ENV E 432 Solid Waste Management

Fall 2024 - September 03 to December 09

Class time: Monday, Wednesday, Friday 11:00-11:50 Location: ETLC E2-001

Instructor:

Nicholas Beier, PhD, P.Eng, He/Him
7804928183
nabeier@ualberta.ca
DICE 6-224
Office Hours: Monday 1-3 or by appointment

Course Description:

*3 (fi) (either term, 3-0-0) Principles of solid waste management to protect public health. Study of solid waste components, refuse collection, storage, and handling. Design and operation of solid waste transfer and disposal facilities including transfer stations, resource recovery and composting facilities, incinerators, and landfills.

Prerequisites: ENV E 324

Course synchronous and asynchronous content delivery schedule:

Land Acknowledgment:

The University of Alberta respectfully acknowledges that we are situated on Treaty 6 territory, traditional lands of First Nations and Métis people.

TA Information:

Monisha Alam, E-mail: monisha@ualberta.ca

Course Objectives & General Content:

- Principles of solid waste management to protect public health.
- Study of solid waste components, refuse collection, storage, and handling.
- Design and operation of solid waste transfer and disposal facilities including transfer stations, resource recovery and composting facilities, incinerators, and landfills.

Course Outline
Chapter 1: Introduction to Municipal Solid Waste (MSW) Management
Chapter 2: Physical, Chemical, and Biological Properties of MSW
Chapter 3: Collection Systems for MSW
Chapter 4: Separation, Processing, Recycling, and Transformation Technologies for MSW
Chapter 5: Landfill Engineering

Learning Outcomes:

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

1. Define and explain important fundamental and engineering concepts of solid wastes management with respect to sources, composition, properties, collections, disposal and/or transformation processes.
2. Prepare preliminary solid waste engineering design calculations for characterizing waste amounts and properties, and waste collection and treatment facilities
3. Identify relevant legislation and regulations, future trends, and resource recovery options from solid wastes and landfill leachates.
4. Make an oral presentation related to solid waste management, and analyze in a written report.
5.
6.
7.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Homework assignment 1			5%
Homework assignment 2			5%
Homework assignment 3			5%
Homework assignment 4			5%
Term Presentation		November 25, 2024	15%
Quiz 1			5%
Quiz 2			5%
Mid Term Exam		October 21, 2024	15%
Final Exam		December 19, 2024	40%

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.

Calculator Policy

Approved programmable or approved non-programmable calculators are permitted in examinations. Any calculator taken into an examination must have a sticker identifying it as an acceptable programmable calculator (green sticker) or 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.

Text and References (Mandatory):

None

Text and References (Recommended):

Detailed course notes and other relevant course materials will be available to download from the eClass. Lecture covering each part of the course content will also be posted in advance. This course will be mainly based on the course notes and lectures. For references, the following textbooks are recommended:

- Tchobanoglous, George, Hilary Theisen, and Samuel Vigil. Integrated solid waste management: engineering principles and management issues. McGraw-Hill, Inc., 1993.
- Solid Waste Engineering, A global perspective, 3rd edition, William A. Worrell/P. Aarne Vesilind/Christian Ludwig. 2016. Cengage.
- Rowe, K. Geotechnical and Geoenvironmental Engineering Handbook. 2001. Springer Science.

Website:

eClass

Previous Examples of Evaluative Materials:

Examples will be provided via course website.

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!

