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ECO 314S: Energy and the Environment Fall 2020

CALENDAR DESCRIPTION, REVISED:

The Covid-19 pandemic has led to enormous changes in energy markets. Oil demand has plummeted, and then recovered somewhat, as have oil prices. At one point in March 2020, a barrel of 'Western Canadian Select' was selling for about the price of a latté. This course surveys important features of energy markets and related environmental challenges in a rapidly changing world. One of the central objectives is to provide an understanding of the key economic tools needed to analyse these markets and to develop an appreciation for the political and geopolitical centrality of energy issues. A related objective is the development of a framework for understanding the public discourse on energy and the environment. Topics include the hydrocarbon economy (oil, natural gas and coal), electricity markets, global warming and other externalities, renewable energy and conservation, carbon pricing, sustainability, the geopolitics of energy, and the impacts of the current pandemic on energy markets.

Prerequisite:

ECO200Y1/ ECO204Y1/ ECO206Y1, ECO220Y1/ ECO227Y1/ (STA220H1, STA255H1)/(STA257H1, STA261H1)

Distribution Requirements: Social Science

Breadth Requirements: Society and its Institutions (3)

RELATED COURSES: ECO 414S Energy and Regulation; ENV462H1: Energy and Environment: Economics, Politics, and Sustainability. ECO 314F is not an exclusion to either of these courses.

TIME and LOCATION: Mondays 2-5. The course is delivered entirely online. Relevant tools are on Quercus.

EVALUATION:

Test 1	25%	Monday, October 5, 2-4.
Assignment	15%	Friday, October 16, by midnight
Test 2	25%	Monday, December 7, 2-4
Paper	35%	Thursday, December 10, by midnight.

The Assignment must be submitted as a single pdf document through Quercus with questions in the original order. You are required to submit solutions to all questions. However, only a subset will be graded. The list of questions that are to be graded will not be revealed in advance. Late assignments will be penalized 10% per day.

The Paper will be submitted electronically through Quercus in pdf form. Late papers will be penalized 10% per day. Please name the file using your name: for example, my paper would be "YatchewPaper.pdf".

- a. The paper should be about 3000 words. This does not include references, tables and graphics.
- b. The paper should follow one of the following styles: APA, Chicago or MLA.
- c. The structure of the paper must be as follows:
 - i. Cover Page – Title of paper, name and student number, date submitted, word count and an abstract which is not to exceed 250 words.
 - ii. Introduction – the first paragraph must contain your thesis statement.
 - iii. Literature Review
 - iv. Analysis

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- v. Conclusions
- vi. References – there should be at least seven relevant items. The reference style is of your own choosing but should be one of the standards such as Chicago, APA.
- d. You are responsible for selecting the topic of your paper. It should be on energy and one related area such as the environment, sustainability, security, technology...
- e. The “Analysis” section is a critical part of the paper. You should set out the evidence to support your thesis statement. You may want to critique positions taken by others.
- f. The “Conclusions” section should discuss policy implications.
- g. The approximate marking scheme for the paper is as follows: Abstract 5 marks, Introduction 5 marks, Literature Review 5 marks, Analysis 10 marks, Conclusions 5 marks, References and Style (APA/Chicago/MLA) 5 marks.

You are reminded that plagiarism and cheating are **serious** academic offences with potentially serious penalties. **Turnitin will be used on submitted work, including answers on tests.** The purpose is to check for textual similarity and to detect possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site. The University of Toronto's Code of Behaviour on Academic Matters (www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

The only generally acceptable reason for missing a term test is illness. Normally, a medical certificate is required under such circumstances. In present circumstances we will abide by University policies which may not require such certificates.

COURSE OBJECTIVES

1. Broad overview of major areas of energy economics and related environmental issues.
2. Brief review of important economic tools used to analyse energy markets.
3. Understanding public discourse on energy and environmental debates, (e.g., decarbonization, fracking, renewable energy, markets v. regulation, geopolitics ...).
4. Facility with data resources on energy and related environmental issues.

