ADVANCE DYNAMIC SIMULATION & HISTORY MATCHING RSE023

COURSE OVERVIEW

This course is designed to cover state-of-the-art techniques/workflows for history matching geologic and reservoir models for both conventional and unconventional reservoirs. The course will discuss manual and assisted history matching methods and, inverse modeling techniques and the pros and cons of the methods.

The production/history data can be in the form of pressure or rate transient tests, tracer tests, multiphase production history, or interpreted 4D seismic information. Field examples will be presented to illustrate the current state of the art and limitations. The use of history matched models for optimizing reservoir development and management strategies will be discussed. These include optimal infill well-placement, rate optimization/well allocation for maximizing sweep efficiency, and optimizing well completions in unconventional reservoirs.

The course will involve a combination of theoretical discussion, practical applications, and computer exercises using public domain software to provide the participants with hands-on training on the workflows that can be applied using available commercial software.

COURSE OBJECTIVES

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

- Understand challenges, limitations, and state-of-the-art techniques in history matching for conventional and unconventional reservoirs.
- Apply streamline and assisted/automatic history matching methods.
- Optimize well placement, rates, and completions using history matching.
- Use static modeling for permeability predictions, facies identification, and upscaling in history matching.
- Utilize commercial software and stay updated on new developments in history matching.
- Gain practical experience with history matching tools and workflows.
- Perform uncertainty analysis and explore experimental design and surrogate models.
- Apply multiscale history matching with grid coarsening.
- Analyze case studies to understand the impact of history matching on rate optimization and well placement.

WHO SHOULD ATTEND

Practicing geoscientists and engineers performing geologic modeling, reservoir simulation, and optimization studies. Participants are expected to have basic knowledge and/or experience related to geologic modeling and reservoir simulation.

COURSE DURATION

5 Working Days

COURSE OUTLINES

Day 1

- Pre course evaluation.
- Recognize the difficulties and sources of error in history matching
- Define the current state of the art in history matching and the limitations of various techniques for both conventional and unconventional reservoirs
- Apply theory of streamlines and streamline-assisted history matching for waterflooding
- Understand the background and theory of commercially available assisted/automatic history matching tools and algorithms

Day 2

- Apply concepts of experimental design/response surface/surrogate models for history matching
- Use learnings from case studies for a systematic procedure for history matching and well placement optimization in a mature field
- Well rate optimization/allocation in a mature field
- Well completion optimization for an unconventional reservoir
- Use static modeling for history matching:
  - Permeability predictions
  - Facies identification
  - Upscaling

Day 3

- Recognize new and ongoing developments in history matching
- Use commercial tools for history matching
- History Matching:
  - Fundamentals
  - Workflow
- History matching - overview and state of the art
- Review of reservoir simulation equations
- Reservoir Simulation: background
- History Matching: mathematical background
- History Matching: unconventional reservoirs

Day 4

- Unconventional Reservoirs:
  - Background
  - Performance analysis
- Drainage volume calculations
- Completion optimization
- History matching of unconventional reservoirs
- History Matching: practical considerations
- Streamline-based history matching
- Streamline Simulation: overview
- Streamlines: mathematical background
- Streamlines: applications
- Streamline-based history matching

Day 5

- History matching and uncertainty analysis
- Experimental design and surrogate models
- Multiscale history matching with grid coarsening
- Case Study: history matching and rate optimization
- Case Study: history matching and well placement optimization
- History Matching: new developments
- Post course evaluation.