GEOMECHANICS FOR DRILLING ENGINEERS DRL046

COURSE OVERVIEW

This course covers the necessary fundamentals of geomechanics for drilling Engineering. This course will focus on the origin of stresses in the subsurface and how in situ stresses can be understood from wellbore data; rock mechanical properties, pore pressure prediction, stress around the wellbore calculations, building the Mechanical Earth Model, rock failure criteria, selection the safest well trajectory and mud window. Different case studies of wellbore stability will be covered through the course.

COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Understand the origin of stresses in the subsurface and how in situ stresses can be understood from wellbore data.
- Estimate the rock mechanical properties,
- Understand the origins of pore pressure and how it can estimate.
- Recognize the stress around the wellbore and how it can calculate.
- Recognize the origins and causes of hole breakouts.
- Build the Mechanical Earth Model and how it can use.
- Understand the rock failure criteria.
- Select the safest well trajectory to avoid well instability.
- Build stereographic projection that represent the effect of well deviation and azimuth in hole breakouts
- Identify the safest mud window.

WHO SHOULD ATTEND

Drilling engineers, Geologists/Geophysicists/Geomechanics engineers, completion engineers, exploration supervisors and managers concerned with the geomechanics and wellbore stability.

COURSE DURATION

5 Working Days

COURSE OUTLINES

1. Pre course evaluation

2. Basic Rock Mechanics
   - Concept of stress/strain
   - Mechanical properties—Young's modulus, Poisson's ratio, bulk modulus, shear modulus, bulk compressibility
   - Rock strength—UCS, tensile strength, and shear strength
   - Computation of mechanical properties and strength parameters from logs
   - Dynamic to static conversion of mechanical properties
   - Overview of common rock mechanics tests (lab demonstrations).

3. Understanding Earth Stresses
   - In-situ stresses and plate tectonics
   - Computing stress profile from logs
   - Stress measurement and calibration—mini-frac/LOT/MDT tests
   - Basic definitions of fracture gradient, closure pressure, and other terminologies used in lot/xlot
   - How fractures are created—preferential direction, fracture growth (frac height and width)

4. Pore Pressure and Fracture Gradient Estimation
   - Normal, under, and overpressure reservoirs
   - Measuring, predicting, and modeling of pore pressure
   - Pore pressure and the principle of effective stress

5. Mechanical Earth Modeling (MEM)
   - Data requirements for a typical geo-mechanical analysis
   - Process of building mechanical earth model
   - Log data—Dipole Sonic Imager (DSI) and Sonic Scanner
   - Integrating log data, core data, and field stress measurements in MEM
   - Calibration of geo-mechanical model

6. Rock Failure
   - Tensile versus shear failure
   - Mohr-Coulomb criterion for rock failure
   - Identifying rock failure from logs

7. **Wellbore Stability**

   - Predicting Stresses Around Borehole
   - Factors causing wellbore instability
   - Wellbore Placement
   - Shale Characterization,
   - Borehole Stability Models
   - Planning Pro-actively to Avoid/Reduce Wellbore Instabilities
   - Wellbore Instability (Software Demonstration)
   - Build stereographic projection that represent the effect of well deviation and azimuth in hole breakouts
   - Safest wellbore trajectory selection
   - Safest mud weight selection

8. **Post course evaluation.**