

PET 212E ROCK PROPERTIES

Course Title		Rock Properties				
				Course Implementation, Hours/Week		
Code	Semester	Local Credits	ECTS Credits	Theoretical	Tutorial	Laboratory
PET 212E	4	3	7	3	0	0
Department		Petroleum and Natural Gas Engineering				
Course Type		Compulsory		Course Language		English
Course Prerequisites						
Course Category By Content, %		Math & Basic Sciences		Engineering Topics; Check if Contains Significant Design (√)		Other
				100		-

Course Description	Fundamental physical properties of porous media; porosity, permeability, saturation, and compressibility. Rock/fluid interactions; wettability concept, relative permeability, and capillary pressure. Fluid flow in porous media: Darcy's equation for single and multi-phase flow. Electrical, thermal, acoustic and radioactive properties of reservoir rocks.					
Course Objectives	<ol style="list-style-type: none"> 1. To provide students with basic knowledge of reservoir rock properties, 2. To emphasize the importance of rock properties in engineering design of petroleum, natural gas and geothermal system, 3. To acquire the students with the tools available to measure or infer the reservoir rock properties essential for petroleum, natural gas and geothermal engineering studies. 					
Course Learning Outcomes	<p>Students who pass the course will be able to:</p> <ol style="list-style-type: none"> 1. Identify reservoir forming rock types, 2. Define fundamental rock properties related to petroleum engineering as well as discuss the relation of those properties to various parameters. 3. Describe basic laws and principles related to reservoir rock properties. 4. Explain the tools to measure or infer rock properties required in the related engineering design studies. 					
Textbook	-					
Other References	<ol style="list-style-type: none"> 1. M. Onur, PET 212E Lecture Notes, İTÜ. 2. M. Mihçakan PET 212E Lecture Notes, İTÜ. 3. Petroleum Reservoir Engineering: Physical Properties by J. W. Amyx, D. M. Bass, Jr. and R. L. Whiting, McGraw-Hill (1960) New York. 4. Properties of Reservoir Rocks: Core Analysis by R. P. Monicard, Institute Francais du Petrole Publications (1980) Gulf Publishing Company, Houston. 5. Petrophysics – Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties by D. Tiab and E.C. Donaldson Gulf Publishing Co. Houston TX, 1996. 6. Physical Properties of Rocks by J.H Schon Pergamon Oxford UK 2nd Ed. 1998. 					
Homework & Projects	Throughout the semester the students will be given homework assignments.					
Laboratory work	-					
Computer Use	Students will be using the computer for their homework assignments.					
Other Activities	-					
Assessment Criteria	Activities				Quantity	Effects on Grading, %
	Midterms				1	
	Quizzes				4-6	
	Homework				4-6	
	Projects					
	Term Paper/Projects					
	Laboratory Work					
	Other Activities					
Final Exam				1	40	

Weeks	Course Plan	Course Outcomes
1	The rocks of the earth - their composition and classification	1
2	Porosity and fluid storage capacity of rocks. Methods for measuring porosity.	2,3,4
3	Fluids saturations in porous media.	2,3,4
4	Surface tension and wettability.	2,3
5	Capillarity and capillary pressure. OWC & GOC concepts. Leverett's J function.	2,3,4
6	Saturation distribution in the reservoir, determination of free water level, oil and transition.	2,3
7	Rock compressibility, overburden effects, measurements and correlations, pressure gradient and temperature gradients in oil and gas reservoirs.	2,3
8	Darcy's law and permeability concept. Measurement of permeability.	2,3,4
9	Capillary flow; Poiseuille's Law, viscous laminar flow; Bundles of capillaries	2,3
10	Flow in linear, radial heterogeneous beds connected in series and parallel.	3
11	Gas flow in porous media; ideal and non ideal gases, Klinkenberg effect, non-Darcy flow	2,3
12	Multiphase flow; critical saturation, relative perms and hysteresis.	3,3
13	Extension of Darcy's law to multiphase flow.	3
14	Elastic, acoustic, electrical, radioactive, and thermal properties of rocks.	2,3,4

Related Performance Indicators

- 1a. Identify and formulate appropriate methods for solving petroleum, natural gas, and geothermal engineering problems
6c. Infer and report engineering conclusions from the analysis and interpretation of data.

Relationship of Course Learning Outcomes to the Performance Indicators		
Course Learning Outcome	Performance Indicator	
	1a	6c
1	x	
2	x	
3	x	
4		x