ACKNOWLEDGEMENT

UBC’s Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (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

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Course Code Number</th>
<th>Credit Value</th>
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<tbody>
<tr>
<td>Environmental Engineering and Sustainability</td>
<td>CHBE 473 573</td>
<td>3</td>
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</table>

PREREQUISITES

None

CONTACTS

<table>
<thead>
<tr>
<th>Course Instructor(s)</th>
<th>Contact Details</th>
<th>Office Location</th>
<th>Office Hours</th>
</tr>
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<tbody>
<tr>
<td>Naoko Ellis</td>
<td><a href="mailto:naoko.ellis@ubc.ca">naoko.ellis@ubc.ca</a></td>
<td>CHBE 227</td>
<td>by appointments</td>
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COURSE INSTRUCTOR BIOGRAPHICAL STATEMENT

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

Her 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; pyrolysis product utilization; and biofuels. She has worked on adding value to biomass residues through production of syngas, bio-oil upgrading and biochar development. Between 2015-2018, She 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, she has been 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://www.chbe.ubc.ca/profile/naoko-ellis/
https://www.linkedin.com/in/naoko-ellis-03b9401

COURSE NARRATIVE

This course explores the gap between engineering solutions and societal change (adaptation/embracement) in envisioning a sustainable future. Various advances in science and technology have been made through research and innovation. However, for technological advancements to become solutions that will positively impact society, we need to understand and define the problem differently. What are the assumptions about how the world operates and how
people and societies behave? What does it mean to be a member of society wanting to contribute to a
more sustainable future? Through leadership training, on-campus community-based learning, and
acquiring a framework for sustainable practices, students are empowered to develop their own
approach and capabilities in contributing to and envisioning a more sustainable future.

COURSE STRUCTURE

This version of "Environmental Engineering and Sustainability Leadership" is a discussion based course,
which requires active participation from all. There are two 90 minute classes every week (Mondays and
Wednesdays 11:30 am- 1:00 pm PST) involving a combination of mini-lectures, discussion of assigned
readings, peer facilitation and small group activities. In order to effectively contribute to discussions 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
couraged to broaden our perspectives and create an inclusive learning community.

SCHEDULE OF TOPICS

Potential Topics: (select topics are covered each year)

- Sustainability
  - Mental models
    - Become aware of our deeply engrained assumptions which lead to how we
      interpret the systems around us (personal stance)
    - Develop structural knowledge of problems appropriate to sustainability
      (transdisciplinary) inquiry
  - Systems thinking
    - Discover interconnectedness and complexity
    - Analyze using causal loop diagram and/or stock and flow models
    - Leverage intervention in a system
    - Develop skills of systems thinking in environmental issues
    - Identify incentives that perpetuate an unsustainable system
    - Recognize unintended consequences
    - Practice applying system dynamics modelling as a tool for scenario writing and
      communication
  - Concept mapping
    - Identify concepts; establish relationships; denote structure
    - Structure learning through connection to prior knowledge
  - Industrial Ecology/circular economy as framework for assessment
    - Acquire knowledge of input-output methods; material flow analysis; ecological
      footprint; and life-cycle assessment as environmental systems analysis tools
  - Environmental and energy literacy
    - Assess information and source critically
    - Envision an energy literate person
  - Environmental engineering
    - Examine the nexus of energy, water and food through environmental
      engineering tools
    - Explore the role and its profession
CHBE 473 573 Environmental Engineering and Sustainability Leadership Syllabus

University of British Columbia

- Understanding the landscape for changes
  - Develop personal goals of being the agent of change
  - Analyze components and evolution of social transformation and change theory

- Reciprocity
  - Value Indigenous and traditional teachings of reciprocity
  - Examine one's act of reciprocity with the world

- Well-being
  - Assess components contributing to well-being of community
  - Frame happiness as one measure of well-being
  - Establish connections between happiness and wellness

- Imagination and futuring
  - Explore ways of tapping into imagining a world we wish to be in
  - Exercise backcasting from the imagined future
  - Understand seven generations teaching and its practice
  - Exercise futuring as engineers

- Storytelling
  - Explore storytelling as means to communicate and connect with others

