

ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəyəm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next on this site. As we explore sustainable energy futures in this class, it is critical that we also reflect on the historical and ongoing connections between energy, environment, and society of this place and its peoples.

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Energy, Environment & Society	ENVR 410	3

PREREQUISITES AND COREQUISITES

Enrollment in this course requires 4th year standing in B.Sc., B.A.Sc., or related programs. Students from other faculty can enroll upon request. Energy systems are inherently multi-faceted, and this course is very interdisciplinary. Each of you bring training, experience, and insights that can help us understand energy systems. However, because the course is interdisciplinary, we also anticipate that there will be times when you encounter concepts and material that may be entirely new and unfamiliar. Do not be alarmed – this is part of the process!

Because this course is within the Environmental Sciences (ENVR) program, we will assume some familiarity with environmental science concepts. For non-ENVR students, who feel they would benefit from some review of these topics, please see the Resources section at the end of the Syllabus, or contact the Instructors for suggested materials.

TEACHING TEAM CONTACTS

Course Instructors	Contact Details	Office Location	Office Hours
Amanda Giang (she/her) Assistant Professor Institute for Resources, Environment & Sustainability and Department of Mechanical Engineering	amanda.giang@ubc.ca or via Canvas You can expect me to respond to email inquiries within 48 hours.	AERL 434	TBD first week of class
Terre Satterfield (she/her) Professor Institute for Resources, Environment & Sustainability	terre.satterfield@ires.ubc.ca or via Canvas You can expect me to respond to email inquiries within 48 hours.	AERL 417	TBD first week of class
Course TA Rudri Bhatt (she/her) PhD Student Institute for Resources, Environment & Sustainability	rudri.bhatt@ubc.ca		

LEARNING OUTCOMES

What would a sustainable energy system look like, and how will we get there?

Energy undergirds almost every aspect of our lives today. Its production and use shapes how we live, work, learn, and play. It also shapes the planet. The climate crisis is just one example of how energy is deeply linked with the environment and society. Addressing energy challenges like climate change therefore requires us to understand not just the science and engineering of energy technologies, but broader human-natural-technological energy systems.

This course is focused on understanding energy systems (including their social and environmental dimensions); developing a toolbox of analytical and conceptual tools (from social and natural sciences) that can help us evaluate policy choices about energy systems; and using these tools to think critically about how these systems can be transformed to reach our collective sustainability goals. To reach these goals, we explore a series of contemporary and historical case studies of energy debates, from here in North America and elsewhere in the world.

By the end of this course, you will:

- Develop a deeper quantitative and qualitative understanding of the technical, social, and environmental dimensions of energy systems and their interactions, for specific energy issues
- Apply concepts and analytical approaches from natural and social sciences to better understand energy policy debates and controversies, from local to global scales
- Identify the strengths, limitations, and underlying assumptions of different analytical and conceptual approaches
- Evaluate strategies to transition to more (environmentally, socially, economically) sustainable energy systems
- Appreciate the role of both facts and values in the evaluation process
- Effectively communicate technical information about energy issues in written, visual, oral formats to a range of audiences
- Collaborate in interdisciplinary teams to conduct energy systems analysis

COURSE STRUCTURE AND ACTIVITIES

In the **online version** of this course, we will conduct **1-hour of synchronous learning activities each week on Tuesdays**. To accommodate the various time zones represented in the class, we will hold two synchronous sessions via Zoom each Tuesday: **8:00 – 9:00 am PT and 11:00 am – 12:00 pm PT**, of which you are expected to attend one regularly. (These sessions will also be recorded.) These synchronous sessions are designed to incorporate student-centered active learning approaches, including interactive discussion, role-play simulations, and workshops for the collaborative class project. **On Thursdays, we will release asynchronous learning materials, to be viewed/completed before Tuesday**. These materials will consist of recorded lecture videos, worksheets, and other learning activities. You might choose to work through this material during the Thursday class time. For the most part, Tuesday activities will be based on material from Thursday. In total, synchronous and asynchronous “in class” time will not exceed 3 hrs/week.

