
ROBERTSON PETROLEUM TRAINING CENTRE

ADVANCED STRUCTURAL GEOLOGY: 5 DAYS

Who should attend:

Geologists and structural geologists with a good basic understanding of structural geology who wish to further develop their skills in this area.

Overview:

The course involves an in-depth study of Structural Geology theories and applications. With a considerable practical element, this course enables the trainee to analyse and assess faults and fractures and their role in Petroleum Geology.

Outline:

Day 1

Lecture: Deformation dynamics, kinematics and structures: simple shear and pure shear

- Deformation modes and mechanisms: cataclasis, diffusive mass transfer, crystalline plasticity, brittle-ductile transition

Exercise: Assessing the likely deformation mode and mechanism from lithology and pressure data

Lecture: Rock mechanics: force, strain and stress (including Mohr diagram and strain analysis methods)

- Reservoir geomechanics: wellbore breakouts, hydraulic fracturing and reservoir depletion

Exercise: Analysis of lithostatic and hydrostatic pressure data

Day 2

Lecture: Experimental rock deformation tests and failure criteria: uniaxial, triaxial, hydrostatic and shear rock deformation, role of temperature, water, strain rate

Exercise: Analysis of experimental data to understand likely failure conditions for differing lithologies.

Lecture: Brittle rock deformation: faulting (including fault rock development, fault seal analysis and palaeostress analysis from fault slip data) and fracturing (including joint development) in the upper crust

Exercises:

- Analysis of fracture patterns to determine rock deformation history and palaeostress directions
- Prospect risk analysis to identify sealing potential of a fault-bound horst prospect using Allan diagrams and shale gouge ratio

Day 3

Lecture: Ductile rock deformation: folding and shear zone development

Exercise: Using oriented photographs and geological maps showing faults, folds and minor structures to determine the tectonic history of the area

Lecture: Role of fluids, fluid pressure and fluid flow in hydrocarbon exploration

Exercise: Effect of varying fluid pressures on reservoir performance

Day 4

Lecture: Geodynamics: lithospheric extension models, development of rift basins and passive margins and stretching factors,

Exercises: Combining topographic analysis, Bouguer gravity, geological map interpretation and Landsat data to analyse and interpret a rift basin setting

Lecture: Lithospheric compression models and development of foreland fold and thrust belts

Exercise: Interpretation of seismic lines in a foreland basin setting to show foreland basin geometries and effect on regional elevation. Cross section construction and section balancing and restoration to check the validity of the interpretation.

Day 5

Lecture: Geological analysis of field data: stereographic analysis, cross section construction, restoration and balancing, 4D cross section evolution

Exercise: Analysis of a folded and faulted sequence using traditional structural geology methods including; stereographic projection analysis, cross section construction and fault plane juxtaposition sections

Case studies will be used throughout to illustrate industry application