

**MECH 411: Air Pollution, Technology and Society**

Phone 604 822 2781
Fax 604 822 2403
www.mech.ubc.ca

University of British Columbia

Department of Mechanical Engineering

Course Instructor Prof. Naomi Zimmerman, Ph.D, P.Eng. (*she/her/hers*)

Contact Details	Office Location	Office Hours
Email: nzimmerman@mech.ubc.ca Note: I encourage you to send me messages using the Canvas inbox as you are likely to get a faster reply. I aim to reply within 24 hours during weekdays	CEME 2066	None officially scheduled – contact me if you have specific questions.

Teaching Assistant(s) Mina Jamshidi

Contact Details	Office Location	Office Hours
Email: mina.jamshidikalajahi@ubc.ca	N/A	Mina will track participation in the course and grade the policy briefs. She can answer questions via email.

Course Requirements/Prerequisites None.

Class Meeting Time and Location

Monday, Wednesday, Friday 2-3PM in CEME 1202

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people.

Course Structure

MECH411 consists of lectures and discussion. We will have three hours of class every week (Mon-Wed-Fri at 2 PM PT); many Friday classes will consist of in-person debates for our five “Big Ideas” topics.

All pre-debate videos of opening arguments for the Grand Challenges assignment will be posted on the UBC Collaborative Learning Annotation System (CLAS).

Discussion posts will be posted using the Canvas “Discussions” tab.

Learning Outcomes

At the completion of this course, you should be able to:

1. Explain fundamental concepts of air pollution (air quality, climate, and health effects)
2. Identify key air quality and climate change pollutants, their sources, and control technologies



3. Describe the role of engineering in managing air pollution
4. Understand the air pollution policy process in Canada, and the basics of international air quality management
5. Assess the social and economic impacts of air pollution using economic tools (e.g., externalities) or policy-tools (e.g., environmental impact assessment)
6. Identify examples of sustainable design and development in the context of air pollution
7. Critically assess potential design trade-offs in terms of air quality, climate, health, social impacts, and economics
8. Communicate technical analysis to policy makers and the public in writing (policy briefs) and orally (presentations on big ideas)

Course Schedule and Topics

Week	Content
September 3 – 5	Course Overview + Introduction to Air Pollution
September 8 – 12	Air and Climate Pollutants
September 15 – 19	Atmospheric Science & Meteorology
September 22 – 26	Industrial emissions and control
September 29 – October 3	Industrial emissions and control (cont'd) Fundamental quiz, in class October 1st 2PM PT
October 6 – 10	Transportation emissions and control Debate #1: BC LNG Export Expansion is a Net Benefit
October 13 – 17	Natural source emissions and control No class on Monday Oct. 13 (Thanksgiving)
October 20 – 24	Natural source emissions and control (cont'd) Debate #2: MV Road Pricing as Most Equitable Option to Cut Emissions
October 27 – 31	Policy process & policy evolution Debate #3: Canada Should Support Field Experiments in SAI
November 3 – 7	Environmental justice and collective action
November 10 – 14	Economics of air pollution, energy policy & externalities No class on Nov 10-12 (Reading Break)
November 17 – 21	Economics game, design case study #1 Debate #4: Large scale CCUS for Oil Sands is Responsible Use of Funds
November 24 – 28	Design case study assessments #2-3 Debate #5: BC Should Expand Prescribed & Cultural Burning
December 1 – 5	Exploration of real-world air quality monitoring tools + low-cost sensor build Collective final exam planning Policy Brief Due, December 5 11:59PM PT

Learning Activities

- Attending lectures
- Viewing asynchronous material and doing selected readings before class
- In-class participation in class discussions, polls, activities, debates
- Recorded oral presentations uploaded to the UBC CLAS platform
- Peer discussion and evaluation of the oral presentations
- Discussion posts on Canvas (9 total prompts)
- Writing a policy brief



Learning Materials

Canvas: Your primary course hub. You will find lecture materials here, assignment calendars, and links to other platforms as required (see: UBC Blogs, CLAS). You will submit your policy brief and final exam here as well. Lecture slides will be posted to Canvas at least 24 hours prior to lecture on this platform under the appropriate module.

