

## Advanced Drilling Technology

- 1.1 Course Number: PE312
- 1.2 Contact Hours :3-0-0 Credits: 9
- 1.3 Semester-offered: 3<sup>rd</sup> Year-Odd
- 1.4 Prerequisite: Drilling Technology
- 1.5 Syllabus Committee Member: Dr. Amit Saxena & Dr. Shailesh Kumar

### 2. Objective:

- To be familiar with drill string design calculations
- To understand the various methods and equipment used for well control
- To understand the mud hydraulics and Drilling economics
- To access the wellbore problems and remedies

### 3. Course Content:

Unit	Topics	Sub-topic	Lectures
1	Drill String Design	API classification, Design criteria MOP, Various loading conditions, Fatigue bending of pipe, Critical rotary speed, Drill string vibrations, Tangent point, Drill collar tangent length, Bit side force with respect to directional drilling aspect.	7
2	Mud Hydraulics	Drilling Hydraulics: Fluid flow and associated pressures in the rotary rig circulating system, Pressure losses in pipe and annulus during drilling operations, pressure drop across bit nozzles, ECD, Optimization of bit hydraulics, Nozzle size calculation	7
3	Well Bore Problems	Downhole drilling problems and solutions, problems concerned with drilling fluid and drill pipe stuck up, geometry of a stuck pipe. Lost Circulation, Kick and Blow Out, causes of kicks, kick signs, shut in procedure for land, type of influx, influx behaviour, close circulation	6
4	Well Control	BHP, Normal, abnormal pressure, causes, U tube concept, shallow gas, top hole drilling with riser, gas cutting, effect of gas expansion in riser, swab, surge effect, SCR, choke line friction, Primary, Secondary, Tertiary well control operational procedures, well control methods, well control kill sheet, kick pressure analysis, Special conditions and	12

		problems, BOP control unit, Accumulator calculations, BOP stack testing's, Snubbing, Stripping	
5	Coring and Fishing	Coring definition, tools, coring operations, Fishing tools and operations	3
6	Drilling Economics	Drilling economics and costing, Cost analysis and predictions, AFE calculations.	3
		<b>Total</b>	<b>40</b>

#### 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:

- Drilling Fluids Optimization A Practical Field Approach Author: J. L. Lummus, Publisher: Pennwell Corp, ISBN: 0878143068.
- 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

#### 5 Outcome of the Course:

Ability to design drill string, mud circulation system, and well control procedure.

Ability to perform coring and fishing operation

Understanding of Drilling Economics