, nuclear fission, and photovoltaics
- Evaluate various forms of energy production and consumption according to observed patterns of global and local pollution, climatic change, and socio-economic issues
- Consider political and economic restraints on current systems and implications for change

Skill Development

- Application of sustainable development principles to energy systems
- Problem-solving and quantitative evaluations using mathematical skills
- Effective communication of scholarly research in written form

Course Delivery

In accordance with the safety protocols at Lakehead University during the pandemic of Fall 2020, this course will be delivered using on-line methods. The primary mode of contact will be synchronous lectures during the scheduled time periods each week.

Course materials and tests will be delivered through the **Desire2Learn** platform at MyCourseLink. Lectures will be hosted by the instructor using the **Zoom** platform; links to the sessions are in the MyCourseLink Calendar. Class activities will be shared among classmates using **Google Docs**.

Recordings of **Zoom** lectures and **Google Docs** will be made available asynchronously for students who are unable to attend the lectures at the scheduled times, due to technological limitations or other reasons. Students are responsible for keeping up with the class.

LU Notice for Recording Lectures and Class Activities

In GEOG/ENST 3431, in the context of remote instruction and participation, video and audio recordings of class activities will be made to ensure students' and instructors' easy and comprehensive access to those activities. The recordings are confidential and are intended only for the use of the course students and instructors. They may otherwise not be used or disclosed. During recording, to protect others' privacy, each student should ensure that no one else is present in the location where they are being recorded without that non-student's consent. The recordings are made under the authority of sections 3 and 14 of The Lakehead University Act, 1965. Questions about the collection of the images and sounds in the recordings may be directed to the Dean of Science and Environmental Studies, ses@lakeheadu.ca.

LU Accommodation Statement

Lakehead University is committed to achieving full accessibility for persons with disabilities/medical conditions. Part of this commitment includes arranging academic accommodations for students with disabilities/medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability/medical condition and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please email sas@lakeheadu.ca or visit <https://www.lakeheadu.ca/faculty-and-staff/departments/services/sas>.

GEOG/ENST 3431 Research Project

Introduction

The objective of this project is to produce an expository research paper on recent developments in a topic of your choice related to the subject of Energy and Sustainability.

An expository paper should compile the facts and evidence related to your topic, evaluate this evidence in a balanced and impartial fashion, and conclude by making a reasoned argument based on this evaluation. The paper should be no longer than **1200 words** (roughly four pages in length at 1.5 line spacing).

The paper will be graded according to the following criteria:

- Quality and relevance of research
- Reasoning and persuasiveness of conclusion
- Writing style and organization
- Proper citation of sources

Do not be satisfied with one draft of your paper! Consider this a writing exercise as well as a research project. Any first draft can be greatly improved through revision and using support options such as review by your peers or others.

Project Support

The Library provides considerable support for students conducting academic research and accessing reputable peer-reviewed literature. Contact Moira Davidson (mdavidso@lakeheadu.ca) or Janice Mutz (jmutz@lakeheadu.ca) for help refining your topic and locating the information that you need. They're much better than Google.

The Academic Support Zone (<https://www.lakeheadu.ca/students/academic-success/student-success-centre/academic-support-zone>) provides **free** consultation and coaching for writing and polishing your work.

Material

The basis for each project is *current research*, represented by articles chosen from academic journals and emphasizing ones that were published within the last 10 years. **This research must go beyond what is covered in the course.**

Your sources should be primarily **peer-reviewed journal articles**; you are expected to make use of **at least three**. Reports from the “grey literature” (unpublished manuscripts, conference proceedings, government or UN reports, etc.) will be acceptable as **secondary** sources. Magazines, newspapers, web sites, etc. will generally **not** be considered useful.

Look for articles that cover the same or closely related subjects but also *complement* rather than duplicate each other. Consider both quality and quantity of papers in your research; 4-10 should be sufficient, but you must acquire a good grasp of a subject that is new and interesting.

Remember to cite your sources within your paper! Failure to refer to your sources constitutes plagiarism. All papers are to be fully referenced using the author-date style of referencing (e.g.: Hanson et al. 2016). If you are unsure of how to do this, follow the format described in the Department of Geography and the Environment Undergraduate Thesis Manual, available through the department web site:

<https://www.lakeheadu.ca/academics/departments/geography/thesis>

Suggested Topics

Listed below are some suggested starting points for individual research. **This list is not exhaustive**; you may decide on a topic that does not fit any of these categories.

You should discuss your topic with the instructor before the end of September to ensure that your topic is relevant and goes beyond the basic course material.

Energy development

- Bituminous sands
- Hydraulic fracturing for gas extraction
- Transcontinental pipeline projects
- Expansion of nuclear power
- Transitions to renewable fuels

Socio-economic issues

- International conflict
- Economic development
- Markets and subsidies
- Carbon taxes
- Sustainable development

Environmental issues

- Air quality
- Global climate change
- Energy extraction