Throughout the course, you will also work in small groups on a larger case study (in- and outside of class time). This case will be an opportunity for you to apply the concepts and tools we discuss in each unit to a specific, real-world issue.

All course materials will be shared on Canvas. You are responsible for checking the course webpage on Canvas regularly (e.g., 2-3 times a week) to be aware of any updates or changes to course content, schedule, and activities. **We will regularly use the Announcements feature for class communications, so we recommend changing your Canvas notification settings so that these Announcements also go to your email inbox.**

The course is organized into three units:

What is an energy system? In this unit, we will focus on understanding energy from a systems perspective, and its linked technical, social, and natural components. We will explore the scientific and engineering principles behind energy production, introduce ideas from energy policy and politics, and analyze how natural systems are sources of, and also impacted by, energy production and use.

What are energy system consequences? Energy systems are complex and multidimensional. In this unit we outline some of the environmental and social consequences of energy systems, good and bad. We also discuss ways of thinking about these different kinds of impacts together, to support evaluative decision-making about energy systems that considers their technical, social, and environmental dimensions. We explore the strengths and limitations of these tools.

How do we transform energy systems? Often, our goal isn't just to understand energy systems, but to transform them—to be more sustainable, just, and efficient. In the final unit, we learn to think critically about what is needed to get us to sustainable energy systems. We consider supply- and demand-side challenges and opportunities, and the levers (e.g., law and policy, technology, public opinion) we have at our disposal.

SCHEDULE OF TOPICS

Schedule updates will be reflected on Canvas. Please see the Detailed Schedule for readings. Synchronous sessions are noted **in bold**.

Module	Dates	Topic	Questions	Assignments
What is an energy system?				
1	Jan. 12	Course Intro	What is this course about? What is an energy system? How do people and the planet fit into them?	Beginning of term reflection
2	Jan. 14 Jan. 19	Energy science and engineering fundamentals Energy fundamentals activities	Where does energy come from, and in which forms? How is it stored and converted? How much do we need? What is special about electricity, and what is the electric grid?	
3	Jan. 21 Jan. 26	Energy policy and politics fundamentals Energy imaginaries	What policies frame energy development in Canada? What extra-formal activities are responding to those (e.g., activism, NGOs etc.)?	

4	Jan. 28 Feb. 2	Stakeholders and Deliberation Hydroelectric Dam Impacts Negotiation Simulation	What do we expect of energy systems? How might these expectations differ between stakeholders?	<u>Individual Assignment #1:</u> Energy Calculator and Biography due <i>January 29th</i>
<i>What are energy systems consequences – good and bad, big picture?</i>				
5	Feb. 4 Feb. 9	QUIZ 1 Environmental Impacts (Case Study Workshop)	What are the links between energy systems and land, air, water, climate, and life?	
6	Feb. 11 <i>READING WEEK</i> Feb. 23	Social Impacts, including Relocation, Energy Poverty, Distributional Impacts and Benefits Human-technical-environmental interactions	What are some of the social and cultural consequences linked to energy development in Canada?	
7	Feb. 25 Mar. 2	Integrating social and environmental impacts through decision analysis Framing the big picture and developing indicators (Case Study Workshop)	How might we evaluate policy options?	<u>Group Case Study Assignment #1:</u> Group Contract and Energy Systems Map due <i>February 26th</i>
8	Mar. 4 Mar. 9	Uncertainty; Risk Analysis and Perception Applying risk frameworks (Case Study Workshop)	How do we assess the environment, health, and safety risks associated with energy tech? How and why do people intuitively evaluate energy systems as 'good' or 'bad'? What challenges does this pose? Are perceived risks the only or primary concerns wrt energy systems or are other consequences of energy systems ignored given patterns of perceived risk? Is this a 'developed' v 'developing world' problem?	
9	Mar. 11 Mar. 16	Life Cycle Assessment and Cumulative Impact Assessment LCA: Biofuels and natural gas CIA: TBD	How do we assess environmental impacts of energy technologies from "cradle to grave?"	<u>Individual Assignment #2:</u> Annotated Bibliography

