PET E 668 Flow Assurance

Winter 2025 - January 06 to April 09

Class time: Tuesday, Thursday 11:00-12:20 Location: GSB 8-11

Instructor:

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Donadeo Innovation Centre For Engineering 6-245
Office Hours:

Course Description:

*3 (fi) (either term, 3-0-0) Overview of flow assurance in oil and natural gas flowlines and pipelines. Fundamentals of surfaces and dispersions, nucleation and crystal growth, multiphase flows. Introduction to fast- forming and slowly forming flow assurance risk factors; gas hydrates, demulsification, dehydration, wax deposition, asphaltene precipitation, scale formation, sand erosion, pipeline corrosion, sensing and mitigation strategies.

Prerequisites: Consent of instructor

Course synchronous and asynchronous content delivery schedule:

Course Objectives & General Content:

Overview of flow assurance in oil and natural gas flowlines and pipelines. Fundamentals of surfaces and dispersions, nucleation and crystal growth, multiphase flows. Introduction to fast-forming and slowly forming flow assurance risk factors; gas hydrates, demulsification, dehydration, wax deposition, asphaltene precipitation, scale formation, sand erosion, pipeline corrosion, sensing and mitigation strategies.

Learning Outcomes:

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

1. Name and describe fast- and slowly- forming flow assurance risk factors in oil and gas pipelines
2. Articulate the roles of various types of dispersions that impact the range of flow assurance risk factors in different ways
3. Contrast different modes of nucleation and crystal growth of undesirable phases.
4. Articulate various flow patterns and flow pattern transitions in two-phase flows of liquid and gas and two-phase flows of condensed phases, instabilities that lead to said flow pattern transitions, and modes of accumulation of one phase over the other.

5. Name and describe the contemporary prevention strategies of each major flow assurance risk factor and articulate the compatibility issues involved.

6. Name and describe the contemporary remediation strategies.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Midterm exam		TBA	30%
Final exam		TBA	30%
Project		TBA	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.

Calculator Policy

There is no calculator policy in this course; students are free to use the calculator they wish for all assessments.

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!

Date	Topics	
20250107	L 1-1	Introduction
20250109	L 2-1	Basic fluid mechanics
20250114	L 3-1	Surfaces & dispersions
20250116	L 3-2	Surfaces & dispersions
20250121	L 3-3	Surfaces & dispersions
20250123	L 4-1	Phases & nucleation
20250128	L 4-2	Phases & nucleation
20250130	L 4-3	Phases & nucleation
20250204	Midterm review	
20250206	Midterm exam	
20250211	L 5-1	Flow patterns in two-phase flows
20250213	L 5-2	Flow patterns in two-phase flows
20250218	**Reading week**	
20250220	**Reading week**	
20250225	L 6-1	Gas hydrates
20250227	L 6-2	demulsification & dehydration
20250304	L 6-3	wax & asphaltenes
20250306	L 6-4	scales & sands
20250311	L 6-5	corrosion
20250313	L 6-6	sensing & maintenance
20250318	Presentation sessions	
20250320	Presentation sessions	
20250325	Presentation sessions	
20250327	Presentation sessions	
20250402	Presentation sessions	
20250407	Final review	
20250409	**Final Exam**	

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)

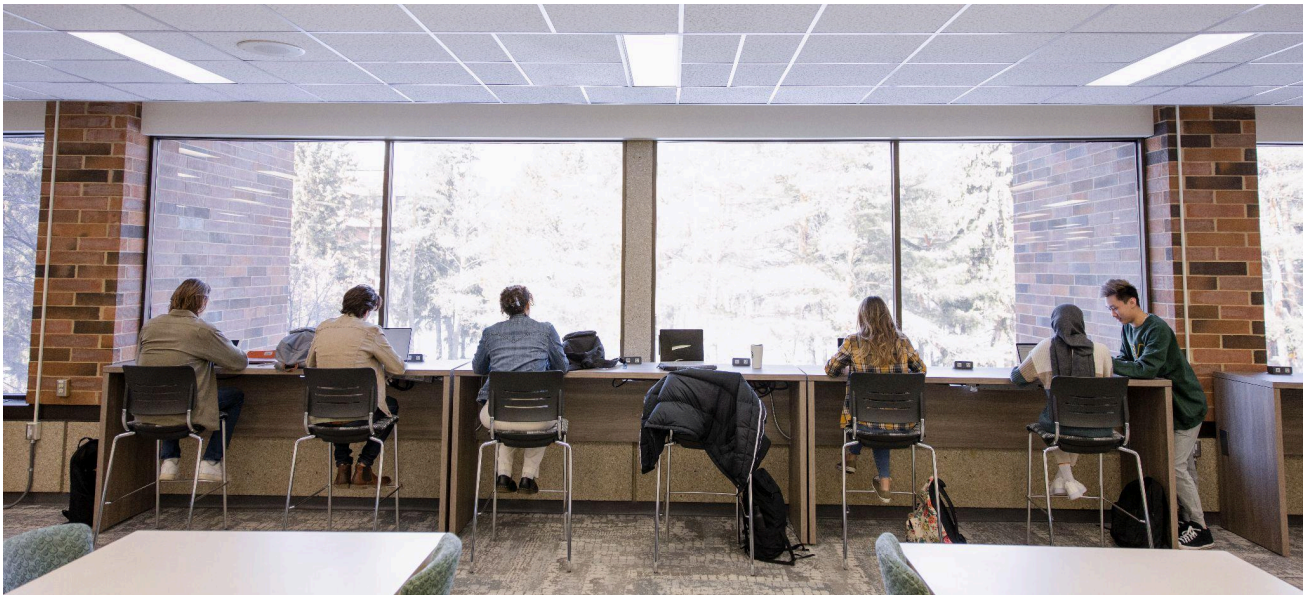
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

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.

UNIVERSITY OF ALBERTA

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.