UBC CLAS: The UBC Collaborative Learning Annotation System. This is kind of like YouTube, except it is internal to UBC and will be embedded in Canvas. This is fundamentally a platform for uploading videos and allows for time-stamped comments if you have questions. Pre-debate informative videos and the “debate” oral presentations will be posted here. Your comments on the UBC CLAS platform will be partially used to assess participation in the MECH410U “debates” (see: Assessments of Learning for more details).

Discussion Boards: All course discussion posts will live on Canvas under the “Discussions” tab.

Optional textbook for further reading: Fundamentals of Air Pollution, 5th Edition

Author(s): Daniel Vallero

ISBN: 978-0-12-401733-7

Availability: Free online through the UBC Library (see Online Library Course Reserves on Canvas)

Assessment, Evaluation, and Grading

Assessment Plan:

• Fundamentals Quiz	10%
• Final Exam	35%
• Policy Brief	20%
• Presentation (Debates)	20%
• Discussion Posts	10%
• Participation	5%

- **Fundamentals Quiz (10%):** The quiz will occur in-class on Wednesday October 1st
- **Final Exam (35%):** The final exam question is an essay-style question. The final exam question will be based on an in-class collaborative discussion about topics of interest. You will be provided a short-list of questions in advance, and you will complete your exam in-person (but submitted online) and supply a hard copy of an annotated bibliography along with your submission.
- **Policy Brief (20%):** You will summarize a peer-reviewed publication in the form of a 2-4 page policy brief. We will go over policy briefs in class. Each student must choose and register a unique publication to summarize that is approved by the instructor. The policy brief is due on Canvas on the last day of class, December 5 at 11:59PM PT (can be submitted earlier, it is assigned in late October).
- **Presentation (20%):** Over the semester, we will have 5 presentation days, with 2 groups presenting per presentation day. Each presentation day will focus on a contentious issue, with the two groups presenting their case on either side of the issue. These presentations will be uploaded to the UBC CLAS platform the Tuesday before the presentation date, to allow time for other students to view and comment on the presentations.
- **Discussion Posts (10%):** Nine times per term, you will be prompted to respond to a discussion prompt. The quality of your post will be used for assessment. There are 9 opportunities total to respond to discussion prompts; you need to do 7 out of 9 (i.e., you can choose to skip two).



- **Participation (5%):** This is based on three components: (1) Commenting on discussion posts; (2) Commenting on Presentation videos on UBC CLAS; and (3) Completing peer evaluation of the debate presentations.

Generative AI Teaching & Learning Guidelines

Students are permitted to use AI tools for formative work such as gathering information or brainstorming but may not use it on any assessed work or final submission.

Privacy and confidentiality guidelines: In line with FIPPA and UBC Information Security Standards, do not share any personal, private, or confidential information when interacting with GenAI tools that have not undergone a Private Impact Assessment (PIA) review and have not been approved for use with such information, as this data may be available to vendors, could be used for training models, and could end up in later outputs.

- This includes information such as names and personal email addresses of students, faculty, and staff; student numbers; and grades attached to identifiable students. It also includes anything that you would not, or do not have permission to make public, such as exam questions or other confidential data or materials.
- Most GenAI tools can only be used in teaching and learning at UBC with low-risk information. As of May 2024, no GenAI tools have been approved for use at UBC with personal or other sensitive information.

See Guidelines here for more general guidance: <https://genai.ubc.ca/guidance/teaching-learning-guidelines/learning-with-genai/>

Concession Requests

Eligibility: Under certain circumstances, students may be eligible for an academic concession, which, if approved, is an allowance determined by your instructors for you to make up missed coursework or an assessment. Academic Concessions can be requested for in-term work (all graded assignments, quizzes, and midterms during the UBC term dates) and final exams (exams scheduled during the UBC exam period). Before applying for a concession, students should:

- Review UBC's policy on Academic Concession (<https://vancouver.calendar.ubc.ca/campus-wide-policies-and-regulations/academic-concession>)
- Ensure the reason that you are requesting an academic concession fits within one of the following approved categories:
 - Conflicting responsibilities
 - Medical circumstances
 - Compassionate grounds
- Refer to this course syllabus for more specific information about what types of concessions may be available in applicable circumstances.

