

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 their culture, history, and traditions from one generation to the next on this site.

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Environmental Engineering and Sustainability Leadership	CHBE 473	3
Class Meeting Times	Class Location	
Mondays 6:00 – 7:30 pm Wednesdays 6:00 – 7:30 pm	FNH 30 https://learningspaces.ubc.ca/classrooms/fnh-30	

PREREQUISITES

Basic understanding of Life Cycle Analysis (e.g., CHBE 370 or equivalent)

TEACHING TEAM CONTACTS

Course Instructor	Contact Details	Office Location	Office Hours
Naoko Ellis (primary instructor)	naoko.ellis@ubc.ca	CHBE 227	by appointments
Faye Hajiali (instructor/assistant)	faye.hajiali@ubc.ca	PPC 223	by appointments
To be announced (teaching assistant)			

COURSE INSTRUCTOR WELCOME STATEMENT

I, Naoko, am an uninvited guest of Japanese ancestry that was born on the traditional territories of the Anishinabewaki, Huron-Wendat and Haudenosaunee peoples, which is now known as Toronto, Ontario. My educational history did not include any indigenous knowledge or perspectives.

As an uninvited guest that resides in the city of Vancouver, I am privileged to learn about the history and presence of the Coast Salish people, and Indigenous voices. On my learning journey, the acknowledgement of the many ways of knowing has transformed the way I teach and learn, especially in the realm of sustainability education. The relationality of land and Indigenous peoples have inspired me to learn more about the teachings of reciprocity that can lead to regenerative thinking. I continue to learn about the multi-perspective ways of understanding and holistic thinking that may lead to understanding and relating to the climate emergency we face today.

As an instructor, I hope to co-create a learning environment that brings in contextual layers allowing learners to become curious and engaged in cultivating enriching layers to their learning. I am honoured and grateful to be hosted and welcomed by the Musqueam people. I feel a deep sense of gratitude towards the group of knowledge holders who can guide and support me in my learning journey on the unceded land of the Musqueam people.

I am a Professor in the Department of Chemical and Biological Engineering at the University of British Columbia (UBC), and hold a Ph.D. (UBC, 2003); M.E.Sc. (Western, 1993); and a B.Sc. (Honours, Waterloo, 1991).

My expertise lies in the area of multiphase reaction engineering with emphasis on biomass utilization. Some current projects include: biomass gasification and pyrolysis; CO₂ capture, including chemical looping combustion; transdisciplinary education around energy transition. I have worked on adding value to biomass residues through production of syngas, bio-oil upgrading and biochar development. Between 2015-2018, I served as the Senior Research Director of the Carbon Capture & Conversion Institute (CCCI), which is a collaborative partnership between CMC Research Institutes, the University of British Columbia and BC Research Inc. During the most recent sabbatical leave, I was the interim dean of undergraduate faculty at the newly founded Fulbright University Vietnam, a liberal arts, science and engineering, not-for-profit University in Saigon.

<https://chbe.ubc.ca/naoko-ellis/>

<https://www.linkedin.com/in/naoko-ellis-03b9401>

COURSE NARRATIVE

This course explores the gap between engineering solutions and societal and systems changes in envisioning a sustainable future. CHBE 473 is a new course based on a previous graduate course in leadership, inviting students to explore the possibilities of change through leadership and systems approaches to compliment your engineering degree. The course is organized around five topics:

1. Systems approaches
2. Analysis of complex dynamic systems
3. Design thinking
4. Servant leadership
5. Life cycle analysis

Servant leadership will be exercised in this course through mentoring student teams in CHBE 264.

COURSE STRUCTURE

This version of "Environmental Engineering and Sustainability Leadership" is a discussion and analysis based course, which requires active participation from all. There are two 90-minute classes every week (**Mondays and Wednesdays 6:00 – 7:30 pm PST**) involving a combination of mini-lectures, discussion of assigned readings, peer facilitation and small group activities. In order to effectively contribute in-class, it is mandatory for you to do the reading and come to class prepared.

This course is open to any students. Diversity in student background and discipline is strongly encouraged to broaden our perspectives and create an inclusive learning community.

LEARNING OUTCOMES

By actively participating in the course, students will be able to:

- Practice and build capacity for facing complexity and applying systems approach to complex societal challenges
- Demonstrate the ability to integrate knowledge of social and ecological systems to predict or forecast, assess, analyze and integrate the effects of human activities or technical solutions
- Apply circular economy and systems integration to gain deeper understanding of systems and possible solutions
- Develop systems dynamics modeling skills to predict and forecast a case
- Build one's leadership toolkit

- Develop leadership qualities and skills, including communication, collaboration, mediation and consensus building strategies, to advocate for positive changes, and demonstrate empathy for others and the ability to weigh multiple perspectives
- Engage in self-assessment, self-reflection, and analysis and cultivate a strong awareness of one's own values and how they inform one's perspectives
- Apply the methodology of design thinking to innovate solutions and assess impact
- Identify attitudes, values and behaviours that require shifting in affecting change

LEARNING ACTIVITIES/ SCHEDULE OF TOPICS

Classes are based on discussions, class activities and facilitation.

