

Natural Fracture Analysis in Compressional and Extensional Basins Training Course

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Overview

Natural Fracture Analysis in Compressional and Extensional Basins Training Course is a one-week advanced course for structural and reservoir geoscientists, geomechanics specialists, interpreters, and modelers who leave with a Basin Fracture Interpretation and Reservoir Integration File. Participants connect compressional basin fracture analysis, extensional basin fracture analysis, borehole image fracture interpretation, fracture intensity and connectivity, and discrete fracture network inputs across scales, evidence types, uncertainty, and well decisions. Agile Leaders Training Center presents natural fracture analysis and reservoir integration.

Who Should Attend

- Structural interpretation functions responsible for folds, faults, stress history, and fracture chronology
- Exploration functions responsible for seismic evidence, basin architecture, and structural uncertainty
- Reservoir characterization functions responsible for core, image-log, and fracture property integration
- Geomechanics functions responsible for stress, strain, fracture reactivation, and well implications
- Subsurface modeling and field-development functions responsible for static models, connectivity, and well decisions

The course assumes participants can interpret structural geology, well, core, and seismic data, and it leaves out fault-seal prediction, hydraulic-fracture design, generic geology instruction, and dynamic reservoir simulation.

Departments and Industries

The course supports departments and industries that characterize natural fractures and use them in subsurface decisions.

- Oil and gas exploration, appraisal, and field development
- Geothermal reservoir characterization and well planning
- Carbon storage site characterization and containment studies
- Mining and engineering-geology structural assessment
- Geoscience consulting, geomechanics, and subsurface modeling

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Learning Objectives

By the end of this course, participants will be able to:

- Analyze stress, strain, and tectonic controls on fracture systems
- Compare fracture patterns in compressional and extensional basins
- Use outcrop, core, image-log, and seismic evidence together
- Evaluate fracture sets, chronology, intensity, and connectivity
- Build uncertainty-aware inputs for static reservoir models
- Prioritize fracture evidence for well and development decisions

Course Agenda

Day 1: Establish Fracture Mechanics and Evidence

- Stress, Strain, and Failure Concept Map
- Natural Fracture Type and Origin Classification
- Joint, Vein, and Shear-Fracture Description Sheet
- Fracture Set and Relative Chronology Matrix
- Multi-Scale Fracture Evidence Register

Day 2: Interpret Compressional Basin Fractures

- Fold-Thrust Belt Structural Position Map
- Fold Curvature and Fracture Orientation Analysis
- Thrust Damage-Zone Fracture Concept Model
- Compression-Related Fracture Sequence Diagram
- Compressional Basin Fracture Prediction Matrix

Day 3: Interpret Extensional Basin Fractures

- Rift Architecture and Normal-Fault System Map
- Fault-Block Rotation and Fracture Orientation Analysis
- Normal-Fault Damage-Zone Fracture Concept Model
- Extension-Related Fracture Sequence Diagram
- Extensional Basin Fracture Prediction Matrix

Day 4: Integrate Measurements and Models

- Outcrop Scanline and Sampling-Bias Worksheet
- Core Fracture Description and Scaling Table
- Borehole Image Dip-Azimuth and Stereonet Plot
- Seismic Attribute and Fracture Proxy Evidence Map
- Fracture Intensity, Connectivity, and DFN Input Register

Day 5: Practice Reservoir Integration

- Suggested Exercise: Correlate Fracture Sets and Chronology
- Suggested Exercise: Compare Compressional and Extensional Predictions
- Suggested Exercise: Reconcile Core, Image-Log, and Seismic Evidence
- Suggested Exercise: Rank Scale, Connectivity, and Uncertainty Effects
- Capstone Exercise: Complete the Basin Fracture Interpretation and Reservoir Integration File

Practical Exercises

The course uses suggested activities to connect tectonic setting, measured evidence, scale, uncertainty, and reservoir use.

- Suggested activity: classify joints, veins, and shear fractures and establish relative chronology from field and core records.
- Suggested activity: predict fracture orientations and structural positions in fold-thrust and rift examples.
- Suggested activity: compare scanline, core, image-log, stereonet, and seismic evidence while recording sampling limits.
- Suggested activity: define fracture properties, uncertainty ranges, model inputs, and well implications in one file.

FAQs

Who suits natural fracture analysis in basins training, and what does it assume?

Natural fracture analysis training suits structural, exploration, reservoir, geomechanics, seismic, modeling, and field-development functions. It assumes participants can interpret structural geology, well, core, and seismic data.

How does natural fracture analysis differ from fault seal and trap integrity assessment?

Natural fracture analysis evaluates fracture origin, sets, chronology, orientation, intensity, connectivity, scale, and reservoir integration. Fault seal and trap integrity assessment concentrates on juxtaposition, fault-rock properties, column containment, leakage risk, and trap preservation.

How do compressional and extensional basins produce different fracture patterns?

Compressional settings link fractures with shortening, folds, thrusts, curvature, and damage zones. Extensional settings link fractures with rifting, normal faults, fault-block rotation, relay structures, and evolving stress orientation.

How are borehole images used in natural fracture analysis?

Borehole images support fracture identification, dip and azimuth measurement, set grouping, open-versus-healed interpretation, structural-dip analysis, and comparison with core, seismic, and well evidence.

How are natural fracture uncertainties carried into reservoir models?

Natural fracture uncertainties are carried through data-quality records, sampling-bias checks, scale ranges, alternative set interpretations, intensity and connectivity ranges, calibration evidence, and explicit static-model scenarios.

Conclusion

Participants take back a Basin Fracture Interpretation and Reservoir Integration File linking tectonic setting, fracture mechanics, sets, chronology, measurements, connectivity, scale, uncertainty, and model inputs. The file changes separate observations into one traceable interpretation. It supports static-model reviews, well placement, data acquisition, geomechanics, and field-development decisions.

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