

PET 211E FLUID PROPERTIES

Course Title		Fluid Properties				
				Course Implementation, Hours/Week		
Code	Semester	Local Credits	ECTS Credits	Theoretical	Tutorial	Laboratory
PET 211E	3	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	Elements of petroleum and natural gas and basic hydrocarbon chemistry. Ideal and real mixtures. Ideal and real fluid equations of state. Phase behavior and physical properties of reservoir fluids. Correlative and experimental methods used to determine the physical properties.					
Course Objectives	<ol style="list-style-type: none"> 1. Provide information on formation and chemistry of petroleum and natural gas, 2. Inform students with basic hydrocarbon phase behavior and hydrocarbon reservoir fluids, 3. Explain real and ideal models used to model gas-liquid equilibria, 4. Explain five different reservoir fluids to the student in detail, 5. Demonstrate experimental and correlative methods to determine hydrocarbon fluid properties. 					
Course Learning Outcomes	<p>Having successfully completed the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Describe basic chemistry of petroleum and natural gas 2. Describe general phase behavior of hydrocarbon systems 3. Apply vapor-liquid equilibrium relations to reservoir fluids (flash calculations, equation of state for ideal and real gases) 4. Define and determine physical properties of reservoir fluids (z-factor, formation volume factor, solution gas-oil ratio, isothermal compressibility, viscosity, interfacial tension) 5. Determine reservoir fluid properties by using experimental and correlative methods 					
Textbook	The Properties of Petroleum Fluids, McCain, W.D. Jr., Second Edition PennWell Publishing Company, Second Edition, 1990, Tulsa, Oklahoma, ISBN 0-878-14-335-1					
Other References	<ol style="list-style-type: none"> 1. Hydrocarbon Phase Behavior, Ahmed, T., Gulf Publishing Company, 1989, Houston. 2. Phase Behavior of Petroleum Reservoir Fluids, Pedersen, K.S. et al., CRC Press, 2015, Boca Raton FL. 3. Phase Behavior, Whitson, C.H., and Brule, M.R., SPE Monograph Series, 2000, Richardson, Texas. 4. Petroleum Reservoir Rock and Fluid Properties, Abhijit Y. Dandekar, CRC/Taylor & Francis, 2006, Boca Raton. 5. PVT and Phase Behaviour of Petroleum Reservoir Fluids, Ali Danesh, Elsevier, 1998, Amsterdam. 					
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	40%
	Quizzes					
	Homework				8-11	10%
	Projects					
	Term Paper/Projects					
	Laboratory Work					
	Other Activities					
Final Exam				1	50%	

Weeks	Course Plan	Course Outcomes
1	Origin and constituents of crude oils and natural gases	1
2	Hydrocarbon chemistry	1
3	General phase behavior of petroleum related hydrocarbons	2
4	Ideal gas laws and ideal gas equation of state	3
5	Ideal mixtures and use of Dalton and Raoult laws to model ideal solutions, modeling real solutions with K values	3
6	Equation of state for real gases, definition of z-factor, calculation of z-factor using graphical correlations	4
7	Effect of non-hydrocarbon gases on z factor, other cubic real gas equations of state	4
8	Classification of hydrocarbon reservoir fluids, and phase behavior characteristics of each fluid type	4
9	Properties of dry gases: General definitions	4
10	Properties of dry gases: heating value, Joule-Thomson effect	4
11	Properties of oils	4
12	Experimental methods to determine hydrocarbon fluid properties	5
13	Correlations used to calculate fluid properties	5
14	Characteristics of formation waters and final review	5

Related Performance Indicators
1a. Identify and formulate appropriate methods for solving petroleum, natural gas, and geothermal engineering problems
1b. Apply engineering methods to reservoir, drilling and production engineering problems

Relationship of Course Learning Outcomes to the Performance Indicators		
Course Learning Outcome	Performance Indicator	
	(1a)	(1b)
1	x	
2	x	
3		x
4		x
5		x