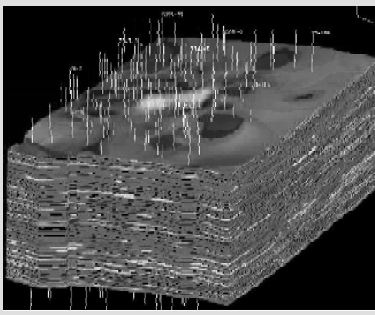
16PL305 PETROLEUM RESERVIOR ENGINEERING-I



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	20

WA/RA	SSH/HSH	CS	SA	S	BS
10	40	-	3	5	5

Course Description and Objectives:

To impart knowledge in the basic concepts like PVT analysis for oil, Material balance applied to oil reservoir, Darcy's law and applications, well inflow estimation for stabilized flow conditions.

Course Outcomes:

The student will be able to :

- To make them suitable as reservoir engineers for petroleum industry

SKILLS:

- ✓ Estimate the reserves of various sands of the reservoir from well data
- ✓ Calculate the formation damage and can recommend suitable stimulation operations to reverse the wells

ACTIVITIES:

- *Minor project on analysis of Darcy's law.*
- *Case study on Darcy's law applications in petroleum reservior.*

UNIT - 1 **L-9**

Some basic concepts in reservoir engineering : Calculation of hydrocarbon volumes- Fluid pressure regimes- Oil recovery and recovery factor-Volumetric gas reservoir engineering– Application of the real gas equation of state - Gas material balance and recovery factor-Hydrocarbon phase behavior.

UNIT - 2 **L-9**

PVT analysis for oil: Definition of the basic PVT parameters–Collection of fluid samples - Determination of the basic parameters in the laboratory and conversion for field operating conditions - Alternative manner of expressing PVT lab analysis results - Complete PVT analysis.

UNIT - 3 **L-9**

Material balance applied to oil reservoirs: General form -The material balance expressed as alinear equation- Reservoir drive mechanism- Solution gas drive- Gas cap drive- Natural water drive- Compaction drive under related pore compressibility phenomena.

UNIT - 4 **L-9**

Darcy's law and applications: Darcy's law and field potential- Sign convention- Units and units conversion- Real gas potential – Datum pressures- Radial steady state flow and well stimulation- Two phase flow- Effective and relative permeabilities.

UNIT - 5 **L-9**

The basic differential equation for radial flow in a porous medium- Derivation of the basic radial differential equation – Conditions of solution – The linearization of the equation for fluids of small and constant compressibility.

Well inflow estimation for stabilized flow conditions: Semi steady state solution–Steady statesolution.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total Hours-20

1. Determination of porosity using water saturation method.
2. Measurement of surface tension & interfacial tension with the ring Tensiometer. Equipment: Tensiometer.
3. Measurement of surface tension using capillary rise method.
4. Measurement of surface tension with the ring Stalagnometer.
5. Determination of fluid density using Pycnometer and hydrometer methods. Equipment: Pycnometer and hydrometer.
6. Liquid viscosity measurement using capillary tube viscometer (Ostwald type). Equipment: Capillary tube viscometer.
7. Liquid viscosity measurement using falling ball tube method.

8. Determination of capillary pressure of reservoir rock (core) using porous plate method. Equipment: Capillary pressure cell.
9. Absolute permeability measurement of water. Equipment: The Darcy apparatus.
10. Measurement of contact angle (between oil, water and solid surface) using imaging method. Equipment: The image system set-up.
11. Determination of relative permeability of oil-water using unsteady state method. Equipment: Relative permeability apparatus

TEXT BOOKS:

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science, 1978 (17th Impression 1998).
2. B. C. Craft – M. Hawkins Applied Petroleum Reservoir Engineering, Third Edition, Revised by Ronald E. Terry & J. Brandon Rogers, Prentice Hall, New York, 2014.

REFERENCE BOOKS:

1. Reservoir Engineering Handbook, Tarek Ahmed, 3rd Edition, Gulf Professional Publishing, 2006.
2. Petroleum Reservoir Engineering, James W Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill, 1960.
3. Rider, M. H., “The Geological Interpretation of Well Logs” John Wiley Publishing Company.
4. Stefan M. Luthi, 2001, Geological Well Logs: Their Use in Reservoir Modelling, Springer, 381 pp.