



**Energy Science and Technology (ERSC 2300H)
Fall 2010 Syllabus**

Background

Energy is essential to our modern economy. Canadians consume energy to produce industrial goods, to transport themselves and the products of commerce, to heat and cool homes and buildings, and for a vast array of electrical appliances. Canada also exports a great deal of energy, largely crude oil, synthetic crude, natural gas, and electricity from large-scale hydro.

This course will examine the applied science behind energy production and consumption. We will also examine technologies used in producing, moving, and consuming energy. As we go through the course, we will examine policies that are, or could be put, in place to enable a secure and sustainable energy future.

Our approach to these topics will be problem based. The problem is simply stated: our existing energy system is ecologically unsustainable making current energy infrastructure obsolete. Solutions to this problem will come from changes to many areas, including technology, markets, regulations, and behavioural change. Moreover, energy technology is engrained within our social and cultural systems. As a result, no single approach or perspective is sufficient to solving our energy dilemmas. Solutions should not be considered in isolation from their context: there are no easy answers.

Instructor:

Dr. Stephen Hill
Office hours: Tuesday 12-2pm

Email if you have a short question. For more complex matters, please call or come and talk with me in person.

Contact:

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Class meetings:

Lecture: Friday 11am-1pm. OC 205

Seminars: CCW A1. Fortnightly. Thursday 2-3pm or 3-4pm. There will be two seminar sections and you will sign up for one of these during the first class.

Required texts:

1. Coley, D. 2008. *Energy and climate change: creating a sustainable future*. Wiley. 2008. Available at campus bookstore and online at Wiley.com. Cost (MSRP) = \$54.99
2. Selected online readings (posted to WebCT)

Assignments & Grading:

- a) Problem sets: 2 problem sets (2 x 5% each = 10%)
- b) Mid-term exam: 1 hour. In lecture during week 6 of course. (15%)
- c) Final Exam: 3 hours. Combination of numerical questions and longer answer written questions. Scheduled by Registrar in the December exam period (30%)
- d) Group project (20%): Small-scale green energy project feasibility study for Peterborough area using Retscreen. Assignment details to be provided under separate cover.
- e) Participation: quality and consistency of participation in lecture and seminar (5%)
- f) Individual research essay: on suggested topic or one of student's choosing, with prior approval from instructor (ca. 1000 words). Due in week 7 of class. (20%). Possible topics:
 - The promise of thin film solar photovoltaic technology?
 - Privatization of BC's rivers.
 - Hydroelectric development in Ontario's north
 - Social acceptance of green energy technology
 - Social friction in renewable energy siting
 - Challenges and opportunities with hydrogen storage
 - Smart Grids appliances
 - Smart meters and their impact
 - An assessment of the potential of solid oxide and PEM fuel cell technologies

- A history of energy conservation in Ontario
- Energy poverty for low-income Canadians
- Community energy
- Technology assessment of coal gasification, carbon capture and storage for Alberta's thermal electricity generation
- A review of Alberta's CCS funding
- Evaluation of Ontario's Renewable Energy Facilitation office
- Health risks with wind turbines
- Real-time electricity pricing in Ontario?
- A state of the art assessment of turbine efficiencies
- Wall warts (power adapters) and energy efficiency
- Information technologies & the smart grid

Course policies:

ERSC 2300H is governed by the academic regulations at Trent University, found in the Trent University 2010-11 Academic Calendar. Some additional policies specific to ERSC 2300H are listed below:

Assignments:

- Problem sets do not need to be typed. Clear, hand-written submissions are acceptable.
- Assignments are to be submitted during lecture or to the assignment drop box outside of Rob Loney's office (ESB A204) before 4:30 p.m. on the day they are due. Late assignments will not be accepted and will receive zero. Do not submit assignments under my office door, by email, or directly to the TA. Extensions will only be granted under exceptional circumstances (e.g., severe flu, medical condition, family emergency) as determined by me.
- Your graded assignments will be returned in class, normally one or two weeks following the assignment's due date. Assignments that are not claimed in class will be left for pick up in the ERS office.
- If you feel that any assignment has been incorrectly or unfairly graded, please put your argument in writing, attach it to the original assignment, and deliver it to me at your earliest opportunity. In the event that we cannot resolve a grading issue, you can appeal your grade by submitting a new, unmarked copy of your assignment. I will ask another professor to then remark the entire assignment. The new mark, which could be either higher or lower than the original mark, will be your grade.
- Assignments do sometimes get lost. It is your responsibility to keep an original, unopened digital back-up copy of your work and/or your rough notes. This will ensure that you can resubmit and still get full marks for your work.

