COURSE TITLE	**RESERVOIR ENGINEERING**
COURSE CODE	**01CH0511**
COURSE CREDITS	**4**

Objective:

1 Reservoir engineering is a crucial discipline in petroleum engineering that deals with the characterization, modeling, and management of hydrocarbon reservoirs. This course provides an in-depth understanding of reservoir properties, fluid behavior, and techniques for optimizing hydrocarbon recovery

Course Outcomes: After completion of this course, student will be able to:

1 Learn the core principles of reservoir engineering and reservoir characterization techniques
2 Analyze fluid flow behavior in reservoirs
3 Study different recovery mechanisms and their applications
4 Explore reservoir simulation and management techniques

Pre-requisite of course: Heat Transfer Operation, Mass Transfer Operation, Engineering Mathematics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Reservoir Engineering** Overview of petroleum reservoirs, Reservoir classification and characteristics, Reservoir fluid types and properties, Basic reservoir equations and principles, Reservoir Rock Properties - Porosity and permeability, Capillary pressure and wettability, Rock compressibility and its effect on reservoir behaviour, Core analysis techniques	10
2	**Reservoir Fluid Properties and drive mechanisms** Fluid phase behaviour, PVT analysis, Saturation and interfacial tension, Fluid sampling and analysis techniques, Water drive, Gas drive, Solution gas drive, Combination drive mechanisms, Reservoir pressure maintenance techniques	12
3	**Reservoir Performance Analysis and simulations** Material balance equations, Decline curve analysis, Well test analysis, Reservoir surveillance techniques, Introduction to reservoir simulation, Numerical methods for reservoir simulation, Grid types and modeling approaches, History matching and uncertainty analysis	12

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Contents : Unit	Topics	Contact Hours
4	**Enhanced Oil Recovery (EOR) and Reservoir Management** Overview of EOR techniques, Miscible and immiscible displacement processes, Chemical EOR methods, Thermal EOR methods, Reservoir development planning, Production optimization techniques, Reservoir monitoring and surveillance, Economic analysis and decision-making in reservoir management	8
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorial 1** To summarize the properties of rock and its correlation with fluid flow characteristics	2
2	**Tutorial 2** Numerical problems on gravity drainage water mechanism	2
3	**Tutorial 3** Numerical problems on water drive mechanism	2
4	**Tutorial 4** Numerical problems on combination drive reservoir	2
5	**Tutorial 5** Numerical problems on steady state model in material balance equations	2
6	**Tutorial 6** Numerical problems on unsteady state model in material balance equations	2
7	**Tutorial 7** Numerical problems on exponential decline curve	2
8	**Tutorial 8** Numerical problems on hyperbolic decline curve	2
9	**Tutorial 9** Numerical problems on harmonic decline curve	2
10	**Tutorial 10** To get an introduction of reservoir simulation	2
11	**Tutorial 11** To learn the types of simulation models (black oil, compositional)	2
12	**Tutorial 12** To learn the types of simulation models (thermal)	2
Total Hours		**24**

Textbook :

1 Applied Petroleum Reservoir Engineering, Craft, B.C., Hawkins, M.F., and Terry, E.W., Prentice Hall, 1991

2 Reservoir Engineering Handbook, Tarek Ahmed, Gulf Professional Publishing, 2019

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Textbook :

3 Modern Reservoir Engineering: A Simulation Approach, Dake, L.P., Prentice Hall, 1977

References:

1 Petroleum Reservoir Engineering Practice, Petroleum Reservoir Engineering Practice, Nnaemeka Ezekwe, Prentice Hall, 2010

2 Well Testing, Well Testing, John Lee, Society of Petroleum Engineers, 1982

3 Petroleum Reservoir Rock and Fluid Properties , Petroleum Reservoir Rock and Fluid Properties , Abhijit Y. Dandekar, Taylor and Francis, 2006

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc23_ch77/preview

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