CHM197 Environmental Chemistry in a Sustainable World: Focus on Energy

Instructor and Course Delivery

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Class location: LM155
Class hours: Thursdays from 10 am to 12 noon
Office Hours: We'll find a time that works for most people, after the course starts.
Delivery mode: In person

Covid-19 Issues

It is requested that masks are worn in class. If you are sick, please don't come to class. There is no online attendance option, but audio recordings of each class will be provided.

Are you in the correct course?

If you are a science major, you are likely in the wrong course! This is a course for non-scientists, who have little science background. While hopefully interesting, a science major will find aspects of the course too easy. Also, please note that this is a seminar course with an expectation that you will participate in oral and written discussion; it is not a lecture-style course.

Course Overview

What this course is about

An important role that chemicals play in our lives is through their connections to energy, i.e. its production, use and impacts. This is true for all energy sources: fossil fuels, nuclear, solar/wind, and renewable biofuels. Energy choices are of central importance to human society, with direct impacts on the environment. With rising populations and (hopefully) higher standards of living for many countries in the future, there are important choices to make: Do we value energy solutions that have severe short-term environmental impacts or more diffuse long-term impacts? Are we concerned whether the impacts are local, regional or global? Should we follow grassroots or high-tech pathways, centralized options, or ones distributed to the local or even household level? Intelligent solutions require a strong scientific understanding of the different options and their environmental impacts. *In sum, we will examine the chemistry of energy choices and their environmental impacts, as the world charts its way to net zero and a more sustainable future.*

What this course is not about

Important aspects of the connections between chemistry and energy are the ethical, economic and socio-political factors that come into play. While we will discuss these topics, CHM197 is a science course and so we will largely focus on the scientific and technical aspects of the subject.

Anticipated learning outcomes from the course. At the completion of the course, you will be able to:

- Demonstrate the connections between chemistry, energy, and the environment
- Evaluate how societal energy choices affect the environment
- Demonstrate the importance of scientific understanding in making those choices
- Think quantitatively about these subjects
- Critically evaluate scientific literature, learning to summarize concepts and ask questions
- Critically evaluate media coverage of energy topics
- Better express yourself orally and in a written manner

Prerequisites

The Ontario minimum standards in high school science and math.

Content

- Energy Overview: world use, historical trends, types
- Chemistry and Energy: units, heat engines, power plants, storage
- Common Chemical Fuels:
    i. Fossil fuels: types, formation, extraction, impacts on climate, acid rain, air pollution
    ii. Chemical products from fossil fuels: refining, petrochemicals
    iii. Nuclear power: fission, nuclear reactors, waste disposal, health impacts
- Energy, Chemistry and the Future:
    iv. Solar Energy: solar cells, passive versus active
    v. Wind energy: locations, impacts
    vi. Biofuels: ethanol, biodiesel, food versus fuel, anaerobic digestion
    vii. Hydrogen: sources, fuel cells and transportation
    viii. Carbon sequestration and geoengineering: methods, potential impacts

Course Components and Grading

Grading Scheme

Research project topic choice – 3%
Reading assignment posts – 12%
Media critique video and report – 15% (7.5% video, 7.5% report)
Research project paper – 25%
In-class assessments – 25% (10% first, 15% second)
Participation (in class, via online comments on videos) – 20%

Research Project – It is important to know how to: i) research a topic and ii) assess scientific information given to the public. (There is too much fake news out there!) To do this, there are two major aspects to this project:

- You will write a library research paper on a topic of current interest related to energy and the environment.
- You will evaluate two to three articles in the popular media that address/discuss this topic: What aspects are accurately covered? What is inaccurate? What parts of the subject were ignored? Are the articles doing a good job at educating the public? Do not choose articles from the scientific literature (e.g. from journals like *Nature, Science, Scientific American*). The articles should each present the topic in a different manner, i.e. different biases, foci, and/or accuracy.

You will work on this project throughout the semester:

- You will submit the **Topic** by 5 pm Friday, September 30, which consists of a title, about 100 words describing the topic in energy and the environment, and titles and sources of the media articles you will be critiquing.
- By 5 pm Friday, October 28 you will upload a 5-minute **Video** that describes how the media covers your research topic, using the articles you chose as examples. Other students will provide anonymous feedback by Sunday November 6 at 5 pm that you can address in the final written report. Your video will be graded on how it effectively describes media coverage of your topic, and on its structure, clarity, effective use of graphics.
- You will submit a 2000-word **Research Paper** (by Friday, November 18 at 5 pm), and a 500-word **Media Critique Report** (by Sunday, December 4 at 5pm). Your research paper will be graded on: i) research (Did you go into the scientific literature deeply?), ii) clarity and organization (Is there a clear introduction, conclusion/synthesis, structure?), iii) the choice of topic, iv) citations (Did you include at least 10 citations (in addition to the articles you are critiquing) indicating the research you conducted?). Your media critique will be graded on: i) how effectively you discuss the merits and weaknesses of each article, ii) effective incorporation of feedback from the class, iii) synthesis of how the media covers this topic, iv) good choice of articles to critique.
- All information about how to submit these items will be on the Quercus course page.