			What is meant by CIA? How might it be measured/assessed?	entries due <i>March 19th</i>
<i>How do we transform energy systems?</i>				
10	Mar. 18 Mar. 23	Evaluating proposals to decarbonize energy systems technically Canadian Decarbonization Challenge	What are the challenges and opportunities in scaling up renewable energy?	
11	Mar. 25 Mar. 30	Enabling energy futures: policy levers and incentivizing change Examining the Vancouver Climate Emergency Action Plan	What tools do we have to incentivize change, from the top-down and bottom-up?	
12	Apr. 1 Apr. 6	QUIZ 2 Case Study Presentations and Discussion	What makes an energy system environmentally, socially, and economically sustainable? How do we evaluate energy systems against those criteria? How might energy systems be improved or transformed?	<u>Group Case Study.</u> <u>Assignment #2:</u> Presentation
13	Apr. 8 Apr. 13	Case Study Presentations and Discussion Case Study Presentations and Discussion + Course Wrap up	What makes an energy system environmentally, socially, and economically sustainable? How do we evaluate energy systems against those criteria? How might energy systems be improved or transformed?	<u>Group Case Study.</u> <u>Assignment #2:</u> Presentation End of term reflection
				<u>Group Case Study.</u> <u>Assignment #3:</u> Final Reports due <i>April 23rd</i>

LEARNING MATERIALS

There is no mandatory text book for this course. All course readings will be posted online on **Canvas**, and will range from excerpts from books, scholarly articles, news articles, grey literature (e.g., government and civil society

reports), blog posts, podcasts, and other multimedia content. Copyrighted materials will be made available through the UBC library, but will be CWL protected. Readings will be split between mandatory and optional content. Optional readings offer an opportunity to go deeper into that week's topics, and are given as starting points for further inquiry for interested students. Though not required, some may be useful for your projects.

ASSESSMENTS OF LEARNING

Group case study - 40%

Throughout the term, you will work in small groups of 4-6 students to apply the theory and methods we are learning in class to a real-world example of energy systems decision-making. These cases are drawn from across the globe and from different time periods. Your case studies are designed to encourage you to think rigorously and systematically about: 1) what makes an energy system environmentally, socially, and economically sustainable?; 2) how do we evaluate energy systems against those criteria?; 3) how might energy systems be improved or transformed?

The case study also comprises the single largest component of your assignment load for this course. The challenge, in applying your thinking as it has developed over the course of the term, is to conduct an analysis of a particular case. The idea is to take the case study materials provided and seek to diagnose that case including its status regarding actual or predicted outcomes and whether those are 'sustainable' or 'not' using a definition of that term that incorporates social, environmental and technological dimensions.

At the beginning of the term, we will post a set of case briefs that outline each case. You will then sign up for a case study (directions will be given the first day of class). We want this project to be useful to you, so please choose a topic and bring to that topic expertise specific to your group. Each case study assignment in its final forms will include both a presentation of your ideas and a final written component. You should think of your presented version as a 'dry run' of sorts, wherein you will receive written comments that should help with final revisions to your report. Along the way, there will be one group and one individual assignment to help scaffold your thinking on the case. A full description of the case study project is available on Canvas.

Components of case study:

- Group Contract and Energy Systems Map (10%), due February 26th
- Oral Presentation of Analysis (Pre-recorded) and In-Class Discussion (10%), due April 6th - April 13th
- Written Report (20%), due April 23rd

Case study options:

- Oil extraction in the Niger Delta
- Solar parks in India
- Hydropower in Amazonia
- Unconventional oil and gas extraction in the United Kingdom
- TransMountain Pipeline Expansion in Canada
- Global shipping and transport fuels
- Offshore wind in Northern British Columbia
- Deep seabed carbon removal and storage in British Columbia

Individual Assignments - 25%

There will be two individual assignments throughout the term. The first is an Energy Biography and Calculation, to encourage you to reflect qualitatively and quantitatively on how energy plays a role in your life, and imagine how

that might look different in a carbon-neutral world. The second is an Annotated Bibliography meant to support your work on the case study project. In this assignment you will briefly summarize four substantive readings from your case study reading list (250 words max per entry), by answering a set of guiding questions. See Canvas for more assignment details.

