ENV E 440 Facility Design

Winter 2025 - January 06 to April 09

Class time: Tuesday, Thursday 11:00-12:20 Location: ETLC E2-002

Instructor:

Tong Yu, PhD, P.Eng
(780) 915-3013
tong.yu@ualberta.ca
Donadeo Innovation Centre For Engineering 7-239
Office Hours: Team or individual meeting by appointment

Course Description:

*4.5 (fi) (either term, 3-0-3) Design of water supply, water treatment, wastewater treatment, or sewerage and storm water management facilities. Course includes major design projects, field trips, and presentations. Students work in teams on a design project.

Prerequisites: ENV E 324 and 421. Note: Restricted to fourth-year traditional and fifth-year co-op engineering students

Course synchronous and asynchronous content delivery schedule:

In-person

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:

Abdullah Balfaqih (responsible for BioWin only), Email: balfaqih@ualberta.ca , Phone: (825) 889-3247
Shenxi Guo, Email: shenxi@ualberta.ca , Phone: (780) 907-0824
Mohammad Lotfi-Varnoosfaderani, Email: lotfivar@ualberta.ca , Phone: (780) 885-8653

Lab Sections:

Section	Day	Time	Location
LAB H31	Wednesday	14:00 - 16:50	ETLC E2002

Course Objectives & General Content:

This course is the capstone design project course in the environmental engineering curriculum. It focuses on the design of water treatment facility as well as preliminary engineering design principles and considerations. For this purpose, the students will complete a major design project and project-based learning style will be adopted in this course. The requirements of the design project will be used to guide the determination of specific course content. A combination of lectures by the instructor and TA as well as team

presentations by the students (based on guided self-studies) will be employed to cover the course content. Students will work on the design project in team of 5-6 members and will develop their knowledge of water treatment facility and capability of preliminary engineering design through the project.

Learning Outcomes:

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

1. Identify and articulate water or wastewater treatment project needs;
2. Select alternative technically appropriate water or wastewater treatment solutions to meet project needs;
3. Critically assess and rank alternative water or wastewater treatment solutions with respect to well defined criteria;
4. Design water or wastewater unit operations and processes to satisfy pertinent design criteria;
5. Prepare and deliver effective presentations;
6. Write reports that convey project needs and design solutions clearly and accurately; and
7. Perform effectively within a design team;

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Presentation of unit processes		On specified dates	15%
Tests		On specified dates	20%
Design project		On specified dates	60%
Attendance, teamwork, etc.		Throughout the term	5%

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

Details of the design project requirements will be provided later in the course.

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):

There is no mandatory textbook in this course.

Text and References (Recommended):

A list of reference books and materials are provided.

Website:

eClass

Previous Examples of Evaluative Materials:

Guidelines will be provided for preparation of tests. No past exam will be made available.

Lab Information:

Lab Topic	Date
Lab 1: For all labs, please refer to Note 1) on the "EnvE 440 Course Content (2025)" pages.	

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!

EnvE 440 Course Content (2025)

Time	Course Content	Student Activities
Week 1 (Jan 6-10)	1. Introduction to capstone design 2. Capstone design project: project requirements and major deadlines, preliminary design report deliverables 3. Lecture: Conceptual design and preliminary design of water and wastewater treatment plants 6. Review of unit processes: selection of the topic for each team to review	• Student self-introduction • Team formation (*due at 12 noon on Jan 13*) • Teamwork: design project planning • Teamwork: **design proposal** (*due at 12 noon on Jan 13*) • Formation of the "Unit Process Clubs" - student selection of unit process for review (*due at 12 noon on Jan 13*)
Week 2 (Jan 13-17)	4. Lecture: General considerations in preliminary design of wastewater treatment plants 5. Lecture: General considerations in preliminary design of water treatment plants	• Teamwork: design project requirements – regulatory and client's requirements • Design clinic: regulatory review and "client" interview to determine effluent quality requirements • Unit process clubs: **unit process reviews** (*Presentation ppt file submitted 1 hour prior to the first presentation of the day, and then updated by the end of day after presentation.*)
Week 3 (Jan 20-24)	6. **Unit process club presentations:** review of selected physical, chemical, and biological unit processes (Jan 21-23)	• Teamwork: regulatory review (continued)
Week 4 (Jan 27-31)	7. Lecture: Water reuse case study – Southern California 8. Lecture: Water reuse case study – Singapore 9. Lecture: BioWin software introduction (for BioWin "experts")	• Teamwork: conceptual design • Design clinic: conceptual design Q&A
Week 5 (Feb 3-7)	10. **Test 1** (on Feb 4, in-class) 11. Lecture: BioWin software case studies (for BioWin "experts")	• Teamwork: **conceptual design presentation and report** (*Presentation ppt file due 1 hour prior to the first presentation of the day, and conceptual design report due by 11:59 pm on Feb 14*) • Design clinic: Unit process selections Q&A
Week 6 (Feb 10-14)	12. **Team presentations:** conceptual design of water reclamation facility and class discussion/debate on unit process selections (Feb 11-13)	• Teamwork: conceptual design presentation and report
Feb 17-21	Reading Week	• Potential field trip (optional, TBD)
Week 7 (Feb 24-28)	9. Lecture: BioWin software introduction (for the entire class)	• Teamwork: preliminary design • Design clinic: individual team meetings on conceptual design report feedback (15 min/team)
Week 8 (Mar 3-7)	13. Lecture: Estimating costs for preliminary design of a wastewater treatment plant 14. Lecture: Estimating costs for preliminary design of a water treatment plant 15. Lecture: Technical-economic evaluation for preliminary design 11. Lecture: BioWin software case studies (for the entire class, optional)	• Teamwork: preliminary design • Design clinic: preliminary design Q&A