- Leadership skills
  - Integrity
    - Conduct oneself with integrity – keeping and honouring words
    - Experience unworkability of a team without integrity
  - Authentic listening
    - Practice authentic listening to experience the whole person in context
    - Develop as a skill to cultivate empathy
    - Discover the art of powerful questions
  - Perspective taking
    - Apply and develop perspective taking techniques
    - Develop historical (discipline specific) understanding

- Power of context
  - Discover the power of context
  - Examine leadership as creating context for others

- Mentorship/coaching
  - Develop framework on novice to expert continuum
  - Practice and acquire skills to facilitate reflection and learning

- Adaptive and evolutionary leadership
  - Distinguish between classic leadership role models
  - Embrace ambiguity and cope effectively with change
  - Explore human change dynamics

- Professional development
  - Reflective practitioner
    - Develop skills to practice reflective dialogue as means of facilitating and deepening the levels of learning
    - Compare different levels of reflective practices
    - Identify mechanism to learn from failure
  - Ethical framework
    - Promote moral reasoning and development
    - Practice ethical responsibility, toward present and future generations
LEARNING OUTCOMES

By the end of the course, students will be able to demonstrate competence in the following goals that are divided into three categories.

1. Reframing the problem from a holistic perspective:
   - Establish connections between one’s own discipline and sustainable development goals through systems thinking
   - Demonstrate the ability to integrate knowledge of social and ecological systems to predict or forecast, assess, analyze and integrate the effects of human activities
   - Examine aspects of Indigenous and traditional knowledge in understanding our interactions with nature

2. Cultivating your capacity to provide a sustainable solution
   - Create a personal vision for the changes one intends through understanding one’s leadership purpose/style
   - 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
   - Develop leadership 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

3. Developing and implementing a sustainable solution
   - Apply the methodology of design thinking to innovate solutions and assess impact of a SEEDS (Social Ecological Economic Development Studies) project
• Practice adaptive and evolutionary leadership through identifying attitudes, values and behaviours that require shifting in affecting change

LEARNING ACTIVITIES

Classes are based on discussions, class activities and facilitation.

LEARNING MATERIALS

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

ASSESSMENTS OF LEARNING

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

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<th>Items</th>
<th>CHBE 473</th>
<th>CHBE 573</th>
<th>Notes</th>
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</table>
| Reflections         | Reflective journal (every two weeks) 25%                                  | Reflective journal (every two weeks) 25%                                  | Over the course of the term, students are asked to keep a reflective journal on (entries every two weeks, less than 250 words):
|                     |                                                                           |                                                                           | ▪ Own thoughts about their leadership style                                                                                  |
|                     |                                                                           |                                                                           | ▪ Critical assessment of different leadership frameworks                                                                     |
|                     |                                                                           |                                                                           | ▪ Own sense of place and positionality                                      |
|                     |                                                                           |                                                                           | ▪ What sustainability means to oneself                                       |
|                     |                                                                           |                                                                           | ▪ Some basic beliefs and assumptions of self                               |
|                     |                                                                           |                                                                           | ▪ Shifts that happened during the course                                      |
| Final paper 15%     |                                                                           |                                                                           | A final paper summarizing one leadership model or framework, and overlaying your reflection around your leadership journey. |
| SEEDS Group Project | 40%                                                                       | 40%                                                                       | Each student team will be given a SEEDS project (on-campus project) on affecting change related to sustainability on campus. This will include the application of design thinking to create and iteratively come up with appropriate solutions, which then will be assessed for impact. |
Deliverables for the project are set between the team and its client. The iterated proposal, mid-term reflections, final report and presentation are required.

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<thead>
<tr>
<th>Class Facilitation</th>
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<tr>
<td>o Students working in pairs will choose a topic (from the 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.</td>
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<td>o Facilitate class learning through applying active learning pedagogy. The length is normally set for 45 min with exceptions upon request.</td>
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<td>o Class will give feedback and assessment to facilitators, after each facilitation.</td>
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<tr>
<td>o Class Facilitation Journal 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.</td>
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<th>Participation</th>
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<tr>
<td>o Participation and contribution to in-class discussions</td>
<td></td>
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<tr>
<td>o Engagement and contributions to the learning journey of peers through teamwork and giving feedback</td>
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<th>Exam</th>
<th>Final exam 15%</th>
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<tr>
<td>o Assessment of the matery of concepts covered in class</td>
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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.

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

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 a 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/.
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