

ECON 366 Energy Economics

Andrew Leach

🕒 MW(F) 10:00—10:50, T 1-113

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🌐 aleach.ca or [eClass site](#)

📍 ? Office Hours [Monday 11:30-12:50 in Law 4-07](#) and [Wednesday 11:30-12:50 in Tory 7-28](#)

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Course Description

The goal of this course is to develop a deep understanding of energy markets, regulations, and technologies and to use economics tools from our 100- and 200-level classes to assess strategic behaviour, investment decisions, and regulatory issues in energy. The course will focus on sectors most relevant in Alberta. We will look at the oil sands and other upstream oil and gas production, upgrading, refining, and transportation by pipeline and rail for oil and as well as the production of liquefied natural gas (LNG). We will then look extensively at the electricity sector. The course will consistently feature discussion of climate change, the policies to combat it, and their impacts on the energy sector.

Course Material

There is no text required for this course. Any readings, software, or data I use will be available freely online or available through the University of Alberta Libraries on-line access. You are also expected to remain up-to-date on issues related to the energy industry in the news. The topics of discussion may change rapidly if news evolves.

Deliverables

Data Assignments (30%)

You will have three (3) data processing assignments during the term using tools that we develop and practice in class. In each case you will, in teams of 2 or individually, scrape energy data from an online source, process data in R, produce both visual (graphs/tables) and brief textual analysis of the significance of the data you've extracted, and submit your report and the code to generate it in an RMarkdown or Quarto document (those with Python experience may use Python and submit either a Quarto document or a Jupyter notebook). Further details and samples to follow.

Midterm (25%)

The midterm exam will cover concepts (including readings and data assignments) in the first part of the term, but will not directly involve data processing or scraping nor direct use of software other than your browser. It will be written during class time, on eClass, on February 14th (Wednesday before Reading Week). The midterm is not *fail-safe* nor optional. A practice midterm exam will be provided in advance.

Final Exam (45%)

The tentative exam date for this class is Monday, April 22nd at 2:00 PM. The final exam will be cumulative and concept-focused, but will include some analysis. One or more practice exams will be provided in advance.

Class Schedule

This is a rough outline for the semester. Actual class content may vary over the course of the term, and the detailed class schedule is available [here](#).

Introduction

- Introduction to the class, assignments, exams, and expectations
- Introduction to key data tools, online locations, etc.
- Basic outline for the term
- Energy units primer

Concepts: RMarkdown; Quarto; Data sources(e.g. EIA; CER; AER; AESO; CANSIM; ECCC; IEA; BP)

The Global Energy Economy

- Global energy demand and supply and how these differ from how we frame supply and demand in Marshallian economics
- Regional (and provincial) variation in energy supply
- Implications of climate change policy on the global energy system
- Canada's climate change challenge

Concepts: TPES; supply; demand; electricity generation vs. capacity; IPCC; climate change.

Oil and gas markets

- Crude quality, location, and pricing
- Futures pricing
- Energy units vs. volume units
- Gas vs. oil units
- Natural gas liquids
- Key drivers of oil and gas prices

Concepts: OPEC; WTI; Brent; AECO/NIT; Henry Hub; fractionation; backwardation; contango; storage; inventories; sweet vs. sour crude or gas; well-head prices; pipeline gas.

Oil and gas production, reserves, resources

- How do we produce oil and gas?
- How do economists think of an oil and gas production decision?
- Royalties and taxes
- Resources and reserves of oil and gas companies
- Supply cost for oil sands projects

Concepts: conventional vs. unconventional extraction; shale gas; light tight oil; fracking; *in situ* vs. mined oil sands; type curves; 1P and 2P reserves; company-level vs. country-level reserves; capital vs. operating costs; supply cost and net present value of an oil

project.

