

Fundamentals of Petroleum Geomechanics



Geomechanics Training Series

About the Course

This course provides an overview of fundamentals of geomechanics and its different applications in petroleum industry. It presents the essentials of rock mechanics such as stress and strain tensors as well as the most common rock constitutive models and failure criteria. Different mechanical and rock properties such as poroelastic and strength parameters and their experimental measurement will also be covered. Origins of pore pressure generation and different models for estimation of pore pressure will be discussed and in-situ stresses and different methods of estimation of vertical and horizontal stresses will be presented. The course will review different steps of building Mechanical Earth Models (MEMs) and it will show how 1D and 3D MEMs are used in geomechanical models to solve everyday problems in industry such as borehole stability and drilling, sand production, hydraulic fracturing, production optimization, ground deformation and caprock integrity. The new advancements in geomechanics of unconventional plays will also be discussed. Several exercises and case studies will help the participants to gain a profound understanding of the presented materials. An online blog dedicated to the course will ensure that the participants will take their learning experience beyond the classroom.

Designed for

Geoscientists in the fields of geology, geophysics and petrophysics as well as engineers in the fields of reservoir management, drilling, and completion and fracturing. The participants are assumed to have limited or no background in geomechanics.

Quality Consulting Services

Focused Training Courses

Advanced Data Management

Course Outline

Day 1

- Introduction to petroleum geomechanics and its different applications
- Basics of rock mechanics: stress and strain tensors and constitutive models
- In-situ stresses, pore pressure and plate tectonics in the earth
- Laboratory measurement of elastic and strength rock properties
- Application of log and seismic data for calculation of rock mechanical properties

Day 2

- Origins of pore pressure generation and different pore pressure calculation models
- In-situ stress estimation using field tests, wireline logs, image logs and seismic data
- A review of different data sources for geomechanical characterization
- Construction of 1D and 3D MEMs and their key characteristics
- Data uncertainty analysis for geomechanical analysis
- Geomechanical modeling and its different applications

Day 3

- Borehole stability modeling and drilling design
- Sand production control and efficient completion design
- Hydraulic fracturing modeling
- Coupled modeling, subsidence analysis and caprock integrity assessment
- Geomechanics of unconventional plays

You Will Learn About

- Fundamentals of rock mechanics, stress tensor and behavioral models
- Different Methods for rock properties measurement and in-situ stress estimation
- Pore pressure generation and its estimation
- Different sources of geomechanical data and strategies for data acquisition and quality control
- Construction of Mechanical Earth Models and data uncertainty analysis
- Application of geomechanical modeling in borehole stability analysis, sand production, hydraulic fracturing, coupled reservoir modeling and unconventional reservoirs.