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)

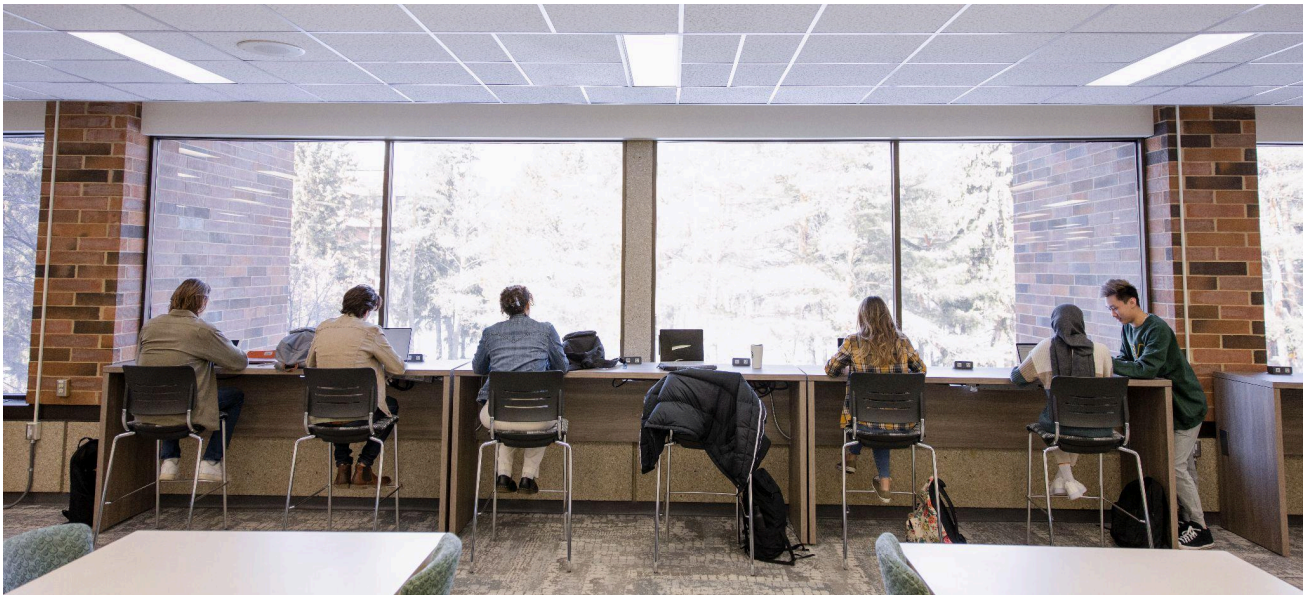
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

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.

ENV E 432: Solid Waste Management

University of Alberta, Faculty of Engineering

Department of Civil and Environmental Engineering

Instructor: Nicholas Beier, Ph.D., P.Eng.

E-mail: nick.beier@ualberta.ca

Office: DICE-6-224

Phone: 7804928183

Office Hours: My preferred office hours are Mondays 1-3 PM, except holidays. For hours outside this time, please contact me via email to arrange 10-30 minutes in-person or online meeting via Google Meet. Please include "ENVE 432 Meeting Request" in the title line. Additional office hours for mid-term and final exam will be announced during the lecture.

Lecture Schedule/Location: MWF 11:00 - 11:50 (ETLC E2-001)

(Mountain Standard Time/Edmonton local time)

In the case of instructor absence, guest lecturers and/or problem tutorials will be utilized. Alternatively, recorded lecture material will be available on eClass for asynchronous consumption.

Teaching Assistant:

Monisha Alam

- E-mail: monisha@ualberta.ca

Course Description

- Principles of solid waste management to protect public health.
- Study of solid waste components, refuse collection, storage, and handling.
- Design and operation of solid waste transfer and disposal facilities including transfer stations, resource recovery and composting facilities, incinerators, and landfills.
- Prerequisites: ENV E 324 and 251/351.

Course Outline

Chapter 1: Introduction to Municipal Solid Waste (MSW) Management

Chapter 2: Physical, Chemical, and Biological Properties of MSW

Chapter 3: Collection Systems for MSW

Chapter 4: Separation, Processing, Recycling, and Transformation Technologies for MSW

Chapter 5: Landfill Engineering

Learning Objectives

By the end of this course students will be able to:

1. Define and explain important fundamental and engineering concepts of solid waste management with respect to sources, composition, properties, collections, disposal, storage and/or transformation processes.
2. Prepare preliminary solid waste engineering design calculations for:
    a. Characterizing waste amounts and properties, and
    b. Waste collection, treatment, and disposal facilities
3. Identify relevant legislation and regulations, future trends, and resource recovery options from solid wastes and landfill leachates.
4. Present a state-of-the-art review of solid waste management topics and analyze it in a written report.