Pipelines and Downstream Processing

- transportation options for oil and gas
- pipelines vs. rail for oil and bitumen
- economic regulation of pipelines including common carrier vs. contracted pipelines
- LNG projects and the economics of gas extraction

Concepts: tolls; common carrier; open season; diluent recovery unit; *Canadian Energy Regulator Act*; cost-of-service regulation.

Electricity

- Electricity market segments (generation, transmission, distribution)
- Electricity demand and supply characteristics
- Industrial load and the role of combined heat and power
- Renewable power
- Competitive vs. regulated electricity markets
- Alberta's wholesale electricity market
- Cost of new generating capacity
- Role of electricity in decarbonization

Concepts: duration curves; cost-of-service; merit order; ancillary services; energy storage; prices and riders; rate regulation; electrification.

GHG Policy

- The economics of climate change policy
- Constitutional constraints on climate change policy
- Carbon taxes, cap-and-trade and hybrid policies
- Canada's *GGPPA* and Alberta's *TIER*
- Mitigation vs. adaptation

Concepts: marginal abatement cost; marginal damage; carbon budgets; POGG; tax; output-based allocation; GHG; Kyoto; Copenhagen; Glasgow; IPCC; UNFCCC; COP.

Course policies

Prerequisites

The prerequisites for ECON 366 are ECON 109 and ECON 281. If you do not have these, your registration will be cancelled in BearTracks.

Friday R lessons

My plan is to provide you with virtual sessions focussed mostly but not exclusively on data work with R, as well as to cover the solutions to data exercises and assignments in lieu of an in-person Friday class most weeks. This material is best learned at your own pace, with your own machines. These sessions are integral to the course and to your completion of the data assignments.

Attendance

Attendance is not mandatory, although my expectation is that you will come to class and participate actively. I promise that I won't test you on material you haven't seen in class, but if you rely only on notes, you may miss material that will be tested.

Late Assignments and Missed Exams

The midterm will be completed on eClass during class time. If you know that you will be unable to complete the midterm as scheduled for a legitimate reason, please notify me in advance so that we can make arrangements which may include a make-up opportunity or a transfer of grades to other course material. If you fail to contact me in advance, you will receive a zero.

Late assignments will be penalized 25 percentage points per day late. I will not accept assignments after two full days or once solution keys are available to the class or discussion of solutions has taken place.

Final exam deferrals are managed exclusively through the Dean's office. You may, in all cases, fill out a Request for Deferral of Examinations and/or Term Work form available from the Faculty of Arts Undergraduate Student Services forms cabinet.

Accessibility

If you have a condition that may require classroom or exam modifications, please contact Accessibility Resources to obtain a determination as to what accommodations should be made. In addition to formal accommodations, if there are things I can do in class to make your learning environment more positive (colours, fonts, etc.) let me know.

Sexual Violence Policy

It is the policy of the University of Alberta that sexual violence committed by any member of the University community is prohibited and constitutes misconduct. Resources and more information can be found [here](#).

Recording

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Academic Misconduct

“The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the [Code of Student Behavior](#) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University” (GFC, 29 Sep 2003).

I will take any and all incidents of plagiarism seriously, including the improper use of AI tools for assignment preparation. It is your responsibility to ensure that you are familiar with the rules that govern academic misconduct, in particular the following section:

30.3.2 Inappropriate Academic Behaviour, 30.3.2(1) Plagiarism

“No Student shall submit the words, ideas, images or data of another person as the Student’s own in any academic writing, essay, thesis, project, assignment, presentation or poster in a course or program of study.” For more information, see [the policy manual here](#).)

More information on academic policies is available from the [GFC Policy Manual](#).

Policies re: Grading and Course Outlines

Grading policies for the University of Alberta may be found [here](#).

Policy about course outlines can be found in the Evaluation Procedures and Grading System section of the University Calendar.

Student Resources

A wide range of other resources for students is available [here](#).

Important dates for the term

January 8th: Classes begin.

February 19th: Family Day

February 19-23: Reading Week

April 12: Last day of classes.

April 22: Final exam (tentative), at 2:00 PM

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