CHM197 Environmental Chemistry in a Sustainable World: Focus on Energy

<u>Teaching Team, Time, and Location</u>
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Class location: UC256
Class hours: Tuesdays from 9 am to 11 am
Office Hours: We'll find a time that works for most people, after the course starts.
Delivery mode: In person

<u>Are you in the correct course?</u>
If you are a science major, you may be in the wrong course! CHM197 is designed for non-scientists, who have little science background. While the course may still be interesting, a science major may find the topics are not probed in as much detail as in other science courses. Also, please note that this is a seminar course with the expectation that you will participate in oral and written discussion; it is not a lecture course.

<u>Course Overview</u>
<u>What this course is about</u>
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? Are there environmental justice issues associated with energy choices, so that some groups in society benefit more or less? 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 winds its way to net zero and a more sustainable future.

<u>What this course is not about</u>
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.

<u>Anticipated learning outcomes from the course. At the completion of the course, you will be able to:</u>
- 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

<u>Prerequisites</u>
The Ontario minimum standards in high school science and math.

<u>Content</u>
- 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 Organization

This course consists of weekly two-hour classes. We will use that time to introduce new concepts and discuss assigned readings. There are no tutorials. Students are responsible for all material presented in class and all assigned readings. Please see the section below for important dates. Assessments will be conducted in class, whereas the research paper, posts, video will be submitted online via Quercus.

Evaluation, Grading Scheme, Important Dates

Grading Scheme
Research project topic choice – 5%
Reading assignment posts – 10%
Media critique video – 15%
Research project paper – 25%
In-class assessments – 30% (two @ 15% each)
Participation – 15% (10% in-class discussion, 5% comments on videos)

Late penalties
Topic – 1% off per day late, e.g., a complete topic submission that is two days late is worth 3%.
Video, paper, video comments – 10% off per day late, e.g., a paper that would have been 85% if on time would receive 75% if submitted on November 25 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.
In-class participation – no credit if you are not present in class.

Medical (or equivalent) emergencies
No penalties in such circumstances. Please consult the instructor.

Research Project – The rise of social media now means there is a lot of false information and fake news readily available. This project will develop your skills in: i) collecting and summarizing reliable scientific information, and ii) assessing the validity of public information on science topics. There are four aspects to this project:

- You will submit the **Topic** by 6 pm Friday, October 6 consisting of: i) a title, ii) about 100 words describing the topic in energy and the environment, iii) titles and sources of the three popular media articles you will be critiquing in your video, and iv) titles and sources of three scientific articles that you will use as references for your research paper.

- By 6 pm Friday, October 20 you will upload a 5-to-6-minute **Media Critique Video** that describes how the media covers your research topic. In it, you will evaluate three articles in the popular media that discuss your 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 popular media

articles ideally should each present the topic in a different manner, i.e., different biases, foci, and/or accuracy. Your media critique will be graded on: i) how effectively you discuss the merits and weaknesses of each article, ii) synthesis of how the media covers this topic, iii) good choice of articles to critique, and iv) quality of your video (e.g., structure, clarity, effective use of graphics).

- You are required to post **Constructive Comments** on the videos posted by your classmates by 6 pm Friday November 3. For example, "I really liked this part of your talk because … but I didn't understand this part … " or "Had you thought of addressing the issue of xxx …?". The instructor will indicate for which videos you need to comment.

- You will submit a 2000-word **Literature Research Paper** by Friday, November 24 at 6 pm on your topic of energy and the environment. Your paper will be graded on: i) how deeply you did literature research, ii) clarity and organization (Is there a clear introduction, conclusion/synthesis, structure?), iii) the choice of topic, iv) references (Did you include at least 10 citations from the scientific literature?). The research paper will be checked for plagiarism. Note that the use of generative artificial intelligence tools or apps for assignments in this course, including tools like ChatGPT and other AI writing or coding assistants, is prohibited.

Reading assignment posts – Every week we will discuss articles from the scientific literature and popular media. For each reading assignment, you will post to a class discussion board at least one question or comment/insight that arose while you read the article(s). These don't have to be long – one or two sentences is enough. Please submit these posts by midnight of the day preceding the discussion. To get full credit (10%), you must submit posts for 8 reading assignments. For every assignment fewer than 8 in number that you post, you will lose 1.25% credit.