Reference Materials

Detailed course notes, problem tutorials, and other relevant course materials will be available to download from the eClass. Lectures covering each part of the course content will also be posted in advance. This course will be mainly based on the course notes and lectures (slides, annotations, tutorial problems and spoken content). For reference, the following textbooks are recommended:

- Tchobanoglous, George, Hilary Theisen, and Samuel Vigil. Integrated solid waste management: engineering principles and management issues. McGraw-Hill, Inc., 1993.
- Solid Waste Engineering, A global perspective, 3rd edition, William A. Worrell/P. Aarne Vesilind/Christian Ludwig. 2016. Cengage.
- Rowe, K. Geotechnical and Geoenvironmental Engineering Handbook. 2001. Springer Science.

Guest Lectures

We will have guest lectures during the semester (based on availability). The schedule will be provided during the lecture.

Assignments

Four (4) assignments will be scheduled during the term. The deadline for each assignment will be posted on eClass. A late submission of the assignment will be penalized 20% per day. However, the student should contact the TA for an extension. No extensions will be given, except in the event of illness or other overwhelming factors. Workload and other commitments outside of this class are not a valid reason for extensions of due dates.

Exams

Mid-term exam: October 21, 2024 (11:00-11:50 AM)
Syllabus: Chapter 1-3

Final Exam: December 19, 2024 (1:00 – 3:00 PM) – *Refer to Beartracks for official schedule*
Syllabus: Chapter 2-5

Only approved non-programmable calculators permitted. For further information on the Faculty of Engineering Calculator Policy visit www.engineering.ualberta.ca/students/calculators.asp

Quiz

Two (2) online, asynchronous quizzes via eclass will be used to evaluate knowledge on theoretical aspects of the courses. Quizzes will include questions in various forms including multiple-choice, True/False, matching, and numerical response.

Quiz (1) syllabus: Chapter 1-3 (~mid October 2024)

Quiz (2) syllabus: Chapter 4-5 (~late November 2024)

The schedule will be announced during the lectures depending on progress. The quizzes will be available to completed on eClass for 24 hours.

Term project

Students will work as a group (maximum 5 students in each group, 11 groups total) to prepare a term project presentation on an emerging topic related to the solid waste management industry. The details of the term project will be provided during the lectures. A late submission of the outline or final presentation will be penalized 20% per day. No extensions will be given except in the event of illness or other overwhelming factors. Workload and other commitments outside of this class are not valid reasons for extensions of due dates.

Due dates:

Group/Topic Selection due: September 20, 2024 by 5 PM MST

Annotated outline due: October 28, 2024 by 5 PM MST

Final presentation file: November 25, 2024 by 5 PM MST

Evaluation

All letter grades will be assigned according to the criteria specified in the University of Alberta Marking and Grading Guidelines. At the end of the course, final grades will be assigned with periodic homework assignments, midterm exam, mini quizzes, term presentation and final examination. Scores will be weighted to compute final grades as listed below:

- 20% Homework assignments (4 assignments)
- 15% Term Project
- 10% Online Quizzes (2 quizzes)
- 15% Mid-term Exam
- 40% Final Exam

Academic integrity

Please review the Student Academic Integrity Policy paying particular attention to Appendix A: Academic Misconduct. The Student Academic Integrity Policy can be found at https://policiesonline.ualberta.ca/PoliciesProcedures/Policies/Student-Academic-Integrity-Policy.pdf

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" (UofA Calendar Attendance).

Disclaimer

Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.