COURSE MATERIALS

1. Richard Muller, *Energy for Future Presidents*, Norton, 2012. Hardcopy and Kindle versions available.
2. Bruce Usher, *Renewable Energy: A Primer for the Twenty-First Century*, Columbia University Press, 2019. Available electronically through University of Toronto libraries. Also, hardcopy and Kindle version available.
3. Jaccard, M. *The Citizen's Guide to Climate Success*, Cambridge University Press, 2020, Entire pdf version available at <https://www.cambridge.org/core/books/citizens-guide-to-climate-success/49D99FBCBD6FCACD5F3D58A7ED80882D>

IN THE NEWS

Students are required to follow current issues in energy by signing up for alerts (e.g., through Google Alerts <https://www.google.com/alerts>, Bloomberg New Energy Finance <https://about.bnef.com/>, Utility Dive <https://www.utilitydive.com/>, or other such sources). Each class will begin with a brief discussion of the week's developments in energy. Students should regularly visit MIT Technology Review <http://www.technologyreview.com/> to review advances in energy. For insightful commentary on a range of issues, some related to energy, please sign up for the weekly briefing from Project Syndicate <http://www.project-syndicate.org/>. Material on the site is available through our library system.

LECTURE TOPICS

1. Background and Introduction
 - a. Yatchew, A. 2014: "Economics of Energy: Big Ideas for the Non-Economist", *Energy Research and Social Science*, 1(1), 74-82, <http://dx.doi.org/10.1016/j.erss.2014.03.004> , available electronically through University of Toronto libraries.
 - b. Muller, Part I, Ch. 1- 2., Part IV.
 - c. Jaccard, Ch. 1.
 - d. Usher, Ch. 1-3.

2. Milestones in Energy History
 - a. Smil, Vaclav "World History and Energy" in *Encyclopedia of Energy*, Volume 6, 2004 Elsevier Inc. Available electronically through University of Toronto Libraries.

3. Economic Tools: Theory and Empirical Analysis.

Refer to your texts in microeconomics to review the following subject areas: supply/demand analysis; consumer and producer theory; industry structures – monopoly, oligopoly, monopolistic competition, perfect competition; game theory; externalities; public goods; taxes and deadweight loss; regulation and competition policy. See in particular: Competition Bureau Merger Enforcement Guidelines [http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapi/cb-meg-2011-e.pdf/\\$FILE/cb-meg-2011-e.pdf](http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapi/cb-meg-2011-e.pdf/$FILE/cb-meg-2011-e.pdf)

4. Environmental Issues
 - a. Muller, Part I, Ch. 3 Global Warming and Climate Change.
 - b. Jaccard, M. *The Citizen's Guide to Climate Success*, Cambridge University Press, 2020, Ch. 4,6, 10-12.
 - c. Brander, James, "Easter Island: Resource Depletion and Collapse", *Encyclopedia of Energy*, 2004 edited by Cutler Cleveland.
 - d. Nordhaus, William, "The Climate Club: How to Fix a Failing Global Effort", *Foreign Affairs*, May/June 2020.
 - e. Nordhaus, William, "The Pope & the Market", *New York Review of Books*, October 8 2015. <http://www.nybooks.com/articles/archives/2015/oct/08/pope-and-market/>

5. Regulation and Government Intervention
 - a. Yatchew, A. 2014: "Economics of Energy: Big Ideas for the Non-Economist", *Energy Research and Social Science*, available electronically through University of Toronto libraries.
 - b. Yatchew, A. 2016: "Rational vs 'Feel-Good' Carbon Policy", *Energy Regulation Quarterly*, Vol. 4, Issue 3, <http://www.energyregulationquarterly.ca/articles/rational-vs-feel-good-carbon-policy-transferability-subsidiarity-and-separation#sthash.GBtFuIOG.dpbs>

6. Electricity and Renewables
 - a. Muller, Part III, Ch. 16 Electric Automobiles.
 - b. Usher, Ch. 4-12.
 - c. Muller, Part II, Ch. 7, Part III, Ch. 8-11, 13, 15.
 - d. Yatchew, A. 2019, "How Scalability is Transforming Energy Industries" *Energy Regulation Quarterly*, 7:2, 35-44.

