Identification	**Subject**	PETE540, Advanced Petroleum Reservoir Engineering, 6 ECTS
	Department	Petroleum Engineering
	Program	Graduate
	Term	Spring 2026
	Instructor	PhD. Leyla Alimuradova
	E-mail:	leyla.alimuradova@gmail.com leyla.alimuradova@khazar.org
	Phone:	
	Classroom/hours	11 Mehseti str. (Neftchilar campus), Saturday 08:40-11:50
	Office hours	
Prerequisites	Petroleum reservoir management and evaluation	
Language	English	
Compulsory/Elective	Compulsory	
Required textbooks and course materials	**Core textbook:** • **Advanced Reservoir Engineering.** Tarek Ahmed and Paul D. McKinney, Gulf Professional Publishing is an imprint of Elsevier 2005 • **Applied petroleum reservoir engineering** third edition Ronald E. Terry J. Brandon Rogers Prentice Hall, 2015. • **Reservoir Engineering, MSc Petroleum Engineering,** HERIOT-WATT UNIVERSITY, June 2018 v1 **Supplementary:** • Tiab, D., & Donaldson, E. C. **Petrophysics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties.** 4th ed., Gulf Professional Publishing, 2015. • Dake, L.P. (2001). **Fundamentals of Reservoir Engineering.** • Blunt, M. J. Multiphase **Flow in Permeable Media: A Pore-Scale Perspective.** Cambridge University Press, 2017.	
Course outline	This course is aimed at master's level students. It provides advanced knowledge of petroleum reservoir engineering, with a focus on reservoir characterization, fluid flow in porous media, advanced recovery mechanisms, and modern reservoir management techniques. The course combines strong theoretical foundations with practical applications. Each topic begins with a general overview, followed by a detailed examination of key concepts and methodologies.	
Course objectives	**The objectives of this course are to enable students to:** ▪ Develop an advanced understanding of petroleum reservoir engineering principles and practices. ▪ Analyze and characterize petroleum reservoirs using geological, petrophysical, and fluid data. ▪ Apply fluid flow theory in porous media to evaluate reservoir performance. ▪ Assess and compare primary, secondary, and advanced recovery mechanisms.	

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Perform reservoir analysis to support effective reservoir management and development decisions.
Integrate theoretical knowledge with practical applications to solve complex reservoir engineering problems.
Critically evaluate reservoir data and engineering solutions in both individual and team-based settings.

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<tr><td>Learning outcomes</td><td colspan="3">Upon successful completion of this course, students will be able to:

Demonstrate advanced knowledge of petroleum reservoir engineering concepts and methodologies.
Characterize petroleum reservoirs using integrated geological, petrophysical, and fluid data.
Apply principles of fluid flow in porous media to analyze and predict reservoir behavior. Analyzing two phase flow.
Evaluate reservoir performance under primary, secondary, and advanced recovery processes.
Conduct comprehensive reservoir analysis to support reservoir evaluation and management and development planning.
Critically assess engineering assumptions, uncertainties, and risks associated with reservoir development projects.
Communicate technical analyses effectively through presentations and group discussions.

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<tr><td rowspan="7">Teaching methods</td><td colspan="2">Lecture</td><td>x</td></tr>
<tr><td colspan="2">Group discussion</td><td>x</td></tr>
<tr><td colspan="2">Experiential exercise</td><td>x</td></tr>
<tr><td colspan="2">Simulation</td><td></td></tr>
<tr><td colspan="2">Case analysis</td><td>x</td></tr>
<tr><td colspan="2">Course paper</td><td></td></tr>
<tr><td colspan="2">Others</td><td></td></tr>
<tr><td rowspan="8">Evaluation</td><td>Methods</td><td>Date/deadlines</td><td>Percentage (%)</td></tr>
<tr><td>Midterm Exam</td><td></td><td>30</td></tr>
<tr><td>Class Participation</td><td></td><td>5</td></tr>
<tr><td>Assignments</td><td></td><td>10</td></tr>
<tr><td>Project</td><td></td><td>10</td></tr>
<tr><td>Quizzes</td><td></td><td>5</td></tr>
<tr><td>Final Exam</td><td></td><td>40</td></tr>
<tr><td>Total</td><td></td><td>100</td></tr>
<tr><td>Policy</td><td colspan="3">

Quiz

Each quiz will consist of 5 questions, and each question will be marked with 1 point. One quiz will be organized in the middle of the first semester and the midterm exam. The second quiz will be organized between the midterm exam and the final exam.

