CIV E 624 Biological Waste Treatment Processes

Fall 2025 - September 03 to December 08

Class time: Tuesday, Thursday 15:30-16:50 Location: NRE 2-122

Instructor:

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DICE 7-239
Office Hours: TBD, plus individual meetings by appointment

Course Description:

*3 (fi) (either term, 3-0-0) Study of the theoretical and applied aspects of wastewater treatment by activated sludge, fixed and moving biological films, conventional and aerated lagoons, sludge digestion, septic tanks, land treatment, and nutrient removal. Guidelines, regulations and economics. System analysis and design of facilities

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.

Course Objectives & General Content:

The objective of this course is to study the theoretical and applied aspects of biological waste treatment processes in environmental engineering, as well as fundamental knowledge of environmental microbiology that is necessary to understand the biological processes. In order to teach important design calculations, biofilm processes and activated sludge processes, as they are utilized in biological wastewater treatment, will be used as examples to explain load-based design approach and kinetics-based design approach, respectively. A term project will require students to explore on the role of research in advancement of the knowledge and design practice of biological waste treatment processes.

Learning Outcomes:

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

1. Explain how biological processes work in the treatment of wastewater.
2. Perform kinetics-based design calculations for activated sludge process.
3. Perform load-based design calculations for biofilm processes.

4. Demonstrate their ability of learning from literature to advance research.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Midterm exam		Oct 16, 2025	30%
Term project		On specified dates *	30%
Final exam		Follow the University's final exam schedule	40%

The Faculty recommended grade point average for a 600 level course is 3.3.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

* Refer to "CivE 624 term project requirements (Fall 2025)" for details.

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):

Metcalf & Eddy, Inc. 2013. Wastewater Engineering: Treatment and Resource Recovery. Fifth Edition. McGraw-Hill, Inc. (ISBN 978-0073401188)

Website:

Canvas

Previous Examples of Evaluative Materials:

Guideline questions for midterm and final exam preparation, as evaluative course materials, will be provided to all students prior to each exam and a question-and-answering session will follow.

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!

CivE 624 Course Content (Fall Term 2025)

Time	Lecture Topics	Reading & Homework Assignments
Week 1 (Sep 2-5)	Course Introduction	
Week 2 (Sep 8-12)	**Topic 1**: Review on Constituents in Wastewater **Topic 2**: Fundamentals of Biological Treatment (Wastewater Microbiology)	M&E Sections 2-3, 2-4, 2-6, M&E Sections 2-9, 7-1, 7-2, 7-3, 7-4, 7-5
Week 3 (Sep 15-19)	**Topic 2**: Fundamentals of Biological Treatment (Wastewater Microbiology)	Homework 1
Week 4 (Sep 22-26)	**Topic 2**: Fundamentals of Biological Treatment (Wastewater Microbiology) **Topic 3**: Suspended Growth Biological Treatment Process	M&E Sections 8-1, 8-2, 8-3, 8-4 Homework 2
Week 5 (Sep 29-Oct 3)	**Topic 3**: Suspended Growth Biological Treatment Process **Topic 4**: Modeling Suspended Growth Biological Treatment Process (M&E 7-6)	M&E Section 7-6 Homework 3
Week 6 (Oct 6-10)	**Topic 4**: Modeling Suspended Growth Biological Treatment Process (M&E 7-6) *Review before midterm exam*	
Week 7 (Oct 13-17)	**Topic 5**: Kinetics-Based Design Approach: Activated Sludge Systems I - Example 8-3 Part A	M&E Section 8-6
Oct 16	**Midterm exam (in-class)**	
Week 8 (Oct 20-24)	**Topic 5**: Kinetics-Based Design Approach: Activated Sludge Systems I - Example 8-3 Part A **Topic 6**: Biological Nutrients Removal I - Nitrification	M&E Section 7-9
Week 9 (Oct 27-31)	**Topic 5**: Kinetics-Based Design Approach: Activated Sludge Systems II - Example 8-3 Part B	M&E Section 8-6 Homework 4
Week 10 (Nov 3-7)	**Topic 6**: Biological Nutrients Removal II - Denitrification, Phosphorus Removal, Bardenpho Process **Topic 7**: Load-Based Design Approach I (Biofilms)	M&E Sections 7-10, 7-13 M&E Sections 7-7 and Additional lecture notes
Reading Week (Nov 10-14)	No class	
Week 11 (17-21)	**Topic 7**: Load-Based Design Approach II (RBCs and RBCs Design Example) **Topic 7**: Load-Based Design Approach III/IV - Biofiltration, Bioremediation	Homework 5

Week 12 (Nov 24-28)	**Topic 7**: Load-Based Design Approach III/IV - Biofiltration, Bioremediation **Topic 8**: Term Project Study - Student Presentations	
Week 13 (Dec 1-5)	**Topic 8**: Term Project Study - Student Presentations *Review before final exam*	
Dec 11	**Final Exam (follow university instruction on time and location)**	

Note: Lecture and homework content may vary according to student's background and actual lecture progress in class.

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)

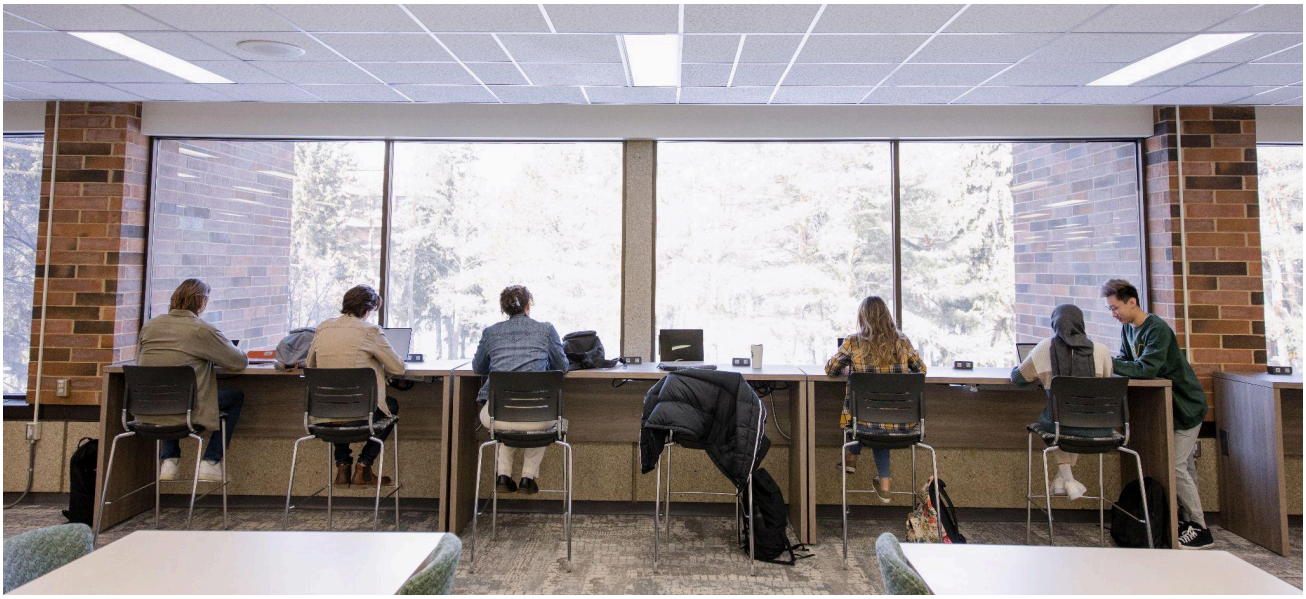
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

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.