ENV E 423 Principles of Air Quality Management and Control

Fall 2024 - September 03 to December 09

Class time: Tuesday, Thursday 9:30-10:50 Location: NRE 1-003

Instructor:

Zaher Hashisho, PhD, P.Eng
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hashisho@ualberta.ca
Donadeo Innovation Centre For Engineering 7-241
Office Hours: Students can meet Dr. Hashisho during his office hours (Monday and Thursday, 1:00 pm-2:00 pm, tentatively), or by appointment.

Course Description:

*3 (fi) (first term, 3-0-0) A first course on air quality and air pollution, dealing with: types of gaseous and particulate pollutants and their sources, effects of air pollution on man, vegetation, and materials, indoor air pollution, sampling and analysis of air pollutants, air pollution meteorology and dispersion, control techniques for gaseous and particulate pollutants, and air quality management aspects.

Prerequisites: ENV E 325. Credit cannot be obtained for both ENV E 323 and ENV E 423

Course synchronous and asynchronous content delivery schedule:

This course will be taught in-person.

Land Acknowledgment:

The University of Alberta acknowledges that we are located on Treaty 6 territory, and respects the histories, languages, and cultures of First Nations, Métis, Inuit, and all First Peoples of Canada, whose presence continues to enrich our vibrant community.

TA Information:

Mr Seyed Amin Mohammadi <seyedam5@ualberta.ca>
Mr Rouhollah Heydari <rheydari@ualberta.ca>

Course Objectives & General Content:

The goal for this course is for students to develop a better understanding of air quality management and control, based on first principles, as it pertains to ambient/indoor air and industrial emissions.

The objectives for this course are for students to be able to:
1) Apply first principles related to air quality engineering and science,
2) Develop treatment options to control gaseous and particulate air pollutants,
3) Use principles of meteorology and atmospheric dispersion to predict the fate of air pollutants, assess ambient air quality, and develop air quality management options.

Learning Outcomes:

By the end of this course, students should be able to:

1. Determine the concentration and emission rates of air pollutants at actual and standard conditions using ideal gas law
2. Determine the size characteristics of a particle size distribution using statistical descriptors
3. Determine terminal settling velocity for a particle using Newton and Stokes laws
4. Identify the health and non-health impacts of common air pollutants and the need to regulate them
5. Develop treatment options to control gaseous and particulate air pollutants from industrial air streams,
6. Predict the performance of air pollution control devices
7. Assess indoor and ambient air quality using gas and particle sampling techniques
8. Predict the fate of air pollutants in the atmosphere using principles of meteorology and atmospheric dispersion.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Homework assignments (best 5 out of 6)	Synchronous	See TENTATIVE schedule	10%
Midterm	Synchronous	Thursday, October 10, 2024	25%
Case study	Synchronous	Thursday, November 21, 2024	20%
Final cumulative exam	Synchronous	Thursday December 19, 2024 at 8:30 am	45%

The Faculty recommended grade point average for a 400 level course is 3.1. Instructors have the leeway to deviate from this average and can assign grades based on their own scheme. All grades are approved by the department chair (or delegate). The office of the Dean has final oversight on all grades.

Term Work

All term work solutions will be posted no later than the last day of classes. All term work will be returned to students by the final day of classes, with the exception of major term work due in the last week of classes. The latter will be returned by the day of the final examination or the last day of the examination period if there is no final examination in the course as per university policy; instructors will make accommodations to return these term work. It is the responsibility of the student to pick up all their term work at the specified time and place. Any unreturned term work, shall be retained and then shredded six months after the deadline for reappraisal and grade appeals. Final examinations will be kept for one year as required by university guidelines and the Government of Alberta's Freedom of Information and Protection of Privacy Act.

Additional Notes

ASSIGNMENTS:
Completed assignments should be submitted through eClass Assignments tab by 11:00pm on the specified completion date. Late assignment will not be accepted unless the instructor is notified by email on or before the assignment deadline. Late assignments will be subject to a 10% penalty per day. No assignment will be accepted after 48 hours past the deadline or after the solution is posted on eClass, whichever comes earlier.