- Energy Biography and Calculation - 15%
- Annotated Bibliography for Case Study - 10%

Quizzes - 20%

There will be two quizzes throughout the course (each worth 10%), based on material from the readings and lecture. Both quizzes will be **open-book** but **time-limited**, and focused on the application of course concepts. The quizzes will be conducted through **Canvas**, and take place during the scheduled class time on **Thursday**/during an agreed-upon alternate time that day.

These quizzes are designed to support your **individual learning**, and **it's very important that students maintain academic integrity and do not share their quiz responses**. We may **follow-up at random, or in any cases where there are concerns about academic misconduct** (collaboration with other parties within or outside the class during the quiz), **with an oral exam** to better assess your individual learning.

Participation - 15%

Active participation in class activities and discussions is essential to deepening your understanding of core class concepts. We understand that not everyone is comfortable speaking in class, so we will also consider other methods of contributing to class conversations, including posts to the online blog, commenting on your classmates' blog posts, attentive listening, and active participation in small group activities, completing a beginning and end of term personal reflection, and a peer assessment of group work.

- Beginning and end of term personal reflections - 2%
- Group work peer assessment - 3%
- Synchronous and asynchronous participation (contributions during class, through the blog) - 5%
- Watching lecture videos (tracked through analytics/interactive quizzes within video) - 5%

Grading Summary

Category	Assignment	Date	Grade
Participation	Beginning and end of term reflection	January 12 th April 23 rd	2%
	Group work peer assessment	April 23 rd	3%
	Synchronous and asynchronous participation	Throughout term	5%
	Watching lecture videos	Throughout term	5%
Individual Assignments	Energy Calculator and Biography	January 29 th	15%
	Annotated Bibliography	March 19 th	10%

Group Case Study	Group Contract and Energy Systems Map	February 26 th	10%
	Presentation + QA	April 6 April 8 April 13	10%
	Final report	April 23 rd	20%
Quizzes	Quiz 1	February 4 th	10%
	Quiz 2	April 1 st	10%
TOTAL			100%

UNIVERSITY POLICIES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).

OTHER COURSE POLICIES

COVID-19: Learning together, online, in the midst of a global pandemic is an unprecedented experience for everyone. We recognize that COVID-19 may impact your ability to engage with this course in ways that are not always easy to predict. I hope that we can all navigate this semester with flexibility and compassion. We are partners in this learning process, and I welcome suggestions for new ways to engage with course content. We will send out a survey before the first day of class to assess your needs and constraints for online learning (e.g., time zones, child care availability) and the course plan may be adjusted accordingly. Please feel free to update us if your needs change during the semester.

We will be sharing several videos as learning materials, including video lectures and recordings of classroom sessions. To protect the privacy of your classmates please **do not share** video content with those outside of our classroom community. Video is never required, and you may change your name on Zoom if you have any privacy concerns.

During this pandemic, the shift to online learning has greatly altered teaching and studying at UBC, including changes to health and safety considerations. Keep in mind that some UBC courses might cover topics that are censored or considered illegal by non-Canadian governments. This may include, but is not limited to, human rights, representative government, defamation, obscenity, gender or sexuality, and historical or current geopolitical controversies. If you are a student living abroad, you will be subject to the laws of your local jurisdiction, and your local authorities might limit your access to course material or take punitive action against you. UBC is strongly committed to academic freedom, but has no control over foreign authorities (please visit <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,33,86,0> for an articulation of the values

of the University conveyed in the Senate Statement on Academic Freedom). Thus, we recognize that students will have legitimate reason to exercise caution in studying certain subjects. If you have concerns regarding your personal situation, consider postponing taking a course with manifest risks, until you are back on campus or reach out to your academic advisor to find substitute courses. For further information and support, please visit: <http://academic.ubc.ca/support-resources/freedom-expression>

Expectations: Given potential constraints associated with online learning, attendance in synchronous class activities is not required, though many find that their learning experience is enhanced by regular, synchronous engagement. If you cannot attend the synchronous sessions, it is your responsibility to be informed of the content discussed in class by watching the recordings, and to participate in class discussions online (via the blog). You are expected to treat your classmates, the teaching team, and yourself with respect at all times, both in and out of the classroom, face-to-face and in writing (over email). Your success in this course will be enhanced if you: arrive to class on time and prepared for active participation, having read the assigned readings; ask questions about any material you don't understand (in-class or on the course Discussion Board); contribute your ideas to discussions.

