Drilling Engineering for Non-Drilling Engineers

Course Description

This short course is intended for participants in the Oil and Gas industry with or without prior basic knowledge and understanding of drilling. Participants would be introduced to the first-hand and essential concepts and principles of drilling, the process and the equipment. Basic and fundamental calculations of drilling are covered in this course as well. Case studies will be presented together with videos on the processes involved.

Course Objectives

• To introduce participants to basic concepts, theories, principles and overview of drilling

• Expose participants to the various drilling facilities onshore and offshore and rig set-up

• Introduction to the stake holders involved in drilling

• Introduce participants to the history of drilling, drilling terminologies and drilling methodologies

• Explain the purpose and essentials of drilling

• Show participants the basic concept of drilling operation and process

• Present and explain the fundamental and basic calculations in drilling

• Introduce participants to major consideration such as well control

• Identify potential drilling problems, means for prevention and mitigation

Who Should Attend

This short course is intended for personnel with no drilling background, knowledge or experience. It is a very basic and introductory course designed to expose and introduce potential candidates to drilling engineering concepts and fundamentals.

Course Content

Fundamentals of Petroleum

Stakeholders involved in drilling and drilling contracts

Drilling contracts and stakeholders

Onshore and Offshore Drilling Units

History of drilling

Rotary drilling

Rig set-up

Drill string and Bottom hole assembly concept

Drilling Process

Concept of Drilling

Fundamental Drilling Calculations

Drilling fluids and cements

Casing design

Well control

Introduction to Directional Drilling

Day 1

Introduction, Terminology, Drilling Context

Introductions

A bit of oil history - Terminology of Petroleum & of Drilling

Overall drilling process

Drilling planning overview

Oil prices & drilling

Major drilling accomplishments & challenges

Essentials of Geology

Hydrocarbon formation

Key elements of economic reservoir, rocks, traps, seals

Geological and geophysical information

VIDEO-1 : Origins of Petroleum

Drilling Rigs & Drilling Systems

Onshore - Offshore rigs, characteristics

Drilling challenges

Rig components - Well classification

Power system - Hoisting system

Circulation system / pumps

Control system / BOPs

Monitoring system

VIDEO-2: Drilling Rigs

Drilling Costs

Drilling cost estimation - Types of costs

Acquisition For Expenditure (AFE)

QUIZ -1- Test your knowledge on today's lecture

Day 2

Drilling Fluids & Drilling hydraulics

Drilling fluid types - Uses

Fluid properties – additives

Rheology of drilling fluids

Static / dynamic conditions / circulation

Rheological models, pressure losses

Bit hydraulics

Cuttings transport issues

EXERCISE: Determine drilling fluid density

CASE STUDY: Basics of drilling fluid design

Abnormal Pressures, Kicks & Kick Control

Sedimentary rocks - Overpressure generation

Pore pressure / Fracture pressure estimation

Kick definition / Kick sequence

Kick detection

Kick control methods, BOPs (video)

VIDEO-3: Kicks & kick control

EXERCISE: Kick control example

Casing Design

Purpose of casing design

Casing / hole diameter selection

Burst / Collapse pressure calculations

Casing depth estimation

Mud weight estimation

Cementing & Cement Job Design

Cementing process

Cements & types of cements, additives

Cement placement / Cementing problems

Cement job evaluation

EXERCISE: Cement slurry density & yield calculation

QUIZ-2 - Test your knowledge on today's lectures

Day 3

The drill string

Drill string components

Drilling bits, Bit wear / Bit selection

Drill collars, characteristics & selection, Neutral point

Drill pipe characteristics

Bottom Hole Assembly

Directional & Horizontal Drilling

Purpose, history & types of deviated wells

Inclination & azimuth

MWD

Horizontal / ERD wells, Multilaterals

Coil-Tubing-Drilling

VIDEO-4: Directional Drilling

Well Logging & Completions

Logging

Mud Log

Open hole logs

RFT, Drill stem testing

Basic components & function of completions

Stimulation

Drilling Problems & Advanced Techniques

Types of drilling problems, severity

Lost circulation - Stuck pipe - Junk in hole

Surface / downhole measurements / problem prevention

Managed Pressure Drilling / Casing Drilling / Dual Gradient Drilling

Drilling safety

VIDEO-5: Managed Pressure Drilling

CASE STUDY: Lost Circulation Problem, identification & solution

FINAL QUIZ: post-assessment of knowledge level on Basic Drilling Engineering for non