

Drilling Technology

1.1 Course Number: PE211

1.2 Contact Hours: 3-0-2 Credits: 11

1.3 Semester-offered: 2nd Year-Even

1.4 Prerequisite: Petroleum Engineering Practices

1.5 Syllabus Committee Member: Dr. Amit Saxena & Dr. Shailesh Kumar

2. Objective:

To understand well planning procedure and functioning of rig components.

To evaluate the drilling mud, casing and cementing procedure

To evaluate the drill bit for effective selection.

3. Course Content:

Unit	Topics	Sub-topic	Lectures
1	Well Planning	Well Planning and Well design: Objective, Input data, Drilling programme preparation, Type of well, Prospect, GTO, Introduction to wellbore pressures.	3
2	Rig Components	Introduction to drilling Technology: Rotary / top drive drilling, Types of onshore/offshore rigs, Introduction to hardware system (Land Rig), power generation system, Hoisting, Rotary and Drilling Fluid circulation system, mud pumps, Rig selection criteria. Horsepower calculations for draw-works and rotary. Advantages and disadvantages of top drive system.	11
3	Drilling Fluids	Introduction, functions, types, compositions, properties of mud, Field test, Rheology, Additives and contamination, Selection of drilling fluids and mud, Conditioning equipment, Mud calculations, Hydrostatic pressure, Volume, Weight related calculations during drilling and tripping	6
4	Drilling Bit	Introduction, Bit Types, Design Factors, IADC classification of bit, Bit selection, factors affecting rate of penetration	6
5	Casing	Functions, Casing policy and design – Pore pressure, Fracture gradient prediction, Casing seat / depth selection, Casing design criteria, Burst, Tension, Collapse, Bi-axial loading etc., combination string, Leak-off test.	7
6	Cementing	Functions, classification of cement, Cement additives, Methods of cementation, Equipment and accessories,	7

		Field problems pertaining to cementation job, Cement slurry calculations, Introduction to multistage cementing, Secondary cementing.	
			Total
			40

Lab Work

Preparation of water and oil based muds, Determination of mud properties –mud weight/density, viscosity, gel strength, sand content, API fluid loss, pH, cation exchange capacity. Determination of the volume of water, oil and solid in drilling fluid. Study of cutting transport capability. Cement slurry preparation and consistency measurement.

4. Readings

4.1 Textbook:

- Hussain Rabia, Oil Well Drilling Engineering, Principles & Practice, Graham & Trotman, ISBN No: 0860107140.
- Editors: Robert F. Mitchell Halliburton Stefan Z. Miska: Fundamentals of Drilling Engineering, SPE Text Book Series, 2011
- Jr. Adam T. Bourgoyne, Keith K. Millheim, Martin E. Chenevert, Jr. F. S. Young : Applied Drilling Engineering, SPE Textbook Series, Vol 2, 1987

4.2 Reference books:

- Mc Ray, A; Cole Frank W: Basic Drilling Engineering, New India Publication
- Azar, J.J.; and Samuel G.R.; Drilling Engineering, Pennwell Corp., 2007
- Editor-in-Chief: Larry W. Lake: Petroleum Engineering Handbook-Volume-II (Drilling Engineering), SPE, 2007
- Walter Francis Rogers: Composition and Properties of Oil Well Drilling Fluids: Gulf Publishing Company

5 Outcome of the Course:

Ability to design a complete drilling rig system.

Ability to design drilling fluid, casing and cementing policy for a drilling operation.