CASE STUDY:
This course involves preparing a case study on a topic related to the main themes of this course (air quality characterization and air pollution control). The case study should be completed in groups and will include a PowerPoint presentation.

Calculator Policy

Only approved non-programmable calculators are permitted in examinations. Any calculator taken into an examination must have a sticker identifying it as an acceptable non-programmable calculator (gold sticker). Students can purchase calculators at the University Bookstore with the stickers already affixed. Calculators purchased elsewhere can be brought to the Student Services where the appropriate sticker will be affixed to the calculator.

Expectations for AI use

In this course, our primary focus is to cultivate an equitable, inclusive, and accessible learning community that emphasizes individual critical thinking and problem-solving skills. To ensure a fair and consistent learning experience for all students, the use of advanced AI tools such as ChatGPT or Dall-E 2 is strictly prohibited for all academic (written/coding/creative/etc.) work, assignments, and assessments in this course. Each student is expected to complete all tasks without substantive assistance from others, including AI tools.
Any use of AI tool in your academic work may result in academic penalties and be considered an act of cheating and a violation as outlined in the relevant sections of University of Alberta (November 2022) Code of Student Behaviour .

Text and References (Mandatory):

- Lecture Notes (available online on eClass).

Text and References (Recommended):

- Buonicore, A.J. and Davis, W.T. (Eds.) Air Pollution Engineering Manual. Van Nostrand Reinhold, New York, 918 pp. (1992).
- Cooper, D. and Alley, F.C. Air Pollution Control: A Design Approach. Waveland Press, 3rd edition, 760 pp. (2002).
- De Nevers, N. Air Pollution Control Engineering. McGraw Hill, New York, NY. (1995).
- Jacobson, M.Z. Atmospheric Pollution: History, Science, and Regulation. Cambridge University Press, Cambridge, UK; New York (2002).
-Wark, K., Warner, C.F., and Davis W., Air Pollution: Its Origin and Control, Addison Wesley Longman Publishing Company, Inc. Menlo Park, CA, 3rd Edition, pp. 573 (1998).

Website:

The class has a website on eClass.
It is the responsibility of the student to regularly check the website for new postings and updates.

Previous Examples of Evaluative Materials:

Sample midterm and final exams will be posted on eClass

Did you know that the University of Alberta has various low-to-no-cost services to help students succeed? Visit http://www.deanofstudents.ualberta.ca/ for information about the academic, wellness, and various other support services available to U of A students. It's never too early or too late to seek help!

Tentative Schedule of Topics
for
ENV E 423: Principles of Air Quality Management and Control
Instructor: Dr. Zaher Hashisho

Week	Topic	Tentative timeline
1	Unit 1: Introduction to Air Pollution	
2	Unit 2: Particle Size Distribution Unit 3: Particle Terminal Settling Velocity	
3	Unit 4: Air Pollution Regulations Unit 5: Air Quality Sampling and Analysis	HW1 due
4	Unit 5: Air Quality Sampling and Analysis Unit 7: General Principles for Air Pollution Control	HW2 due
5	Unit 8: Settling Chambers Unit 9: Cyclones	HW3 due
6	Unit 10: Wet Scrubbers **Midterm exam (Thursday October 10)**	
7	Unit 11: Filters Unit 12: Electrostatic Precipitators (ESPs) General discussion of particle removal devices	
8	Unit 13: Control of Gas Phase Pollutants and Combustion	HW4 due
9	Unit 14: Adsorption Unit 15: Absorption	
10	Unit 6: Indoor Air Quality Unit 16: Meteorological Aspects of Air Quality	HW5 due
11	***No lecture (*Fall Term Reading week, Nov 12-15*)***	
12	Unit 17: Atmospheric Dispersion of Pollutants	Case study due (November 21)
13	Presentation	HW6 due
14	Presentation Review	
Cumulative final exam (Thursday, December 19, 2024, at 8:30 am)		

University and faculty policies

Respect and professionalism

The Faculty of Engineering is committed to fostering and protecting an equitable, inclusive, and respectful work and study environment in line with University of Alberta policies and professional engineering industry standards.