Weeks	Topic	Leadership Character	Sample Readings (subject to change)
1	What this course is about Mini-hackathon		"Regenerative Development and Design" by Mang, Haggard, and Regenis (2016), P V – XXXVI Or https://sevengroup.com/2018/03/13/creating-regenerative-processes/
2	Complexity and change	Listening	Chapters 1 & 2 from "Notes on Complexity: A scientific theory of connection, consciousness, and being" by Neil Theise, pp. 3-22, Spiegel & Grau (2023). Or Find something that teaches you about complexity and share it in class
3	Servant leadership	Empathy	Spears, L.C. (2010). Character and servant leadership: Ten characteristics of effective, caring leaders. <i>The journal of virtues & leadership</i> , 1(1), 25-30. Or Chapter 10 from "Leadership Theory & Practice, Ninth Edition" by Peter Northouse, pp. 253-257, Sage Publications (2022)
4	Design thinking/Systems change	Integrity	https://theconversation.com/climate-strikes-greta-thunberg-calls-for-system-change-not-climate-change-heres-what-that-could-look-like-112891 Rayner, C. & Bonnici, F. (2021). <i>The Systems Work of Social Change</i> , Oxford Press. Introduction pp. xxv – xxviii.
5	Systems approaches	Awareness	Section 2.3 (Chapter 2) in Sustainability Science by Bert J.M. de Vries (2012) pp. 22-33. Cambridge University Press.
6	Systems modelling Different ways of knowing Meeting CHBE 264 student teams	Dialogue	McNamee, S. (2008). Transformative dialogue: Coordinating conflicting moralities. <i>The Lindberg Lecture</i> , 1-16.
	Reading Week		
7	Systems modelling	Healing	Section 2.4 (Chapter 2) in Sustainability Science by Bert J.M. de Vries (2012) pp. 34-40. Cambridge University Press.

Weeks	Topic	Leadership Character	Sample Readings (subject to change)
			Working with Vensim
8	Systems modelling	Reflexivity	Working with Vensim https://medium.com/the-science-of-networks/understanding-complex-systems-start-with-system-dynamics-af5c11d47e38
9	Circular economy	Humility	Depending on your level of knowledge around circular economy, please go through this site: https://ellenmacarthurfoundation.org/the-circular-economy-in-detail-deep-dive Watch at least one video, and read a section from this webpage. If you're lacking background in the circular economy, please read this comprehensive guide for a thorough understanding: https://www.rts.com/resources/guides/circular-economy/
10	Life cycle analysis	Community building	Depending on you level of knowledge around life cycle analysis, please go thorough this site and read sections 1-3: https://ecochain.com/blog/life-cycle-assessment-lca-guide/ Working with OpenLCA
11	Life cycle analysis	Wellness	Read this article on how companies use LCA tools to meet sustainable packaging goals: https://sustainablepackaging.org/wp-content/uploads/2023/07/LCA-Case-Study-Co-created-with-Trayak.pdf Working with OpenLCA
12	Nexus of energy, water and food through environmental engineering tools	Futuring	Brouwer, F. (2022). <i>Handbook on the Water-Energy-Food Nexus</i> . Edward Elgar Publishing. Read Chapter 1, Sections 1.1 - 1.3.
13	Systems beings and complexity Guest lecture: Prof. Derek Gladwin	Commitment to the growth of people	Gladwin, D., & Ellis, N. (2023, March 4). In a complex world, our graduates need to be systems beings. University World News: The Global Window on Higher Education. https://www.universityworldnews.com/post.php?story=20230228140136675
14	Wrap up		

LEARNING MATERIALS

There is no required textbook for this course. Students will access learning materials through the on-line learning management system (Canvas), and other links on the web.

ASSESSMENTS OF LEARNING

Your course grade will be determined according to the following components:

