Geomechanics

Designed for:
This course is designed for geophysicists, geologists, petrophysicists petroleum engineers, reservoir engineers, drilling engineers and production engineers.
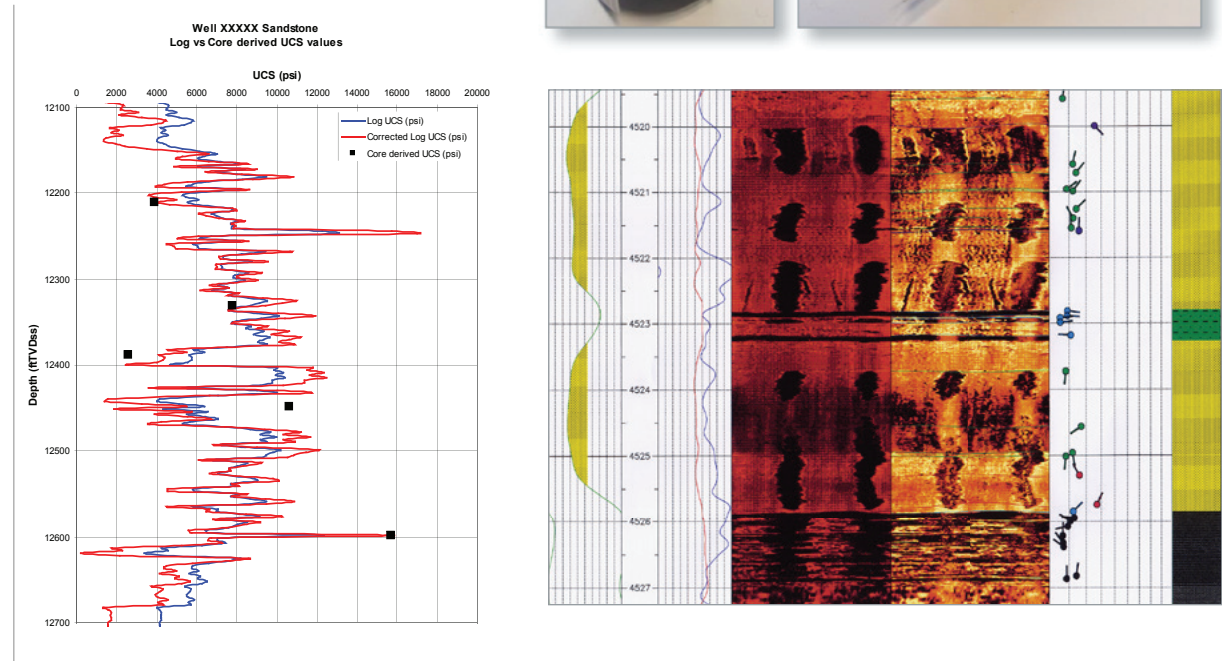
Duration (days)

1 2 3 4 5 flexible

Learning Level:

Skills

Knowledge

Awareness

Reservoir geomechanics (or rock mechanics) can mean many things to many people and these different perceptions can lead to gaps in knowledge and misunderstanding between different disciplines.

In this course we introduce basic geomechanics concepts and processes to provide a level playing field. We also provide examples (with exercises) covering how this knowledge can be applied in the hydrocarbons industry for drilling wells, completion and stimulation designs, reservoir modelling and production / injection simulations.

Well XXXXX Sandstone
Log vs Core derived UCS values

Early Development
E&P Overview
Reservoir
Wells

Business & Risk
Open Air
Coaching
Master Class

Geomechanics continued

Course Content

Theory & Measurement

Basic Theory (with exercises)
- Stress-Strain relationships
- Material Properties
- Mohr circles
- Intact rock failure vs discontinuity reactivation
- Structural geology – natural geomechanics
- Elasticity theory
- Rock physics (acoustic wave propagation)
- Wellbore stress system

Measurement (with exercises)
- Stress tensor
- Pore pressure
- Elastic moduli (from well data and seismic)
- Rock strength (compressive and tensile)
- Friction angle
- Biot factor

Application & Management

Drilling (with exercises)
- Wellbore stresses (stress tensor rotation)
- Wellbore stability models (e.g. Mohr Coulomb, Modified Lade)
- Calibration from offset wells (drilling report data)
- Wellbore design examples (anisotropic failure, open natural fractures)

Productivity (with exercises)
- Sand production prediction (empirical and numerical)
- Sand control (completion design, drawdown, depletion and rate constraints)
- Introduction to hydraulic fracture design (2D and pseudo 3D models, proppant schedules)
- Introduction to acid fracture design (2D and pseudo 3D models, diversion control)

Reservoir Performance
- 3D reservoir geomechanical model construction (well data, seismic inversion data)
- 3D Wellbore stability (trajectory screening & optimisation)
- Production effects (compaction, subsidence, fault reactivation, porelasticity)
- Injection effects (caprock tensile failure, fault reactivation, poroelasticity)
- Naturally fractured reservoirs (fracture compressibility, permeability changes)

Course Duration:

Duration is 4 or 5 days depending on whether it involves one or two trainers and if a field day is included.

Courses available from this series:
Basic Geoscience
Introduction to Geophysics
Geological Application of Well Logs
Openhole Petrophysical Interpretation
Core Description
Production Geology
Applied Production Geology
Reservoir Model Design
Fractured Reservoir Characterisation
Geology for Drilling Engineers
Reservoir Engineering
Applied Reservoir Engineering
Well Test Design & Analysis
Logging While Drilling
Basin Analysis
Geomechanics

Course Tutors

Tim Wynn PhD
Main Series tutoring: Reservoir, Master Class (fractured reservoirs)
Industry experience: over 25 years, geoscience
Career background: British Gas, GeoScience, ICE, AGR and TRACS
Personal: SPE technical editor, technical paper author, geoscience publications

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