

Reservoir Fluid Properties and Phase Behavior

- 1.1 Course Number: PE342
- 1.2 Contact Hours: 3-0-0 Credits: 9
- 1.3 Semester-offered: 3rd Year-Odd
- 1.4 Prerequisite: Reservoir Engineering I, Reservoir Engineering II
- 1.5 Syllabus Committee Member: Dr. Shivanjali Sharma, Dr. Vishnu C. Nair, Dr. Amit Kumar
2. **Objective:** The objective of the course is to provide the concepts related to the properties of reservoir fluids and their phase behavior at different composition and reservoir conditions.
3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Components of Naturally Occurring Petroleum	Saturated and Unsaturated, Aromatic hydrocarbons, Resins, and Asphaltenes	2
2	Equation of state	Ideal gas law, Gas gravity, Deviation from Ideal gas law, van der Waals EOS, other EOS	6
3	Phase Behavior & Reservoir Fluid Properties	PVT diagrams of pure substances, Two-component and Three-component mixtures, Multi component systems and Properties of Reservoir Fluids	6
4	Reservoir Fluid Characteristics	Gas formation volume factor, Gas solubility, Oil formation volume factor, Two phase formation volume factor, Experimental determination of reservoir fluid characteristics, Correlations of Black oil characteristics	7
5	Gas-Liquid Equilibria	Ideal and Nonideal Solutions, Surface separator calculations for black oil and other reservoir fluids	6
6	Calculation of Gas-Liquid Equilibria with EOS	Pure substances, Mixtures, Chemical potential, fugacity, fugacity coefficient	7
7	Characteristics of reservoir water	Composition, Bubble point, formation volume factor, Density, Solubility of natural gas in water, Isothermal Coefficient of Water, Interaction of water with hydrocarbon gases and liquids, Interfacial tension of water and hydrocarbon gases and liquids	6
		Total	40

4. Readings

4.1. Textbook:

- a) The properties of Petroleum Fluids – William D. McCain, Jr
- b) Properties of Petroleum Reservoir Fluids – Emil J. Burick

4.2. Reference Books:

- a) Practical Reservoir Engineering and Characterization – Richard O. Baker, Harvey W. Yarranton, Jerry L. Jensen
- b) Equations of State and PVT Analysis – Tarek Ahmed
- c) Fluid Phase Behavior for Conventional and Unconventional Oil and Gas Reservoirs – Alireza Bahadori

5 Outcome of the Course:

On successful completion of the course, the student shall be able to:

1. Explain the phase behavior of a reservoir fluid at different pressure and temperature conditions.
2. Classify the different reservoir fluids as per its composition.
3. Predict the equilibrium state of gas and liquid hydrocarbons at different temperature and pressure states