G11DE Drilling Engineering

COURSE DETAILS
Course Code: G11DE
Full Course Title: Drilling Engineering
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: No
Postgraduate Taught: Yes
Postgraduate Research: No

COURSE AIMS
The overall aim of this course is to allow the student to:

- understand the concepts and techniques used in drilling engineering
- examine the design requirements of well planning and construction
- optimise the design of a drilling program

LEARNING OUTCOMES – SUBJECT MASTERY
On completion of the course, the student should be able to:

- understand and appreciate the mechanism of well drilling
- calculate the deviation required to reach a specific reservoir target and design the well path
- understand drillstring hydraulics and produce a suitable bottomhole assembly design for each hole section
- produce a casing design for a well
- understand and be able to calculate mud densities to overcome an unexpected well influx (kick) and to design a circulation method to return to safe operation
- design a cementing operation

LEARNING OUTCOMES – PERSONAL ABILITIES
In this course, students will be explicitly encouraged to:

- be aware of the importance of time management;
- develop their personal skills, including an awareness of both traditional and internet-based information sources;
- develop their skills in problem solving
- an ability to apply theoretical knowledge to practical problems.
- provide constructive feedback to teaching staff.

SYLLABUS
Overview of Drilling Operations: To review the processes required to drill wells; to consider the different types of well - exploration, appraisal, development – and their role in the exploration and production of a reservoir; to discuss the resources required in terms of equipment and personnel.

Rig Components: To review the functions of a drilling rig – types, locations, capacities, drilling systems. To examine the main systems – power, hoisting, circulation, cleaning.

Drillstring: Review the function and design of a drillstring for specific operations; to examine the use of stabilisers and mud motors in achieving deviated drilling; to calculate and design the appropriate components to achieve a deviated well; the use of logging (MWD and LWD) in achieving designed trajectories; review of data capture and analysis for MWD and LWD;

Drillbits: To review the characterisation and selection of drill bits for specific formation properties; to assess the longevity of drill bits with reference to industry standards; to compare efficiency of drill bits by reference to cost and specific energy relationships.

Formation Pore Pressure and Fracture Gradient: Understanding the generation of pore pressure within sediments; classification of pore pressure relative to hydrostatic pressure; calculation of pore pressure gradient; review of earth stresses and rock mechanical properties of sediments; calculation of fracture gradient; use of pore and fracture gradients to determine suitable casing setting depths.

Well Control: Design and use of casing in production and injection wells; design of cementing – primary and secondary; design of mud system and appropriate mud weight for specific designs; review of BOP’s in drilling and their function in well control.

Drilling Fluids: Review of types of fluids; design requirements of drilling mud – hole cleaning, bit cooling, formation stabilisation; chemical interaction of drilling fluids

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