Mini project

The mini project must consist of an abstract, introduction, objectives, methodology, results, discussion, conclusion, and references. The report must be no longer than 5-7 pages of A4 in portrait orientation, with a title and text</td></tr>
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size set to Arial 12. The mini project must be presented. The mini-project report and presentation marks will be summarized and divided by 2 to obtain an average mark.

- **Activity**

The students should participate in seminars, conferences, and other events related to their courses to build new connections between academic and non-academic institutions. By 10 May 2026, a one-page report on the students' activities will be required.

- **Withdrawal (pass/fail)**

This course strictly follows the grading policy of the School of Science and Engineering. Students are normally expected to achieve a minimum mark of 65% to pass. In case of failure, he or she will be required to retake the course in the following term or year.

- **Cheating/plagiarism**

Any form of plagiarism or cheating on a proposal, work plan, bibliography, presentation of literature review, final report will result in the cancellation of the work. In this case, the student will receive a mark of nought without any further consideration.

- **After identification cheating or plagiarism, any chance will NOT be given for correction and rewrite report.**
- **Professional Behavior Guidelines**

During class hours, students are expected to conduct themselves in a manner that fosters a positive academic and professional atmosphere. Unauthorized discussions and unethical conduct are strictly forbidden.

- **Ethics**

Students must NOT be late to class. All mobile phones must be turned off and put away during the class.

- **Email**

Use your Khazar University email account **ONLY** when contacting your professor.

- **Student should include “Science Project" in the subject of any emails that he/she sends, at least for the first few emails.**
- **Generally, all emails will be responded to within 72 hours during weekdays (not including holidays).**
- **Illness**

Students with an illness may miss a quiz or presentation. This might be because the student needs to go to the hospital, recover at home, or attend regular medical appointments. In this case, the student must inform the instructor in advance about the illness and must present a document from their doctor. After considering the situation, the instructor may set a new date for the quiz or project presentation. Only one opportunity will be given to the student. The students who do not inform the instructor in advance will not be given a chance to retake the quiz or give a presentation.

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/ Assignments
1		Introduction to Advanced Reservoir Engineering: role of reservoir engineering in field development, data integration, and decision making.	Ch.1. p.1-19 [2]
2		Reservoir Rock Properties and PVT: porosity, permeability, saturation.	Ch.1.1. p.2-4 [1] Ch.3.p.87-202 [4]
3		Reservoir Rock Properties: heterogeneity, anisotropy, and their impact on flow behavior.	Ch.4.p.203-250 [4]
4		Rock–Fluid Interaction; wettability, capillary pressure, relative permeability	Ch.10.p.671-740 [4]
5		Reservoir Drive Mechanisms: solution gas drive, gas cap drive, water drive, and combination mechanisms.	Ch.4.1. p.292-299 [1]
6		Fluid Flow in porous medium: flow in fractured media, piston-like displacement	Ch.1.2. p.5-44 [1] Ch.8.p.227-266 [2]
7		**Mid-term Exam**	
8		Material Balance Concepts Advanced Material Balance Applications	Ch.4.4. p.307-322 [1]
9		Well Performance and Inflow Performance Relationships (IPR): well deliverability, productivity index, and nodal analysis basics.	Ch.2. p.149-180 [1]
10		Reservoir Performance Forecasting: decline curve analysis, forecasting techniques, and uncertainties.	Ch.5. p.327-361 [1]
11		Chemical and Thermal EOR Methods; polymer flooding, surfactants, steam injection, screening criteria.	Ch.11.p.405-433 [2]
12		Reservoir Management and Optimization: field development planning, surveillance, optimization strategies.	Ch.6. p.365-371 [1]
13		Reserves Definitions and Classifications: hydrocarbon reserves evaluation	Ch.6. p.372-396 [1]
14		Integrated Reservoir Engineering Case Studies: real-field examples, lessons learned, and future trends.	Lectures notes, Ch 12. p. 437 - 473 [2]
	TBA	**Final Exam**	

This syllabus is a guide for the course and any modifications to it will be announced in advance.