King Saud University

College of Engineering

Petroleum and Natural Gas Engineering

PGE 362: Properties of Reservoir Fluids

Second Semester 1437 – 1438 (2016 – 2017)

Instructor: Mohammad A. Khamis

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Textbooks: 1- The properties of Petroleum Fluids, McCain Jr., W. D., Penn Well Publishing Co., Tulsa, Oklahoma, 1990.

2- Properties of Petroleum Reservoir Fluids, Burcik, E. J., IHRD, Boston, U.S.A., 1979

References: 1- Reservoir Engineering Handbook, Tarek Ahmed, Gulf Professional Publishing, USA, 2006

2- SPE Journal papers and others

Pre-Requisite: PGE 251

Description: Properties of naturally occurring petroleum deposits, behavior of gases, phase behaviour of liquids, qualitative phase behavior of hydrocarbon systems, quantitative phase behavior, reservoir fluid characteristics.

Goals: This course is aimed to educate petroleum engineering students the basics and fundamentals of the properties and phase behaviour of reservoir fluids.

Course Learning Outcomes (CLO)

CLO 1: Identify the different types of petroleum fluids.

CLO 2: Understand the various properties of petroleum reservoir fluids.

Evaluation:

Home works:	**10 %**
Mid-term exams:	**2x15%**
Quizzes & Attendance:	**10 %**
Term project:	**10%** (Report, 6% + PPT, 4% - Team Work)
Final Exam:	**40 %**

Class Policy:

1. All excuses have to be certified by Student Affairs. (DN: 25% = 11 classes)
2. Maximum time for late is 5 minutes (**2 late = 1 absent**)
3. There will be no makeup exams.
4. Late homework will not be accepted. (Due: 1 week)
5. An appropriate action will be taken against cheating in any written exams.
6. Copying of homework assignments is disallowed.
7. Food, drink, or cell phones are not allowed in the class.
8. Contact via email.
9. All materials will be uploaded weekly to my personal website (**http://fac.ksu.edu.sa/mokhamis**).

Office Hours: Sun - Tues (1:00 - 2:00)

Topics:

Classes	Topics
3 class	**Introduction**: Properties of naturally occurring petroleum deposits, nomenclature, chemical, physical properties of paraffin and unsaturated hydrocarbons, petroleum oil, natural gas, tar and asphalts. **(homework-1)**
6 classes	**Properties of Gases**: Ideal gas laws, mixtures of ideal gases, behavior of real gases, other equations of state for real gases, compressibility factor. **(homework-2, exam-1)**
6 classes	**Phase Behavior of Liquids**: Pressure, Volume, Temperature (PVT) relations for a liquid, vapour pressure of liquids, vapour pressure as a function of temperature, measurements of vapour pressure, Clausius - Clapeyron Equation, heat of vaporization. **(homework-3)**
5 classes	**Qualitative phase behavior** of hydrocarbon systems for single, two and multi-component systems, pressure-temperature-volume and density-temperature diagrams, retrograde phenomena, pressure-composition and temperature-composition systems. **(homework-4,exam-2)**
5 classes	**Quantitative phase behavior:** Gas-Liquid Equilibrium for ideal solutions, non-ideal solutions, flash vaporization, differential vaporization. **(homework-5)**
7 classes	**Reservoir fluids characteristics:** gas formation volume factor, gas solubility, oil formation volume factor, two phase formation volume factor, reservoir fluid viscosities, reservoir fluid sampling. **(homework-6)**
12 classes	Problems and tutorial.