7. Hydrocarbons – Oil, Natural Gas, Coal
 - a. Muller, Part II, Ch. 4-6, Part III, Ch. 14.

8. Geopolitics, Politics and Policy
 - a. Muller, Part V Advice for Future Presidents.
 - b. “2018 Diplomat of the Year Chrystia Freeland: Read the Transcript”, *Foreign Policy*, June 14, 2018, <https://foreignpolicy.com/2018/06/14/2018-diplomat-of-the-year-chrystia-freeland-read-the-transcript/>
 - c. Pineau, Pierre-Olivier “Canadian Energy in Multiple Crises: From Pipeline and Climate to Covid-19”, Slides from webinar, April 15, 2020.
 - d. U.S. Energy Information Administration, “Canada Country Analysis Brief”. Updated periodically on the EIA web-site. <https://www.eia.gov/international/analysis/country/CAN>

ADDITIONAL REFERENCES AND READINGS

1. Lawrence Livermore Laboratories, energy and carbon flow charts <https://energy.llnl.gov/>
2. International Energy Agency, energy flow charts <https://www.iea.org/Sankey/>
3. MIT Energy Initiative conducts research and posts reports on a broad range of topics. See <http://energy.mit.edu/studies-reports/>. See, for example
 - a. *The Future of Solar Energy. An Interdisciplinary MIT Study led by the MIT Energy Initiative*, 2015, <http://mitei.mit.edu/futureofsolar>
 - b. *The Future of Nuclear Energy in a Carbon-Constrained World An Interdisciplinary MIT Study*, 2018, <http://energy.mit.edu/research/future-nuclear-energy-carbon-constrained-world/>
4. *Economics in the Age of Covid-19* –Joshua Gans, MIT Press, April 2020. Kindle Edition available on Amazon.ca. An earlier open access draft is available at <https://economics-in-the-age-of-covid-19.pubpub.org/>.
5. Jeffrey Sachs, *The Age of Sustainable Development*, Columbia University Press, 2015. Hardcopy and Kindle editions available. Also available electronically through UofT Libraries.
6. Carol Dahl, *International Energy Markets*, PennWell, 2015.
7. Peter M. Schwarz, *Energy Economics*, Routledge, 2018. Hardcopy and Kindle versions available.
8. Daniel Yergin, *The Quest*, The Penguin Press, 2011. Hardcopy, Kindle and Audible versions available.
9. Roy Nersesian, *Energy Economics: Markets, History and Policy*, Routledge, 2016.
10. International Energy Agency, most recent documents are available electronically through the University of Toronto Libraries. See also <http://www.iea.org/>
 - a. *World Energy Outlook (most recent edition)*
 - b. *Electricity Information (most recent edition)*
11. Canada Energy Regulator: <https://www.cer-rec.gc.ca/index-eng.html> (formerly the National Energy Board)
12. BP <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html> which publishes the annual *BP Statistical Review of World Energy* and provides data in spreadsheet format.
13. Socolow, R. and S. Pacala: “A Plan to Keep Carbon in Check”, *Scientific American*, pp. 50-57. September 2006. “Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies”, *Science*, Vol. 305, pp. 968-72, 2004.
14. Ontario’s (Four Year) Environment Plan, 2018: <https://prod-environmental-registry.s3.amazonaws.com/2018-11/EnvironmentPlan.pdf>
15. Yatchew, A. and A. Baziliauskas 2011: “Ontario Feed-In Tariff Programs”, *Energy Policy*, 39, 3885-3893.
16. Green, R. and A. Yatchew 2012: “Support Schemes for Renewable Energy: An Economic Analysis”, *Economics of Energy & Environmental Policy*, 1, 83-98.