Academic Integrity:

Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from a 0 grade on an assignment to expulsion from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent University's Academic Integrity Policy. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trent's Academic Integrity website to learn more: www.trentu.ca/academicintegrity.

Access to Instruction:

It is Trent University's intent to create an inclusive learning environment. If a student has a disability and/or health consideration and feels that he/she may need accommodations to succeed in this course, the student should contact the Disability Services Office (BL Suite 109, 748-1281, disabilityservices@trentu.ca) as soon as possible. Complete text can be found under Access to Instruction in the Academic Calendar.

Please see the Trent University academic calendar for University Diary dates, Academic Information and Regulations, and University and departmental degree requirements.

Help with studying, taking notes, time management, reading, writing, etc:

We encourage ALL students to access the many resources of the Academic Skills Centre, located at Champlain College (CC S206, 748-1720). There is a wonderful array of materials and people who can assist you in improving your academic performance.

Referencing your work & plagiarism:

- You are expected to properly reference your essay. References serve three purposes: (1) to credit others for their ideas; (2) to demonstrate your understanding of the literature; and (3) to allow the reader to refer to the original reference for further detail or interpretation. Detailed references should be consistent throughout an assignment and follow a common convention (e.g., APA, Chicago, Nature, MLA, Environmental Science & Technology). More information about proper referencing can be found at the Trent Library webpage: www.trentu.ca/library/help/citations.html and in the Academic Skills Centre booklet: Notes on the Preparation of Essays in the Arts and Sciences (available at the ASC or bookstore). I strongly encourage you to become familiar with some reference management software such as Endnote, Zotero, Wizfolio or Trent Library's online, RefWorks, and use this for your citations and bibliographies.

Course Topics & Schedule (subject to change):

<i>Date</i>	<i>Topic</i>	<i>Comments</i>
Week 1 Sept 17	Forms of energy & power, energy conversions, heat & work, heat transfer, thermodynamic efficiencies (readings: Chapters 1, 2, 4). • No seminars	
Week 2 Sept 24	Energy conservation (reading: chapter 19) and Tour of Trent Environment Centre Guest: Stephen Collette • Seminar A groups: Review of problem set #1	
Week 3 Oct 1	Renewable energy development in Ontario: Opportunities and challenges. Guest: Pete Litster, Toronto Renewable Energy Co-op • Seminar B groups: review of problem set #1	
Week 4 Oct 8	Solar thermal & solar photovoltaic electricity (reading: Chapter 20 & 21) • Seminar A: review of Retscreen for Problem Set #2. (meet at BL 210) www.retscreen.net	Problem set #1 due (5%)
Week 5 Oct 15	Wind energy (reading: chapter 22) • Seminar B: review of Retscreen for Problem Set #2. (meet at BL 210) www.retscreen.net	
Week 6 Oct 22	Combustion, heat engines, heat pumps. (reading: Chapter 7) • Seminar A&B: optional assistance/discussion of essay assignment/mid-term exam.	Mid-term exam (15%) Essay early submission (optional)
Oct 29	Reading week	
Week 7 Nov 5	Geothermal heating (reading: Chapter 26) & Biomass energy. (Chapter 25). • Seminar A: Tour of Robert Lake power house (meet by site)	Problem set #2 due (5%)
Week 8 Nov 12	Energy & climate change. (readings: Chapter 5, 16, 18) • Seminar B: Tour of Robert Lake Power House (meet by site)	Research Essay due (20%)
Week 9 Nov 19	Energy policy in Canada: Markets, regulation & governance • Seminar A: Tour of Stan Adamson power house (meet by site)	
Week 10 Nov 26	Conventional fossil fuel energy (readings: Chapter 8, 9, 10, 11) Synthetic crude from oil sands and oil shale. Carbon capture & storage (CCS) Reading: Chapter 29 • Seminar B: Tour of Stan Adamson power house (meet by site)	
Week 11 Dec 3	Group project presentations (15 minutes per group) • Seminar A: course review	
Week 12 Dec 10	Group project presentations (15 minutes per group) • Seminar B: course review	Group Projects due (20%)
Final exam (scheduled during exam period by the Registrar)		

Please note that I am open to modifying parts of the course based on your suggestions. I am also open to good students completing components of the course mark through an approved alternative project with the Trent Centre for Community Based Education (www.trentu.ca/tccbe) or Ulinks (www.ulinks.ca) to partially fulfill the requirements for this course. TCCBE/Ulinks. Because of the amount of work these projects can require, an altered evaluation & marking scheme is possible but the onus for finding and organising such a project would rest with you.