

## **PET E 366 Petroleum Production Operations**

**Winter 2025 - January 06 to April 09**

Class time: Monday, Wednesday, Friday 9:00-9:50      Location: NRE 2-020

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### **Instructor:**

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Office Hours: By appointment

### **Course Description:**

\*3 (fi ) (second term, 3-0-0) Land units in Western Canada, types and characteristics of well completions, perforating, wellbore damage and simulation, combined inflow and well performance analysis, multiphase flow through conduits, oil well pumping, gas lift, surface facilities and flow measurement, applied mass transfer.

**Prerequisites:** CH E 312

### **Course synchronous and asynchronous content delivery schedule:**

All lectures and exams will be delivered in person. PIPESIM software training will be provided virtually.

### **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:**

Nima Shojaei, nshojaei@ualberta.ca (Assignments and Term Project)  
Rahman Miri, rmiri@ualberta.ca (Term project)

### **Course Objectives & General Content:**

Production engineering seeks to enhance the efficiency of petroleum flow systems, spanning from the bottomhole location to surface production facilities, with the primary goal of improving well productivity in a cost-effective manner. The production phase in the oil and gas industry follows successful exploration and development involving the extraction of hydrocarbons from a field. The fluid produced undergoes a journey through the reservoir, tubing, and piping system, ultimately reaching a separator for gas-oil-water separation. The driving force propelling the fluid is the pressure drop from reservoir pressure to separator pressure. Each component in the fluid's path introduces a specific pressure drop, and the production rate adjusts to ensure that the sum of all pressure drops equals the total pressure drop. Our focus is on mastering the optimal and cost-effective design of individual components within the petroleum production system, as their characteristics significantly influence pressure drop levels. Additionally, the performance of each component has a ripple effect on the entire system, emphasizing the interconnected nature of their

performance.

### Learning Outcomes:

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

1. Perform inflow and outflow performance analysis of an oil and gas production/injection system
2. Perform multi-phase flow analysis in pipes and restrictions
3. Use relevant software for the multi-phase flow analysis of fluids in the petroleum production system, and use the results to ensure optimal flow from the reservoir to the processing facilities
4. Design some components of the production system from the reservoir to the separator (e.g., select optimum perforation scheme, tubing size, choke size, flowline diameter, and artificial lift system).
5. Undertake an open-ended design project using actual or synthetic well data, which requires students to develop assumptions, and, using sound engineering judgement, to conduct a needs analysis for and complete the design of the production system from the reservoir to the separator.

### Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Homework Assignments	Synchronous	Due one week after they are announced	15%
Term Project	Synchronous	April 9, 2025 at 4:00 PM	25%
Midterm Exam	Synchronous	February 13, 2025 at 6:00 PM	30%
Final Exam	Synchronous		30%

The Faculty recommended grade point average for a 300 level course is 3.0. 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.

## **Expectations for AI use**

On the first day of class, we will as a community co-create an agreement identifying expectations on the use of AI tools that ensures everyone: 1) understands the benefits and limitations of the tools, 2) is able to differentiate between appropriate and inappropriate uses, 3) has equal access to such tools, and 4) is clear on the University of Alberta's relevant policies and procedures.

The Community of Learners agreement will align with the University of Alberta's academic integrity policies and procedures (See relevant section on cheating in University of Alberta (November 2022) [Code of Student Behaviour](#)). As necessary, we will agree to revisit and reconsider aspects of the agreement throughout the course to ensure all members of the course's Community of Learners continue to have the required shared understanding of the expectations for AI tool use in this class.

**Important:** Any and all use of AI and AI tools in assessment tasks must be transparently and honestly identified and referenced as directed. Follow-up reflection assignments explaining AI use must be completed and uploaded to eClass assignments within one (1) day of major assessment task completion.