Reading assignment posts – In class, every week we will discuss articles from the scientific literature and popular press. For each reading assignment, you will post to a class discussion board at least one question or comment/insight (these don't have to be long – one sentence is enough!) that arose while you read the article(s). Please submit these posts by midnight of the day preceding the discussion. To get full credit (12%) you must submit posts for 8 reading assignments, indicating in some way that you read the article. For every assignment fewer than 8 in number that you post, you will lose 1.5% credit.

Participation – The participation component of the course will be assessed by both the number and quality of contributions. In particular, you are expected to participate in class discussions. I strongly encourage you to come to all classes. However, if you miss more than one class, this will impact your ability to participate and the participation grade you will receive. For an on-going issue, please contact the instructor and get a medical note. You are also required to provide (anonymous) constructive comments on half of the videos posted by your classmates by 5 pm Sunday November 6. For example, "I really liked this part of your talk because … but I didn't understand this part … " or "Have you thought of addressing the issue of xxx …?".

Assessments – The in-class assessments will consist of definitions, true/false, short answers, and perhaps a couple of short quantitative questions. You are responsible for material presented in class, student videos, and the reading assignments. The tests are short, closed book, in the classroom, at the end of class on Thursday October 20 (max 30 minutes long) and Thursday, December 1 (max 45 minutes long). If you have attended all classes, they should not be too hard (hopefully!).

Important dates

Media critique topic	by Friday, September 30, 5 pm
Media critique video	by Friday, October 28, 5 pm
Comments on posted videos	by Sunday, November 6, 5 pm
Research paper	by Friday, November 18, 5 pm
Media critique paper	by Sunday, December 4, 5 pm
In class assessments	on Thursday, October 20 and December 1
Reading posts	every week (except Week 1) by midnight before class

Course Policies

Late penalties

- Topic – 1% off per day late, e.g. a topic submitted one day late is worth 2%.
- Video, papers – 10% off per day late, e.g. a paper that would have been 85% if on time would receive 75% if submitted on November 19 at 3 pm.
- Posts – no credit for late posts, i.e. the questions are required to frame the discussion for the class the following day.
- Participation – no credit for late online video comments, i.e. the other students need your feedback, and no credit if you are not present in class.

Medical (or equivalent) emergencies

No penalties if appropriate documentation is provided for such emergencies.

Students with accommodations

Students with diverse learning styles and needs are welcome! The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact Accessibility Services as soon as possible. Note that many accommodation requests must be submitted at least one week in advance of the course element deadline. As described above and given the seminar nature of the course, there are specific course elements (i.e. posts, videos, comments on videos, in-class

participation) for which extensions are **not** usually possible because those elements are required for the seminar to proceed smoothly.

Communciation with the instructor
Email is the best way to contact me. I will do my best to return your email within 24 hours, Monday to Friday. I may be a bit slower on the weekend, depending on what I am doing!

Learning environment
The University of Toronto is committed to equity, human rights and respect for diversity. Members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

Privacy issues
Students may create audio-recordings of the classes for their personal use. Recordings are intended to permit class content review to enhance understanding of the topics presented. Audio-recordings are not substitutes for attending class. Students should note that since audio recordings are to be permitted, their voice may be recorded by others during the class. Please speak to the instructor if this is a concern for you.

Students agree to the following terms when creating audio recordings of lectures:

- Recordings are not to be distributed without the permission of the instructor via the Internet, using social media such as Facebook, peer-to-peer file sharing such as One Drive or Dropbox, or other distribution channels.
- Recordings are not to be shared with other classmates unless they are to be used in collaborative assignments, or if the instructor permits for other reasons.

Non-compliance with these terms violates an instructor's intellectual property rights and the Canadian Copyright Act. Students violating this agreement will be subject to disciplinary actions under the Code of Student Conduct.

Submission methods
Use Quercus for all submissions (aside from the assessments).

Technology Requirements

Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/

Advice for students more broadly regarding online learning is available here:
https://onlinelearning.utoronto.ca/getting-ready-for-online/

This course requires the use of computers, and of course sometimes things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, broken printers, lost or corrupted files, incompatible file formats, and similar mishaps are common issues when using technology, and are not acceptable grounds for a deadline extension.

Institutional Policies and Support

Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see https://www.academicintegrity.utoronto.ca/). Here is an additional website to look at: http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize.

In sum, all your work must be your own. It is very easy to identify work that is plagiarized and the ramifications are serious.

Copyright

If a student wishes to copy or reproduce class presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available here: https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/.

Accessibility Needs

Please see entry above for Students with Accommodations

Accommodations for Religious Observances

Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an assignment, tutorial, class or laboratory session. Students must inform the instructor **before** the session/assignment date to arrange accommodations.

Additional Services and Support

The following are some important links to help you with academic and/or technical service and support:

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries

- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information for Technical Support/Quercus Support

Acknowledgement of Traditional Lands

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca and, most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.