
N411: Mechanical Stratigraphy, Stress and Geomechanics

Instructor(s): Kevin Smart and Adam Cawood

Format and Duration

Classroom - 3 Days

Virtual - 5 Sessions

Summary

Business Impact: We will explore the importance and application of **stress and geomechanical analyses** to energy exploration and production in both **conventional and unconventional reservoirs**, with emphasis on the importance of **mechanical stratigraphy and stress states** on processes such as natural deformation and hydraulic fracturing.

This course will apprise course participants of key concepts in mechanical stratigraphy, stress, and geomechanics. Participants will develop the skill sets necessary for planning and evaluating a stress analysis and geomechanics study.

Learning Outcomes

Participants will learn to:

1. Characterize mechanical stratigraphy based on lithostratigraphy and other information.
2. Assess the role of mechanical stratigraphy and stress conditions on rock deformation behavior including fracture prediction in unconventional and conventional reservoirs.
3. Assess the difference between shear and extension fractures and their different effects on permeability anisotropy.
4. Evaluate the basics of stress analysis and geomechanics, including the interrelationship between stress and strain in the context of geomechanical rock behavior. Estimate an *in situ* stress field for an area of interest.
5. Evaluate geomechanical issues for common petroleum and unconventional resource applications such as well design, borehole stability, and hydraulic fracturing.
6. Plan and evaluate a geomechanics study.

Training Method

This is a classroom or virtual classroom course comprising a mixture of lectures, discussion, and computer-based exercises.

Who Should Attend

The course is intended for exploration, development and production geoscientists and reservoir and production engineers whose focus is on unconventional resources and/or conventional fractured reservoirs.

Prerequisites and Linking Courses

Participants should have a familiarity with basic structural geologic principles prior to taking this class, such as is offered in NI 38 (Structural Interpretation in Petroleum Exploration and Development).

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Related courses include:

- N134 (Carbonate and Shale Faulting and Fracturing Field Seminar, with emphasis on the Eagle Ford Formation, Texas, USA)
- N381 (Influence of Tectonics and Mechanical Stratigraphy on Natural Deformation in the Permian Basin, Texas, USA)
- N364 (Fracture Architecture, Sedimentology and Diagenesis of Organic-rich Mudstones of Ancient Upwelling Zones with Application to Naturally Fractured Reservoirs, California, USA)
- N379 (Application of Geomechanics to Reservoir Characterization, Management and Hydraulic Stimulation, Wyoming, USA)

Course Content

Session 1: Mechanical Stratigraphy

- Lecture
- Interactive Exercises

Session 2: Stress Analysis

- Lecture
- Exercises (outside of session)

Session 3: Stress Analysis

- Interactive Discussion Exercises

Session 4: Geomechanics

- Lecture
- Exercises (outside of session)

Session 5: Geomechanics

- Interactive Discussion Exercises