## **Text and References (Mandatory):**

Course notes

## **Text and References (Recommended):**

H. Dale Beggs, "Production Optimization Using Nodal Analysis", 2nd Edition, 2nd Printing, OGCI and Petroskills Publications (2006)

## **Website:**

<https://eclass.srv.ualberta.ca/>

## **Previous Examples of Evaluative Materials:**

Sample exams are provided 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!*

## Course Outline

The following course outline is subject to change, and the number of weeks spent on each topic and the assignment schedule is a rough estimate.

Chapter 1-An Overview of Production Systems Analysis and Design (2 sessions)

Chapter 2-Analysis of Flow in Pipes (9 sessions) [Assignment #1]

Chapter 3-Analysis of Flow across Restrictions (3 sessions) [Assignment #2]

Chapter 4-Reservoir Performance (9 sessions) [Assignment #4]

Chapter 5-Total system analysis (4 sessions) [Assignment #5]

Chapter 6-An Introduction to Production Economic Assessments (2 sessions)

Chapter 7-Social and Environmental Factors (self-study) [Assignment #6]

Chapter 8-Artificial Lift (5 sessions) [Practice Assignment]

The course also includes a training day on the analysis and design of production systems with PIPESIM software involving Assignment #3

## Assignments and Term Project

Homework Assignments: Six lecture assignments are expected, plus a practice assignment for the last chapter. Details of the assignments will be given as we progress in the class. Homework will be due at 4:00 PM, one week from the day the assignment is announced. Late submissions before 4:00 PM of the next day after the due date will be accepted with a 10% penalty. No assignments will be accepted after the cut-off date.

If you think you may have difficulty completing an assignment on time with a valid reason, you may ask for an extension as early as possible. No extensions will be granted fewer than 48 hours before an assignment is due.

Term Project: Per Learning Outcomes for PET E 366, you will carry out an open-ended design project using actual or synthetic well data. Details of the project will be given as we progress. The project will be carried out in groups of up to 2 students. You will be given a chance to identify your group members. If you can't form a group by the deadline, I can assign a group member, or you can do the project alone. The project can be done gradually during the semester, and it involves course materials from all chapters of the textbook. The project requires you to develop assumptions and, using sound engineering judgement, to conduct a needs analysis for and complete the design of the production system from the reservoir to the separator. The deadline to submit your report is tentatively set on the last day of classes. You can't submit the term project report if you have not participated in the PIPESIM training course, which will be held on February 8th.

Grading Questions: The course TAs will grade the assignment sets and the term project. If there is a grading question, please speak with the TA. I will not change an assignment grade that has not first been discussed with the TA. If there is a grading question on the midterm exam, please e-mail me to discuss it.

Helpdesk: Upon request, we can set up helpdesk sessions offered by the course TAs in March. The helpdesk aims to help you with your term project. The exact days and times will be announced after consultation with the class.

### **Training Course**

A production training course will be scheduled. The course covers:

- a) Training for PIPESIM software for wellbore analysis
- b) Training for PIPESIM software for pipeline analysis

The exact timing and a detailed course agenda will be announced. Attendance will be required as the software will be used for the term project.

### **Contacting Us**

Please feel free to contact us with any questions or comments you have. You can also e-mail me for an online appointment. You may e-mail your TAs for an appointment to discuss your assignment grading.

### **Copyright**

All course materials, including slides, are to be solely used by the students for the assignments/reports and exam preparation and are not to be distributed by any means, including e-mail or on the web.

## 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](http://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](http://uab.ca/wellness) to learn more.

### Sexual Assault Centre

Free, anonymous, and confidential drop-in counselling. Visit [uab.ca/UASAC](http://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](http://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](http://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](http://uab.ca/ASC).



### Accessibility Resources

Connects students with disabilities to accommodations. Learn more at [uab.ca/Access](http://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](http://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](http://uab.ca/ESSC) to learn more.



### Office of the Student Ombuds

Call for complex problems and conflict mediation. Learn more at [uab.ca/ombuds](http://uab.ca/ombuds).



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## Financial support



### **Student Service Centre**

For awards and other funding support. Learn more at [uab.ca/ask](https://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](https://campusfoodbank.com).

