

COURSE TITLE	DRILLING ENGINEERING
COURSE CODE	01CH0510
COURSE CREDITS	4

Objective:

- 1 The course is intended to comprehensive knowledge and practical skills related to the drilling fluids, Cementing and directional drilling.

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

- 1 Demonstrate the equipment and practices of oil well drilling.
- 2 Select the suitable drilling fluids during drilling.
- 3 Illustrate the Casing practices and Cementing techniques.
- 4 Develop skills to address problems in drilling oil wells.

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

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction: Well Planning, Drilling Rig and its Components, Selection criteria and Operating systems, Introduction to Drilling Fluids, Its Classification and Properties,, Drilling fluid hydraulics calculations, Drilling fluids equipment, Mud Hydraulics and Mud weight and Pressure loss calculations, Advanced mud Technology, Balanced/Underbalanced drilling, Pore Pressure prediction, Fracture pressure, abnormal pressure. Well Planning, Geotechnical Order (GTO)., Components and functions of drilling string, Types and Performance of Drill Bits.	10
2	Casing and Cementation: Casing Functions of casing, Types of casing, Casing properties, Casing specifications, Casing connections, Factors influencing casing design. , Collapse criterion, Burst criterion, Combination strings, Tension criterion Compression loads, Biaxial effects, Triaxial analysis, Triaxial load capacity diagram, Casing seat selection method., Cementation: Cementing, Cements & cement slurry, Classification of cement, Slurry design, Cementing equipment, Cement additives, Cementing Methods, Primary cementing, , Stage cementing, Liner cementing, Plugging, Squeeze Cementing techniques in practice. Deep well cementing, Cementing calculations.	10

Contents : Unit	Topics	Contact Hours
3	Directional drilling Introduction to Directional Drilling, Tools for deflection & orientation. Directional drilling problems & their remedies, Auto and Verti-track systems: Rotary steerable motors and geo-steering tools, Horizontal Well Drilling Objectives, Selection, Drilling techniques and applications, Coil tubing drilling, Slant drilling, Laser drilling.	14
4	Drilling problems and remedies Drilling problems and remedies, classification of drilling waste, approaches of drilling waste minimization., Disposing of the drilling fluids waste and drill cuttings waste, Wellbore stability, Gas behavior in a well., Kick tolerance, Kicks- Kick control, Pressure control theory, Blow out control.	8
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment-1 To determine the volumes of Water, Oil and Solids in Drilling Fluid using Retort kit.	2
2	Experiment-2 To measure the viscosity of drilling fluid using Marsh funnel viscometer.	2
3	Experiment-3 To calibrate the mud balance and determine the specific gravity / density of the mud.	2
4	Experiment-4 Understanding the preparation of WBM and OBM and determination of pH.	2
5	Experiment-5 To determine the Calcium and Magnesium in fluid by titration method.	2
6	Experiment-6 To determine the Total hardness in fluid by titration method.	2
7	Experiment-7 To determine the alkalinity in fluid by titration method.	2
8	Experiment-8 To determine the Sand content in drilling fluid using sand content kit.	2
9	Experiment-9 To measure the absolute density of mixture after preparing a homogeneous cement slurry.	2
10	Experiment-10 To determine the initial and final setting time of cement.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
11	Experiment-11 To determine the Rheology of the drilling fluid using Rheometer.	2
12	Experiment-12 To determine the Resistivity of drilling fluid and mud cake.	2
Total Hours		24

Textbook :

- 1 Petroleum Engineering: Drilling and Well Completion,, Carl Gatlin, Prentice-Hall, Inc., 1960
- 2 Drilling Engineering, , J.J. Azar and G. Robello Samuel, Pennwell Books, 2007
- 3 Working Guide to Drilling Equipment and Operations, William Lyons, Gulf Publishing, 2009

References:

- 1 Drilling Fluids Processing Handbook, Drilling Fluids Processing Handbook, ASME Shale Shaker Committee, Gulf Professional Publishing,, 2005
- 2 Fundamentals of Drilling Engineering, Fundamentals of Drilling Engineering, Robert F. Mitchell, Stefan Z. Miska, Society of Petroleum Engineers, 2011
- 3 Oil Well Drilling Engineering: Principles and Practice, Oil Well Drilling Engineering: Principles and Practice, H. Rabia, Graham & Trotman, Graham & Trotman, 1985
- 4 Drilling Engineering: A Complete Well Planning Approach, Drilling Engineering: A Complete Well Planning Approach, Neal Adams, Tommie Charrier Pennwell, 1985

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.

Instructional Method:

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

Supplementary Resources:

- 1 <https://archive.nptel.ac.in/courses/123/105/123105003/>