

# RESERVOIR SIMULATION & FORECASTING

## RSE019

### COURSE OVERVIEW

The course provides an in-depth understanding of the role that reservoir simulation plays in exploration and production companies. The course is hands on, looking at real case studies and focuses on practical problems and how to solve them. Simulation for pre-development and mature fields is discussed, providing an integrated view of modelling sub-surface, facilities and commercial operations. A refresher session on multi-phase flow in the reservoir and production facilities is followed by the numerical treatment of the equations of flow, and how these equations are solved using modern computer hardware.

### COURSE OBJECTIVES

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

- Understand reservoir simulation principles and practical application.
- Work with real case studies to develop hands-on skills.
- Integrate static and dynamic reservoir models for a comprehensive understanding.
- Use Petrel software for dynamic model construction and history matching.
- Apply numerical techniques and modern hardware for accurate simulation.
- Upscale models, optimize grid and well spacing for realistic representation.
- Validate and calibrate models through history matching and analysis.
- Interpret results, identify errors, and validate output accuracy.
- Predict reservoir performance and optimize considering economic constraints.
- Implement quality control measures for accurate static models.

### WHO SHOULD ATTEND

Engineers with a good understanding of reservoir engineering principles and a basic knowledge of reservoir simulation. Also, for practicing geoscientists who need to work with and supply data to reservoir simulation engineers.

### COURSE DURATION

5 Working Days

## COURSE OUTLINES

1. **Pre course evaluation**
2. **Introduction & Transition from Static to Dynamic Model**
  - Integrated Reservoir Study Overview
  - Summary of Static Model Development
  - Linking Static to Dynamic Model
  - Model Upscaling
  - Competency Matrix
  - Review of Simulation Basics
  - Model Construction Workflow
  - Static Model Development
  - Linking Static to Dynamic Model
  - New Topics in Reservoir Simulation
3. **Building Dynamic Model Using Petrel Software**
  - Model Construction Steps
  - Factors Affecting Model Design
  - Data Categories
  - Fluid Models / Strata Properties / Wells Data / Facilities Data
  - Grid and LGR
  - Grid Size and Type
  - Well Spacing in Grid
4. **Building Dynamic Model (Cont'd) & History Match Using Petrel Software**
  - Rate and Pressure Constraints
  - Timestep Schedule
  - Simulation Control
  - Model Initialization
  - Model Validation
  - Numerical Performance Statistics
  - Calibrating the Dynamic Model
  - History Matching and its Challenges
  - Example
  - Structured Grid vs. Unstructured Grid
  - Monte Carlo Simulation

## 5. Interpretation of Dynamic Model Run Using Petrel Software

- Sources of Run Errors
- Types of Errors
- Simulator Outputs
- Post Processing
- Result Validation
- Example

## 6. Prediction and Reservoir Optimization Using Petrel Software

- Limitation of Performance Prediction
- Types of Predictions
- Data required for prediction
- Economic Limits
- Transition from HM to Prediction
- Example
- Reservoir Optimization
- Basic Elements in QC'ing Static Model

## 7. Post course evaluation

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