The faculty prepares students to uphold industry standards to become a Professional Engineer (P.Eng). Therefore, respect, professionalism, and accountability must be upheld within the Faculty of Engineering and the University of Alberta.

Academic integrity

All students are expected to follow the University of Alberta's Student Code of Behaviour and Student Conduct Policy. The faculty expects an environment free of harassment, discrimination, and bullying. We encourage you to talk to the Office of Safe Disclosure and Human Rights about experiences, questions, or concerns. Additional resources and support for students are attached below.

Engineering students studying in the province of Alberta must also follow the Code of Ethics set by the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

Course outline policies, course requirements, evaluation and grading information can be found in the University Calendar.

Safety during learning activities

In all Faculty of Engineering courses, labs, seminars or other learning activities, safety is of paramount importance. In some cases, laboratory work in a program requires high standards for risk management to keep potential hazards safely under control.

Anyone found to be unable to function safely in the class, lab, seminar or other learning activity may be asked to leave or be removed for their and the safety of other participants and instructors in alignment with the Student Code of Behaviour and Student Conduct Policy. As members, or prospective members, of the engineering profession, it is your responsibility to identify and inform the proper authorities of unsafe work.

Audio and video recording

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan.

Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Only those items specifically authorized by the instructor may be brought into the exam facility. Students must not bring any unauthorized electronic device into an examination room, including cell phones or other devices.

Student services and support

Health & Wellness Support

Counselling and Clinical Services

Free, short-term, appointment-based counselling and psychiatric services. Also offers drop-in workshops. Book an initial consultation. Visit uab.ca/CCS to learn more.

Wellness Supports Social Workers

Free one-on-one support for students in the areas of housing, finances, academics, personal wellness, life skill development, family dynamics, system navigation, and any area of life where there is a desire to invite change. Visit uab.ca/wellness to learn more.

Sexual Assault Centre

Free, anonymous, and confidential drop-in counselling. Visit uab.ca/UASAC to learn more.

The Office of Safe Disclosure & Human Rights (OSDHR)

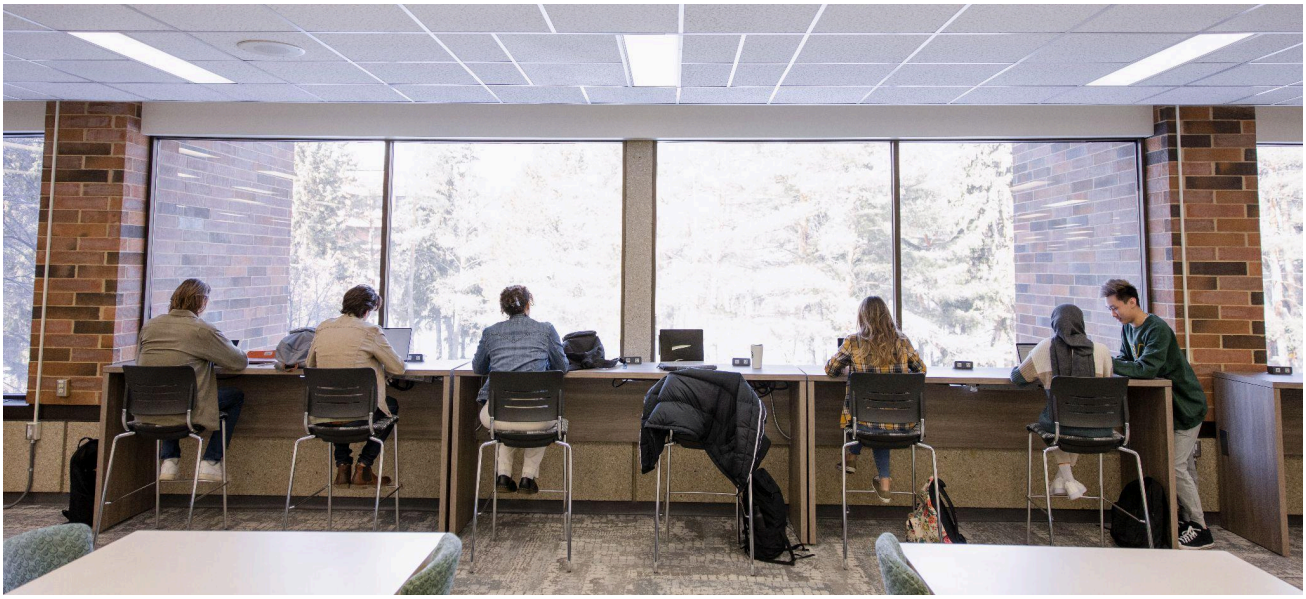
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

