Identification	**Subject**	PETE 303 Physics of Oil and Gas Reservoir, 6 ECTS	
	Department	Petroleum Engineering	
	Program	Undergraduate	
	Term	Fall, 2025	
	Instructor	Fuad Aliyev	
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	Phone:		
	Classroom/hours	TBC	
	Office hours		
Prerequisites	Consent of instructor		
Language	English		
Compulsory/Elective	Required		
Required textbooks and course materials	*1. Hu, X., Hu, S., Jin, F., & Huang, S. (Eds.). Physics of petroleum reservoirs. Springer Geophysics, 2017.* 2. *Reservoir engineering: Heriot-Watt University, Department of Petroleum Engineering, Edinburgh, UK 2004, 814 p.*		
Course outline	This course provides a comprehensive understanding of the physical principles governing the behavior of oil and gas reservoirs. Topics include reservoir rock and fluid properties, fluid flow in porous media, reservoir pressure and temperature, and the principles of reservoir modeling and simulation.		
Course objectives	The course objective is to understand the basic concepts and terminology associated with oil and gas reservoirs, including types of reservoirs, reservoir rock properties, and fluid properties.		
Learning outcomes	• Demonstrate basics of porosity, permeability, relative permeability, arithmetic and geometric average of permeability total porosity, effective porosity, and primary and secondary porosity. Determining pore volume methods, bulk volume, and compressibility factors of reservoir rock. • To learn Darcy equation derivation in different conditions such as steady state, pseudo steady state and unsteady state. Analyzing different equations of state such as ideal gas law and etc. • To learn horizontal and vertical flow, single phase flow of incompressible. • To learn about the Klinkenberg effect, calculate the effect of fractures and channels, turbulence flow near the well bore, and describe methods for determining values of absolute permeability. • To learn reservoir rock and fluid properties, pore pressure concepts. Calculations of pressure gradients will be another outcome of this course.		
Teaching methods	Lecture		X
	Experiential exercise		X
	Case analysis		X
Evaluation	Methods	Date/deadlines	Percentage (%)
	Midterm Exam		30
	Class Participation		5
	Assignment and quizzes		25
	Final Exam		40
	Total		100

Policy	• A midterm exam is an exam given near the middle of an academic grading term or near the middle of any given quarter or semester. The purpose of the examination is that students have a better idea of whether they're advancing well in the course. • The student receives 5 bonus points at the end of the semester if they attend all classes and follow all course policies and procedures. • Assessment of the participant's activity in lectures, practical classes, and in the learning process in general. • A quiz is a quick assessment of student knowledge to test a students' level of comprehension briefly regarding course material, providing teachers with insights into student progress and any existing knowledge gaps. • A project is a collaborative activity of students relating to scientific research. The reasons for including projects in the subject course is to show prospective students and research activity on the subject. • A final examination is an examination administered at the end of an academic term, with a set of questions or exercises evaluating the skill or knowledge of students given to students at the end of a course of study.
	Class assignments Class assignments will be provided during class. The contents will be based on the calculation of formation properties etc. **Project** Research skills and the techniques learnt during class assignments and practical exercises will be the tools to complete the projects**.** **Quizzes** Quizzes will cover the materials studied in previous classes. There will be 2 quizzes during the semester. **Preparation for class** The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. **Withdrawal (pass/fail)** A student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year. **Cheating/plagiarism** Cheating or other plagiarism during the Quizzes, Mid-term, and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations. After identification of cheating or plagiarism, any chance will not be given for correction and rewriting of the report. **Professional behavior guidelines** The students shall behave in a way to creates favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited. **Ethics** Students must not be late to class. All mobile phones must be turned off and put away during the class. **Expected behavior** Includes attending all class activities; meeting deadlines; observing common courtesies to fellow students, teachers, and staff; being honest; making a diligent effort to learn; and does not engage in any disruptive irresponsible manner. Legitimate collaboration is encouraged but academic collusion or dishonesty will not be tolerated.

	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	Week 1	Introduction to the course and reservoir rock	Lecture notes
2	Week 2	Grain-size distribution of rocks	Book 1 Chapter 2
3	Week 3	Reservoir pressures and temperatures	Lecture notes
4	Week 4	Compressibility of reservoir rocks	Book 2 Chapter 6
5	Week 5	Porosity of reservoir rocks	Book 1;2 Chapter 2;2
7	Week 6	Fluid saturation of reservoir rocks	Lecture notes
8	Week 7	Permeability of reservoir rocks **Quiz 1**	Book 1;2 Chapter 2;2
9	Week 8	**Mid-Term Exam**	
10	Week 9	Permeability of reservoir rocks. Part 2	Book 1;2 Chapter 2;2
11	Week 10	Classification of crude oils and natural gases	Lecture notes
12	Week 11	Gas reservoir	Lecture notes
13	Week 12	Oil reservoir	Lecture notes
14	Week 13	Properties of natural gas	Book 1 Chapter 3
15	Week 14	Properties of crude oil **Quiz 2**	Book 1 Chapter 3
16	Week 15	Overall revision and preparation for exam	
	TBA	**Final Exam**	

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