Identification	**Subject**	PETE 415, Gas and Gas-Condensate Reservoir Engineering, 6 ECTS	
	Department	Petroleum Engineering	
	Program	Graduate	
	Term	Fall, 2022	
	Instructor	Tahir Mammadov	
	E-mail:	tahir.mammadov@khazar.org	
	Phone:	(+994 12) 421-79-16 (ext.)	
	Classroom/hours	11 Mehseti str. (Neftchilar campus), Thursday 18:40-21:00	
	Office hours		
Prerequisites	Consent of instructor		
Language	English		
Compulsory/Elective	Required		
Required textbooks and course materials	***Core textbook:*** John Lee, Gas Reservoir Engineering, 1996 Boyun Guo , Natural Gas Engineering Handbook, 2005 H. Dale Beggs, Gas Production Operations L. P. Dake, The practice of reservoir engineering George Stewart, Gas Reservoir Engineering Course and etc.		
Course website			
Course outline	This course is prepared to gain high knowledge about Gas and Gas-Condensate Reservoir Engineering discipline. Reservoir analysis is the main concern of the course. The course combines theoretical foundations with practical applications. We will begin with a general overview in each topic and then go into more detail on several concepts.		
Course objectives	*Generic Objective of the Course:* This course explains the fundamentals of gas and gas-condensate reservoir engineering and their practical application in conducting a comprehensive field study. 1st mid-term includes the origin and characteristics of natural gas, PVT requirements for gas-condensate systems, gas well testing and etc. Here the fundamental mathematical expressions that are used to describe the gas reservoir flow behavior in porous media. A principle of gas well performance calculation is also discussed. Parallel you will be deeply familiar with estimation of gas deliverability. In the 2nd mid-term, it is introduced natural gas transmission and design of gathering systems. Later, Underground Gas Storage (UGS) will be discussed. After gaining knowledge about Gas-condensate reservoir engineering, field special problems will be discussed and illustrated at the end of the course.		
Learning outcomes	**By the end of the course the students should be able:** ▪ Identify and articulate gas and gas-condensate reservoirs ▪ Estimation of gas reservoir volume ▪ Understand cycling processes ▪ Familiarize with Underground gas storage (UGS) ▪ Classification of special problems		
Teaching methods	**Lecture**		x
	Group discussion		x
	Experiential exercise		x
	Simulation		x
	Case analysis		x
Evaluation	**Methods**	**Date/deadlines**	**Percentage (%)**
	Midterm Exam		30
	Class Participation		5
	Assignment and	Quizzes will be assigned	15

	quizzes	each week.	
	Project		10
	Final Exam		40
	Total		100

Policy

- **This course** combines traditional face-to-face classes with online learning. The course management platform Moodle is used to provide a wide range of resources to support learning. And all course related materials including, but not limited to, syllabus, supplementary readings, course announcements, cases and assignments are available only at the course website http://www.khazar.org/moodle**.** Grades will also be posted on Moodle. The students are expected to check it a regular basis and communicate with the lecturer only via Moodle.
- **Project** The project covers main course topics. In this project the students will apply their knowledge from assignments and course materials. Data of X field will be given and students should be evaluated well abandonment for this field, convert field to UGS, find necessary well number to develop as UGS and etc.
- **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. After the lecture, you should study your notes and work relevant problems.
- **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.
- **Professional behavior guidelines**
  The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited.

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/Assignments
1		The origin and characteristics of natural gas • Natural gas composition & properties • Ideal and real gas EOS • Gas reservoirs types • Natural gas resources types	
2		PVT lab experiments • Constant Volume Depletion • Constant Composition Expansion	
3		Gas reserves • Volumetric method • Material balance method	
4		Gas well testing • Dynamic Characterization • Formation testing • Well testing • Drill Stem Test (DST)	
5		Estimation of gas deliverability • Reservoir deliverability • Well deliverability	

6		Gas flow measurement • Methods of measurements • Factors for method selections • Volumetric measurement • Orifice metering	
7		Gas well performance • Static & following BHP • Basic Energy Equation • Adjusting for liquid production • Calculation of static BHP • Gas-liquid flow in wellbore	
8		**Midterm Exam**	
9		Gas gathering & transportation • Friction factor • Reynolds number • Relative roughness	
10		Field treatment and processing of natural gas • Raw natural gas • Natural gas processing • Field treatment unit	
11		Underground Gas Storage (UGS) • Storage role • Storage modulation • Main definitions • Storage history	
12		Gas-condensate reservoir engineering • Mole composition • Drawdown behavior • Condensate banking Condensate behavior	
13		Development of Gas-condensate reservoirs with Oil rim • Introduction • How to get the most out of your Oil rim reservoirs • Oil rim production and depletion strategy • Oil rim development traffic light screening • Oil rim development key success elements • Peculiarities of thin oil rim development • Field examples from Worldwide and South Caspian Basin	
14		Gas reservoir management • Some reservoir engineering applications of producing logging • Selective inflow performance • Field data collection • Pro-active management of fluid contacts • Claymore Reservoir engineering study Permanent downhole gauges and venture flowmeters	
15		Special problems • Pressure-cumulative production plots • Hydrate formation Sour gas production	
16		**Final Exam**	