HIAR (Helping Individuals at Risk)

If you're worried about someone, contact HIAR, who can help assess risk and connect individuals to support. Learn more at uab.ca/HIAR.

Immediate External Supports

Health Link Alberta: 811
Suicide Crisis Helpline: 988



Academic support

Academic Success Centre
Access to a variety of services to maximize your academic success. Learn more at uab.ca/ASC.

Accessibility Resources
Connects students with disabilities to accommodations. Learn more at uab.ca/Access under accommodations + accessibility.

Decima Robinson Support Centre
Academic support for 100- or 200-level introductory calculus, linear algebra and statistics courses. Visit uab.ca/DSC to learn more.

Engineering Student Success Centre
The Faculty of Engineering provides drop-in tutoring for first-year courses. Visit uab.ca/ESSC to learn more.

Office of the Student Ombuds
Call for complex problems and conflict mediation. Learn more at uab.ca/ombuds.

Financial support

Student Service Centre

For awards and other funding support. Learn more at uab.ca/ask.

Campus Food Bank

The Campus Food Bank Society is an independent charity supporting University of Alberta students, faculty, staff, and alumni for up to five years. For additional information visit their website at campusfoodbank.com.

Attendance

"Since presence at lectures, participation in classroom discussions and projects, and the completion of assignments are important components of most courses, students will serve their interests best by regular attendance. Those who choose not to attend must assume whatever risks are involved. In connection to this students should review [Attendance section of the University Calendar]." Accordingly, students are responsible for topics covered in class that are not presented in the textbook, class notes, or supplementary materials.

What to do when a student is sick

Students should contact the instructor as soon as they are able, having regard to the circumstances. If a student fails to notify an instructor within a reasonable time of their request for an excused absence, the instructor may deny the request unless the student provides a legitimate reason for the delay. Excused absences are not automatic, and, in the case of term work or midterm exams, are at the discretion of the instructor. In the absence of a medical note, or where the absence is due to a reason other than illness, instructors can ask a student to visit their faculty office and obtain either a Statutory Declaration or a Faculty Form to outline the reasons for the absence. More info: Attendance Regulations (University Calendar) or What to do when a student is sick.

Missed Term and Final Exams

"Refer to Attendance and Evaluation Procedures and Grading System. **There are no deferred term exams for courses offered in the Faculty of Engineering.** In instances where a student has a documented reason for missing a term exam(s) and at the discretion of the instructor, the value of a missed term exam(s) can be added to the value of the final exam. A missed term exam(s) is considered assigned term work which has not been completed in determining eligibility for a deferred final exam."

"Unacceptable reasons include, but are not limited to personal events such as vacations, weddings, or travel arrangements. When a student is absent without acceptable excuse, a final grade will be computed using a raw score of zero for the work missed. Any student who applies for or obtains an excused absence by making false statements will be liable under the Code of Student Behaviour."

How to succeed in this course

Students are encouraged to do the following:

- Study daily. Each lecture is based on material learned in previous lectures
- Solve the example problems in the class notes
- Think about the interpretation of the results for the examples and assignments (e.g. what is the significance or consequence of the results? Are the results reasonable?)
- Articulate questions or concerns during or after the class, office hours, or by email

For additional help, visit the U of A Academic Success Centre (https://www.ualberta.ca/current-students/academic-success-centre/index.html).

Good Luck!