You can expect that we, the teaching team, will facilitate a respectful and inclusive learning environment, both in and out of the classroom. You can expect that we will post course materials in a timely fashion (at least one week before each session), and be available for consultation during office hours and over email (we will respond within 48 hours). You can expect that we will provide opportunities for you to give us (anonymous) feedback during and at the end of term.

Finally, the classroom functions best as a space of learning when it is diverse, equitable, and inclusive. We echo the statements from UBC's strategic plan that:

Cultural and social differences of learners enrich and enhance the university.

Excellence cannot be achieved without inclusion.

Energy systems intersect with issues of justice, equity, diversity, and inclusion in many ways (that we will unpack in this course). Learning about and discussing energy systems can also bring up strong beliefs, values, and emotions. On the first day of class, we will collaboratively develop a code of conduct for our classroom space so that we can engage in these discussions respectfully and inclusively, together.

Late Policy: Due dates are set to help you manage your time. If not otherwise noted, all assignments are due at 11:59 PM on their due date. Following the suggested timeline will help you earn 100% of your desired grades. We understand that unexpected circumstances may arise, so if you, or your team, need extra time to complete your assignments, please consult with the teaching team in advance. A late penalty of up to 5% a day may be applied if you have not consulted with us in advance.

Re-grading Policy: If you feel very strongly that any reading response or assignment was graded unfairly, please submit a request to the teaching team in writing (over email) indicating what you believe the issue is. Please be as specific as possible. You must submit the request within 2 weeks of the date grades were made available. We will consider your request carefully and will respond via email in approximately one week of receiving it. Re-grading may result in an increase or decrease. That regrade is final.

Academic Integrity: The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by

you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar at <http://calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,0>. Additional resources on academic integrity, including what plagiarism is and how to avoid it, are available at the UBC learning commons: <https://learningcommons.ubc.ca/resource-guides/avoid-plagiarism/>.

Accommodations: If you need any accommodations for course work or to participate in course activities (for instance, due to a disability, or religious obligations), please bring these to the teaching team's attention during the first week of the term. We will make every effort to accommodate your requirements in the classroom. For additional support to enhance your educational experience, UBC Access and Diversity (<http://students.ubc.ca/about/access>) works with students, faculty and staff to ensure a safe and secure learning environment for students living with long-term disabilities.

Learning Resources: The UBC Learning Commons (<http://learningcommons.ubc.ca/>) is an online portal available to all students to help you achieve academic success. You can access peer tutoring and academic coaching, interactive workshops, study groups, tech tools, student-directed seminars, and many other academic resources at the website. Through this portal, you can also access the UBC Writing Centre, which offers free academic writing tutor services from September to April.

Resources to support student mental health and wellbeing are available at the Wellness Centre (<https://students.ubc.ca/health/wellness-centre>), including resources for managing stress, study tips, and navigating the university. **For 24/7 support, you can call the UBC Student Assistance Program at 1 833 590 1328 (in North America) and 1 604 757 9734 (outside North America).** More information is available here <https://students.ubc.ca/health/ubc-student-assistance-program-sap>

Learning Analytics: Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will be using the following learning technologies: Canvas, iPeer, Zoom, Kaltura. Many of these tools capture data about your activity and provide information that can be used to improve the quality of teaching and learning. In this course, I plan to use analytics data to:

- View overall class progress
- Track your progress in order to provide you with personalized feedback
- Review statistics on course content being accessed to support improvements in the course
- Track participation in discussion forums
- Assess your participation in the course