Week 9-10 (Mar 10-21)	16. Requirements on the final preliminary design presentations and reports Introduction to Test 2 (individual oral exam, 4 min/student)	• Potential field trips (TBD) • Teamwork: preliminary design • Design clinic: preliminary design Q&A • BioWin Clinic: BioWin troubleshooting
Week 11 (Mar 24-28)		• Teamwork: **preliminary design presentation and report** (*Presentation ppt file due 1 hour prior to the first presentation of the day, and preliminary design report due by 11:59 pm on Apr 4*) • Design clinic: final preliminary design presentation and report Q&A • BioWin Clinic: BioWin troubleshooting
Week 12 (Mar 31-Apr 4)	17. **Team presentations:** Preliminary design of water reclamation facility (Apr 1-3)	• Teamwork: preliminary design presentation and report
Week 13 (Apr 7-9)	18. **Test 2**	

Notes:

1) To best deliver the content of the course, lecture hours and lab hours in this course will be unified in arranging for the course content and student activities.
2) Course content may vary according to the actual progress of the capstone design project.

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 and student conduct

The University of Alberta is committed to the highest standards of academic integrity and honesty, as well as maintaining a learning environment that fosters the safety, security, and the inherent dignity of each member of the community, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct, and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the Student Academic Integrity Policy and the Student Conduct Policy, and avoid any behaviour that could

potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University.

All students are expected to consult the Academic Integrity website for clarification on the various academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity of the rules, procrastination or personal pressures are not acceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when you need it, and do your own work -- this will lead you toward a path to success. Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences. Suspected cases of non-academic misconduct will be reported to the Dean of Students. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities, and adhere to due process and administrative fairness, as outlined in the Student Academic Integrity Policy and the Student Conduct Policy. Please refer to the policy websites for details on inappropriate behaviours and possible sanctions.

The College of Natural and Applied Sciences (CNAS) has created an Academic Integrity for CNAS Students eClass site. Students can self-enroll and review the various resources provided, including the importance of academic integrity, examples of academic misconduct & possible sanctions, and the academic misconduct & appeal process. Students can also complete assessments to test their knowledge and earn a completion certificate.

"Integrity is doing the right thing, even when no one is watching." -- C.S. Lewis

The Faculty of Engineering 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 Academic Integrity Policy 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)

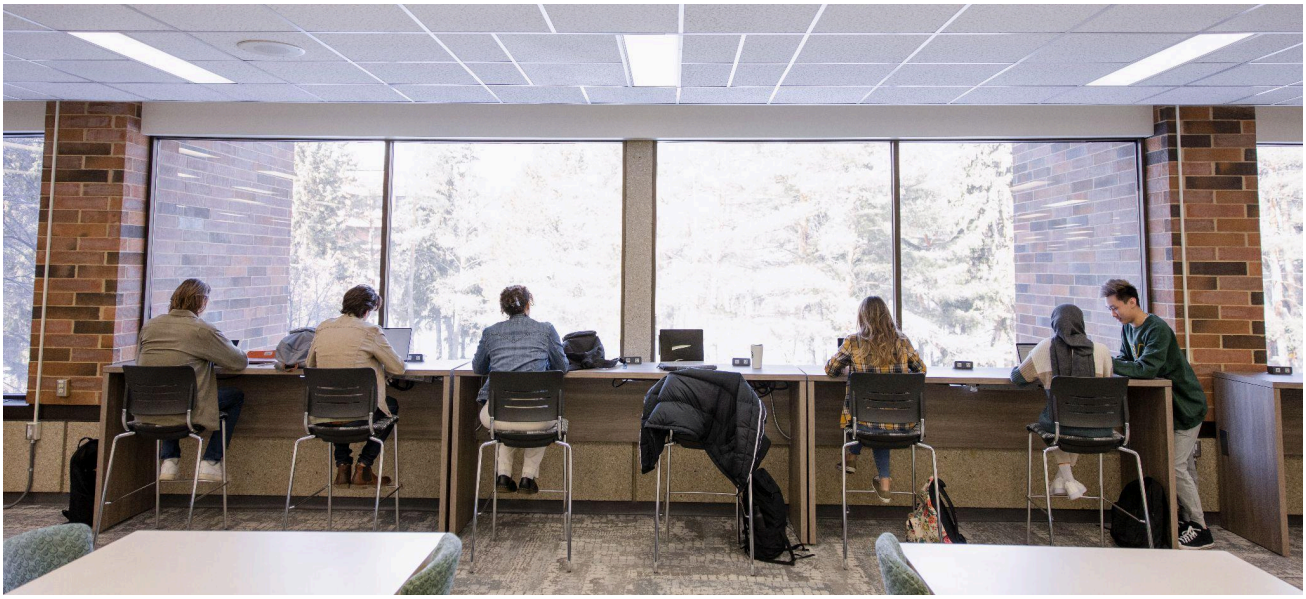
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

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.