## Training Course:

# Hydraulic Fracturing - Theory, Practice, Field Experience and Future Technologies

**Class Size:** Limited to 10 participants
**Duration:** 5 days (40 academic hours)

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## Course Overview:

This comprehensive training program provides participants with an in-depth understanding of hydraulic fracturing (HF) technology - from the fundamental principles of fracture initiation and propagation to treatment design, field execution, quality control, and post-job evaluation.
The course integrates geomechanics, fracture modeling, reservoir engineering, fluid chemistry, surface equipment, operational supervision, and production analysis to provide a complete view of modern hydraulic fracturing operations. Participants will learn how geological, mechanical, and operational parameters influence fracture geometry, treatment effectiveness, and long-term well productivity.
Special attention is given to fracture design optimization, pressure analysis, diagnostic injection testing, quality assurance, and best practices for supervising hydraulic fracturing operations.

## Course Agenda:

**Day 1 – Hydraulic Fracturing Fundamentals**
– Objectives of hydraulic fracturing
– Fracturing materials: fluids, additives and proppants
– Reservoir geomechanical properties
– Minimum horizontal stress estimation
– Well logging for geomechanical and lithological model development
– Evolution of hydraulic fracturing technology
– Factors controlling fracture geometry
– Fundamental hydraulic fracturing parameters
– Fracture modeling concepts
– Fracture treatment design optimization
– Estimating post-fracture well productivity
– Skin factor and its impact on production performance
– Quality control of fracturing fluids and chemical additives

**Day 2 - Field Operations and Hydraulic Fracturing Materials**
**Hydraulic Fracturing Operations**
– Hydraulic fracturing workflow
– Fracturing fleet equipment and surface systems
– Chemical inventory and treatment volume calculations
– Hydraulic fracturing operation supervision
**Pressure Analysis and Diagnostics**
– Fracture pressure analysis
– Diagnostic Injection Tests (DFIT/Test Injections)
– Treatment efficiency evaluation
– Fracture and reservoir parameter interpretation
– Screenouts, treatment failures and operational challenges
– Hydraulic fracturing in horizontal wells
– Emerging hydraulic fracturing technologies
**Fracturing Materials**
**Fracturing Fluids**
– Fluid rheology
– Fluid systems and compositions
– Fluid performance mechanisms
– Types of fracturing fluids
**Proppants**
– Proppant properties
– Particle size distribution
– Density
– Roundness and sphericity
– Proppant selection
– Fracture conductivity

**Day 3 - Reservoir Geomechanics**
**Rock Mechanics Fundamentals**
– Mechanical properties of reservoir rocks
– Rock mechanics principles
– Young's Modulus
– Poisson's Ratio
– In-situ stress regime
– Reservoir stress calculations
– Fracture orientation prediction
– Log-based stress estimation
**Factors Affecting Fracture Geometry**
– Controllable Factors
– Well design
– Treatment design selection
– Uncontrollable Factors
– Reservoir properties
– Petrophysical characteristics
– Geomechanical conditions

**Day 4 – Fracture Modeling and Design Optimization**
– Fundamental hydraulic fracturing parameters
– Net pressure
– Fluid efficiency
– Hydraulic fracture simulation fundamentals
– Fracture modeling methodologies
**Hydraulic Fracture Models**
– **2D Models**: PKN, KGD
– **3D Models**: Pseudo-3D, Planar 3D, Full 3D
**Treatment Design Optimization**
– Constant fracture volume concept
– Dimensionless proppant number
– Unified Fracture Design (UFD)
– JD type curves
– Practical fracture design optimization

**Day 5 – Surface Equipment and Operational Supervision**
**Hydraulic Fracturing Equipment**
– Fluid storage systems
– Hydration units
– Blenders
– High-pressure pumps
– Manifolds
– Wellhead treating iron
**Hydraulic Fracturing Workflow**
– Well preparation
– Treatment design development
– Diagnostic injection testing
– DFIT analysis
– Step-Down Test (SDT)
– Step-Rate Test (SRT)
– Nolte pressure analysis
– Geomechanical model calibration
– Main fracturing treatment
– Post-job evaluation and troubleshooting
**Hydraulic Fracturing Supervision**
– Operational supervision best practices
– Industry standards and regulatory requirements
– HSE management
– Operational quality assurance

## Target Audience:

– Hydraulic Fracturing Engineers
– Completion Engineers
– Reservoir Engineers
– Petroleum Engineers
– Production Engineers
– Geomechanics Engineers
– Field Supervisors
– Operations Engineers
– Technical Specialists responsible for candidate well selection, fracture treatment design, diagnostic injection testing, and post-job performance evaluation.