

## Geomechanics for Geoscientists

5 days

GEOMG-EN-P

### Overview

#### LEVEL

Skilled

#### PURPOSE

This training course aims to ensure the understanding of geomechanics-related phenomena that affect reservoir exploitation management and safety such as compaction/subsidence, reservoir cover layer fracturing, fault activation, and to be aware of the techniques used in the petroleum industry to mitigate these phenomena.

#### LEARNING OBJECTIVES

Upon completion of the course, participants will be able to:

- acquire the basic geomechanical knowledge useful for reservoir applications,
- understand the connection between stress, pressure and temperature both in the reservoir and in the cover layers at the origin of compaction, fracturing and fault activation,
- know the workflow and the data needed to build a geomechanical model first at the well scale and then at the reservoir scale,
- interpret model results to assess compaction/subsidence, the maximum injection pressure, fault integrity.

#### WAYS AND MEANS

Application exercises adapted to reservoir exploitation situations.

#### LEARNING ASSESSMENT

Acquired knowledge will be assessed through studies based on real cases. In each study, participants will have to analyze the situation to provide a diagnosis and possible solutions.

#### PREREQUISITES

Degree in geosciences or drilling, or equivalent experience.

### Agenda

#### INTRODUCTION TO GEOMECHANICS IN THE PETROLEUM INDUSTRY

0.25 d

Review of all the applications of geomechanics in the reservoir and drilling fields illustrated with real cases.

#### THEORETICAL BASES USEFUL FOR RESERVOIR APPLICATIONS

2 d

Stresses, deformations, yield.  
Connection between stress, pressure and temperature.  
Rock tensile failure.  
Rock shearing failure.  
Fault activation criterion.  
Laboratory measurements of tensile and rupture properties.  
Measurements of pore compressibility.  
Geomechanical model of wells (formation pressure, stress and mechanical properties) and calibration from laboratory measurements and logs and well tests, particularly the leak-off test, induced fractures and oval shapes.

## IMPACT OF GEOMECHANICS ON RESERVOIR SAFETY & MANAGEMENT

2 d

Workflow of the building of a coupled reservoir and geomechanical model.

Arching effect.

Compaction and subsidence calculations and assessment of the related risks.

Determination of the maximum injection pressure and the storage capacity in a reservoir.

Methods of monitoring of reservoir cover layer integrity.

## APPLICATION

0.75 d

Exercise based on one or several real cases gathering the major issues of reservoir geomechanics .

Knowledge assessment.