Items	CHBE 473	Notes
Reflections	Reflective journal 9% (individual)	Over the course of the term, students are asked to keep a reflective journal on (one entry a month of less than 250 words): <ul style="list-style-type: none"> ▪ Own thoughts about their leadership style ▪ Critical assessment of different leadership frameworks ▪ Own sense of place and positionality ▪ What sustainability means to oneself ▪ Shifts that happened during the course Due Dates: Jan 30, Feb 29, March 30
Servant Leadership Exercise	16% (individual)	Each student will work with CHBE 264 student teams in guiding them on causal loop diagram and producing a poster. This provides an opportunity for you to exercise your servant leadership skills. While the CHBE 264 students work on their deliverables, you will be documenting your experience through memos and reflections. The effectiveness of your leadership will be assessed in part based on the feedback from CHBE 264 students and instructors.
Assignments	40% (partner)	<ul style="list-style-type: none"> ○ Assignment 1: Systems analysis with Vensim ○ Assignment 2: Life cycle analysis with OpenLCA
Class Facilitation	15% (partner)	<ul style="list-style-type: none"> ○ Students will choose a topic (from the leadership character list above) to facilitate an in-class discussion. Prior to facilitation, students will assign reading and/or viewing material to the class, and set learning objectives. ○ Facilitate class learning through applying active learning pedagogy. The length is normally set for 45 min with exceptions upon request. ○ Class will give feedback and assessment to facilitators, after each facilitation. ○ Class Facilitation reflection entry to be completed after the facilitation. Entry should include topic and learning objectives, summary of and reasons for the assigned reading/viewing, relevance of topic, and reflection on facilitation, including your assessment on how well you were able to achieve the learning objectives.
Active Participation	8% (individual)	<ul style="list-style-type: none"> ○ Your active participation will not only contribute to your personal learning and experience, but also to the learning community of this class. ○ Marks are based on: participation and contribution to in-class discussions; and engagement and contributions to the learning journey of peers through teamwork and giving feedback.
Final exam	12% (individual)	<ul style="list-style-type: none"> ○ The final exam will be a synthesis of what you have learned from the course reflective of your personal leadership journey and technical competencies.

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

- **Accessibility:** UBC is committed to accommodating students with special needs in its instructional programs. If you have special needs, please meet with the UBC Centre for Accessibility advisor to determine for what accommodations/services you are eligible. If you require special assistance or accommodations for this course, please contact me as soon as possible with your information from the UBC Centre for Accessibility (<https://students.ubc.ca/about-student-services/centre-for-accessibility>).
- **Religious observance:** You will not be penalized because of observances of your religious beliefs. Whenever possible, you will be given reasonable time to reschedule any academic assignment that is missed due to participation in a religious observance. You are responsible for informing me of any intended absences for religious observances in advance.
- **Academic integrity:** You must follow UBC's policy on plagiarism and other forms of academic misconduct and are responsible for familiarizing yourself with UBC's campus-wide policy on "Academic Misconduct" (<http://www.calendar.ubc.ca/vancouver/?tree=3,54,111,959>). For further information, see <https://learningcommons.ubc.ca/academic-integrity/>.
- **Use of Generative AI Tools:** If you make use of generative artificial intelligence tools to complete any project deliverables or other course-related work, the generated material must be clearly and correctly indicated, and cited/referenced using [APA referencing style for generative AI](#). Failure to clearly indicate and reference AI-generated material will be reported as academic misconduct. Please consult your instructor if you have any questions about the use of generative AI tools.

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Classes may not be recorded without prior permission from the instructor.

STUDENT RESOURCES

UBC is committed to a community in which every member is respected, included, and celebrated. Taking care of your health and wellbeing is important. [UBC Health & Wellness](#) is here to support wellness of mind, body, and spirit, and provides a range of clinical, counselling, and mental health services for students.

[The Centre for Accessibility](#) facilitates educational equity for students with disabilities and chronic medical conditions. If you think you may need academic accommodations to meet the learning outcomes of this course and you have a disability please contact the Centre for Accessibility. If you're not sure that you qualify as having a disability but are concerned, the Centre for Accessibility can help clarify if you are eligible.

Academic Advising empowers students to take ownership of their education at UBC by offering personalized advising services in a supportive environment.

For CHBE-specific issues such as CHBE course registration and planning, you can connect with [CHBE Departmental staff](#). Drop-in meetings with and advising by CHBE staff is available through Zoom. Staff is available Monday to Friday from 9:00 am to 3:30 pm. You may also email your questions or requests for appointments to undergrad@chbe.ubc.ca. Your email should include your student ID and the specific nature of your enquiry.

For issues beyond CHBE, such as academic concession, late withdrawals, SD exams, and letters of permission/completion, you can reach out to [Engineering Academic Services](#).

[First Nations Longhouse](#): The First Nations Longhouse serves as a “home away from home,” as well as an academic, social, spiritual, and cultural hub for Indigenous students attending UBC.

[Indigenous Liaison for the Faculty of Applied Science: Catherine McInnis](#) is the designated advisor in Engineering Academic Services for Indigenous students in the Engineering program.

[International Student Advising](#) provides advising and resources to assist International students in navigating immigration, health insurance, and settlement matters.

UBC's Equity & Inclusion Office provides information about [accessible and all-gender washrooms on campus](#). Information about how to update [legal and preferred names](#) can be found on the Student Services website. [UBC Trans and Non-binary Student Guide](#) was written in Summer 2020 and describes resources and support on campus for trans and non-binary students.

[The Office of the Ombudsperson](#) works with all UBC community members to ensure students are treated fairly and can learn, work, and live in a fair, equitable and respectful environment. If you have concerns about relevant UBC policies and/or processes, an Ombuds Officer can identify and explain policies and guide you in exploring options for directly and effectively dealing with your concerns.

The [Sexual Assault Support Center \(SASC\)](#) is committed to the education, support, and empowerment of people of all genders who are survivors of sexualized violence, as well as their friends and family.