How to Submit a Request: Requests for academic concession for in-term work must be submitted using the APSC online form (<https://academicservices.engineering.ubc.ca/exams-grades/academic-concession/>) within 72 hours of the missed deadline or exam time. A copy of the request will automatically be forwarded to the instructor for verification and approval – students should double check that they have correctly entered the instructor's email address into the online form. Academic concessions are not guaranteed and submitting



a request does not mean it will be approved. A concession request is only approved when the student has received confirmation of approval from the instructor.

Concessions Related to Final Exams: Students requesting academic concession for a missed final exam should read through the information, policy, and application procedure for Standing Deferred (SD) academic concession requests at <https://academicservices.engineering.ubc.ca/exams-grades/academic-concession/>. A request for a Standing Deferred academic concession should be made as soon as a student is aware that they will miss their scheduled exam.

Assignments: Students are expected to work independently, except in the case of group projects. Offering and accepting solutions from others is an act of plagiarism, which is a serious offense and all involved parties will be penalized according to the Academic Honesty Policy. Discussion amongst students is encouraged, but when in doubt, direct your questions to the professor or teaching assistants.

Attendance and Absences: Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee's responsibility to get all missing notes or materials. In the case of missed assignments or examinations with an approved academic concession, weighting may be shifted to other assignments or examinations; scores may be on a reduced set of submissions for discussion posts, and assignment deadlines for major deliverables may be shifted.

Academic Misconduct

Academic honesty is a fundamental requirement of your studies. It is the obligation of all students to inform themselves of the applicable standards for academic integrity. Students must be aware that standards at UBC may be different from those in secondary schools or at other institutions. Breaching those expectations or failing to follow the applicable policies, regulations, rules, or guidelines with respect to academic integrity constitutes academic misconduct and may have serious consequences. More information about UBC's policy on academic misconduct is available at <https://vancouver.calendar.ubc.ca/campus-wide-policies-and-regulations/student-conduct-and-discipline/discipline-academic-misconduct>

Respectful and Inclusive Environment

It is the Department of Mechanical Engineering's expectation that all students participating in our courses conduct themselves professionally and ethically. It is the obligation of all students to inform themselves of the applicable standards for appropriate conduct as a student and UBC community member. Students are at all times expected to uphold the [UBC Engineering Code of Ethics](#) and act in a manner consistent with the [EGBC Code of Ethics](#).

The Department is committed to providing a respectful and inclusive learning experience and affirms the [UBC Statement on Respectful Environment](#). Students are invited to advise the instructor if they wish to be addressed by or referred to with particular pronouns.

Students who are not conducting themselves in a respectful, professional, and ethical manner may be subject to consequences for non-academic misconduct or lack of professionalism. At a Department or course level, this may result in loss of access to facilities or equipment, impacts to course grades, changes to course arrangements, or other measures directly related to the conduct and applicable course. At a University level, non-academic misconduct can result in disciplinary measures ranging from probation to suspension or expulsion. Students who have concerns about of non-academic misconduct or behaviour within our courses that is not consistent with the UBC Respectful Environment Policy can contact the department by emailing concerns@mech.ubc.ca or speak to any Mechanical Engineering faculty member or staff member.



For group work:

- **BE PROFESSIONAL** Students should be polite and contribute to their group in a positive way when working as a team. Students are expected to treat each other with respect and integrity, and work together as a team to achieve their common objectives.
- **RESPECTFUL ENVIRONMENT** As per the UBC statement on Respectful Environment, disrespectful behaviour will not be tolerated. All team members are to do their part to ensure that everyone feels comfortable contributing as part of the group.

For discussion boards:

- **NO PROFANITY or DEROGATORY TERMS** *Everyone in the class as well as the instructional team can see course discussion boards. Students are expected to be polite and professional in their messaging*
- **RESPECTFUL ENVIRONMENT** *As per the UBC statement on Respectful Environment, disrespectful behaviour will not be tolerated. Students should do their part to ensure that everyone feels comfortable using the discussion board as a resource.*

When contacting instructors or teaching assistants:

- Students should include the course code in their subject heading, and include their name and student number in all communications. It is expected that students will refer to their course syllabus and updates on Canvas first before asking a question – the information may already be published.

Policies and Resources to Support Student Success

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, spiritual and cultural 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 [here](#).

Mechanical Engineering has a Student Services Office (students@mech.ubc.ca), located in CEME 2054, where there are staff who can provide support, academic advising, and refer students to appropriate resources. They are open Monday-Friday, 8:00am-4:00pm.