

Fundamentals of Petroleum Geomechanics

GEO013

Course Description

This course provides an introduction to the fundamental principles of petroleum geomechanics, focusing on the application of geomechanical principles to the exploration and production of oil and gas. Participants will gain an understanding of the geomechanical properties of subsurface rock formations and how they affect drilling, reservoir management, and wellbore stability. The course emphasizes the importance of geomechanics in optimizing well performance, managing risks, and ensuring the safety and efficiency of operations in petroleum engineering.

Course Objectives

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

- Understand the basic principles of geomechanics and its importance in petroleum engineering.
- Identify and explain the geomechanical properties of rocks and their impact on reservoir and wellbore behavior.
- Understand the role of geomechanics in well planning, drilling, and completion.
- Apply geomechanical models to predict and manage wellbore stability and reservoir behavior.
- Assess the risks associated with geomechanical challenges and design mitigation strategies.
- Analyze the relationship between stress, strain, and pore pressure in subsurface formations.
- Utilize geomechanical data for enhanced decision-making in drilling and production operations.

Who Should Attend

- Petroleum engineers and geologists working in exploration and production.
- Drilling engineers and operations personnel involved in well planning and operations.
- Reservoir engineers seeking a better understanding of geomechanical properties and their impact on reservoir management.
- Engineers and technical professionals involved in the assessment and mitigation of geomechanical risks.
- Anyone interested in understanding the principles of geomechanics in the context of petroleum engineering.

Course Duration

5 Working Days



Course Outlines

1. Introduction to Petroleum Geomechanics

- Overview of geomechanics and its importance in petroleum engineering.
- The role of geomechanics in drilling, reservoir management, and well completion.
- Key geomechanical concepts: stress, strain, and pore pressure.

2. Geomechanical Properties of Rocks

- Understanding the mechanical properties of rocks: elasticity, strength, and deformation.
- The impact of lithology and rock fabric on geomechanical behavior.
- Measuring geomechanical properties: laboratory and field testing techniques.

3. In-Situ Stresses and Pore Pressure

- Overview of in-situ stresses and their role in wellbore stability.
- Factors influencing pore pressure in subsurface formations.
- Methods for measuring and predicting pore pressure in reservoirs.

4. Wellbore Stability and Drilling Challenges

- Principles of wellbore stability and factors affecting stability.
- Geomechanical challenges in drilling: stuck pipe, wellbore collapse, and lost circulation.
- Mitigating wellbore stability issues through geomechanical analysis.

5. Geomechanics in Reservoir Management

- The role of geomechanics in reservoir compaction and subsidence.
- Managing geomechanical risks in enhanced oil recovery (EOR) processes.
- The effect of stress changes on reservoir permeability and production rates.

6. Geomechanical Modeling and Simulation

- Introduction to geomechanical modeling techniques.
- Using geomechanical models to predict reservoir and wellbore behavior.
- Case studies of successful geomechanical applications in petroleum operations.

7. Stress Analysis and Fracture Mechanics

- Stress analysis in the subsurface: principal stresses and stress orientation.
- The mechanics of fractures and faults in reservoir rocks.
- Managing fracturing risks and understanding the impact on reservoir performance.



8. Geomechanics for Well Planning and Completion

- Integrating geomechanics into well design and completion strategies.
- Use of geomechanical data in selecting casing, drilling fluids, and completion methods.
- The role of geomechanics in hydraulic fracturing and well integrity.

