ENERGY AND SUSTAINABILITY GEOG/ENST 3431 Winter 2023

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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

Everett, R., S. Peake, and J. Warren (2021). *Energy Systems and Sustainability: Power for a Sustainable Future, 3rd Edition* (Oxford University Press), 648 pp.

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

Exercises	10%	Quasi-weekly
Midterm	25%	February 16
Discussion	5%	Starting February 2
Paper	10%	April 6
Final Examination	50%	TBA

The course includes take-home exercises which will be submitted before class and then discussed. Completing them will be worth 10% of the final grade. Late submissions will not be accepted. The discussion and paper constitute an independent project described in the syllabus.

Lecture Schedule

Tuesdays and Thursdays: 8:30 – 10:00 am (RB 1045)

GEOG/ENST 3431 Schedule of Topics

(subject to changes as necessary)

Date	Reading	Topic
January 10	Chapter 1	Introduction
January 12	Chapter 2	Energy, Work, and Power
January 17	Chapter 3	Using Energy
January 19	Chapter 4	Energy Conversions
January 24	Chapter 5	Coal
January 26	Chapter 6	Heat Engines
January 31	Chapter 7	Oil and Gas
February 2	Chapter 7	Unconventional Fuels
February 7	Chapter 8	Internal Combustion Engines
February 9	Chapter 9	Electricity
February 14	Chapter 9	Generation and Transmission
February 16		**Midterm Examination**
February 21		**STUDY WEEK**
February 23		**STUDY WEEK**
February 28	Chapter 10	Nuclear Energy
March 2	Chapter 11	Nuclear Generation
March 7	Chapter 11	Future of Nuclear Energy
March 9	Chapter 13	Pollution
March 14	Chapter 13	Pollution Mitigation
March 16	Chapter 13	Global Issues
March 21	Chapter 14	Mitigating the Carbon Problem
March 23	Chapter 14	Generation from Hydro and Wind
March 28	Chapter 14	Solar Energy
March 30	Chapter 14	Biofuels
April 4		Energy Markets
April 6		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

This course will be delivered in person.

Course materials including lecture slideshows will be made available through the **Desire2Learn** platform at MyCourselink. Assignments may be typed or handwritten and photographed, then submitted to Courselink in either Word or PDF formats.

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
University graduates are expected to possess the skill of critical thinking. This includes the ability to evaluate information that is presented to you at more than face value. The goal of this project is to examine media reports about current issues relating to course material.

Material
The basis for each project is a **print article** chosen from **mainstream media** (newspapers or magazines, e.g. *Globe and Mail*, *The Toronto Star*, *Maclean's*, *New York Times*, *The Guardian*, etc.) published within the past five years. **The article must describe recent academic research published in a peer-reviewed journal.**

Your sources will include the original article, the academic article it refers to, and **at least one** additional article. The additional material must consist of either academic or 'grey' literature (published reports from government agencies or other responsible organizations). Other popular media (including web sites) will not be sufficient; consult with the instructor if necessary.

Once you have selected your popular media starting point, **notify the instructor** so that there is no duplication, and the article can be distributed to the class. All students in the class will be expected to read this article prior to your discussion.

Discussion
You will be allotted 10 minutes of class time to lead a discussion of this subject with your peers. Audio/visual aids may be used but are not necessary. You should assume that the rest of the class has completed the article and so is familiar with your topic.

Your discussion should consider the following:
- What were the objectives and methods of the original researchers?
- What were their conclusions?
- What was the perspective taken in the popular media version? Do you believe this was justified? Did they make any significant errors in interpretation?
- What is your perspective on this topic?

Papers
Each student will write a summary paper on their topic that is not more than four pages in length (1.5 line spacing; roughly 1200 words). The paper should review the material you have collected and reflect on the critical evaluation from your discussion.

While this is a short paper, it should still have a formal style ***with an abstract and a concluding section***. An abstract is a short paragraph that describes the contents and conclusions of your paper. Most likely 3-4 sentences will be sufficient.

Remember to cite your sources within your paper! **Failure to refer to your sources constitutes plagiarism**, regardless of your intent. All papers are to be fully referenced using the author-date style of referencing (e.g., Hanson et al. 2008). If you are unsure, follow the format described in

the Department of Geography Undergraduate Thesis Manual, available through the department web site:
https://www.lakeheadu.ca/academics/departments/geography/thesis

A short paper may seem like an easier task, but in practice it may be difficult to distill the material and opinions into four pages. Avoid redundancies in your writing, such as the words "and opinions" in the previous sentence. Papers will be evaluated according to:

- Content
- Analysis
- Writing style
- Formatting and referencing

Project Support
The Library provides considerable support for students conducting academic research and accessing reputable peer-reviewed literature. Contact your librarian liaison, Nicole Stradiotto (nicole.stradiotto@lakeheadu.ca), for help locating the information that you need. **Librarians are 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.

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