In-class participation – You are expected to participate in class discussions; your participation will be graded by the quality and quantity of your input. 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 requiring more than one missed class, please contact the instructor.

Assessments – The in-class assessments will consist of definitions, true/false, and short answers. You are responsible for material presented in class and the reading assignments. The assessments are 30 minutes long, closed book, in the classroom, at the end of class on Tuesday October 24 and Tuesday, December 5.

Important dates
Media critique topic	by Friday, October 6, 6 pm
Media critique video	by Friday, October 20, 6 pm
Comments on posted videos	by Friday, November 3, 6 pm
Research paper	by Friday, November 24, 6 pm
In class assessments	on Tuesday, October 24 and December 5
Reading posts	every week (except Week 1) by midnight before class

Course Policies

Learning environment
Each member of this course is expected to maintain a:
(i)   professional and respectful attitude during all course activities
(ii)   personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met
(iii)   collection of notes recorded independently based on concepts covered in course activities (students registered with Accessibility Services requiring a class note-taker will have access to this accommodation)

(iv)   familiarity with the university policy on Academic Integrity

The University of Toronto is committed to equity, human rights, and respect for diversity. All 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. The Course Instructor will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns, we encourage you to reach out to the staff in our Equity Offices.

Process for signaling course absences and requesting make-up tests or other missed pieces of work.
If you are absent from your studies due to illness or other reasons and unable to complete course work (e.g., a term test or an assignment) then a piece of written documentation is required. The following four items are the recognized forms of documentation:

1. Absence Declaration via ACORN (please note the circumstances under which an absence declaration can and cannot be submitted)
2. U of T Verification of Illness or Injury Form
3. College Registrar's letter
4. Letter of Academic Accommodation from Accessibility Services

Students who complete the ACORN Absence Declaration form must additionally contact the course instructor to discuss their situation within five business days of the missed piece of work. This is essential action for any consideration to be granted. For extended absences and for absences due to non-medical reasons, make sure to contact your College Registrar's Office. They can help you decide between a request for an extension or other types of academic consideration. If you suspect or know that you have a disability that is affecting your studies, learn about the services and supports available through Accessibility Services. A disability can be physical disability, sensory disability, a learning disability, mental health disorder or a short-term disability like an injury. If you are not sure whether you have a disability, you can confidentially contact Accessibility Services with your questions.

Artificial intelligence tools.
The use of generative artificial intelligence tools or apps for assignments in this course, including tools like ChatGPT and other AI writing or coding assistants, is prohibited.

Communication with instructor
Email is best. Please don't communicate via Quercus but use my normal email instead: jonathan.abbatt@utoronto.ca. I will do my best to return your email within 24 hours, Monday to Friday. I may be a bit slower on the weekend.

Privacy issues
Students may create audio-recordings of the classes for their personal use, i.e., such recordings are intended to permit class content review to enhance understanding of the topics presented. Audio-recordings are not substitutes for attending class however. 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.

Process for requesting re-grading of course work
Students may request a re-grade of work within one week of receiving the graded item. Please email the request to the instructor with a short explanation justifying the request.

Technology requirements
This course requires the use of computers, and technical issues are possible. When working on a piece of academic work, students are responsible for scheduling enough time to allow for reasonable delays due to technical difficulties to be overcome, so such issues will not be acceptable grounds for deadline extension. Particularly, maintaining an up-to-date independent backup copy of your work is strongly recommended to guard against hard-drive failures, corrupted files, lost computers, etc.

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 some accommodation requests must be submitted at least one week in advance of the course element deadline. 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.

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 (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:

On tests:
1. Using or possessing unauthorized aids. Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz/term test questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters.
2. Looking at someone else's answers or collaborating/discussing answers during a quiz or term test.
On research papers:
1. Any form of plagiarism (see below).
In general 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

www.academicintegrity.utoronto.ca/).

Plagiarism Detection
Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).

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.

Accessibility Needs
Students with diverse learning styles and needs are extremely welcome in this course. 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.

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 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.