Course Title: Integrated 3D Reservoir Modeling Workshop

Discipline
- Geology
- Field Development Planning

Level
- Skill

Duration
- 5 Days

Delivery Mechanism
- Practical Training with Software

Prerequisites:
- Basic training in the use of Petrel (Petrel fundamentals)

The need for robust reservoir models as part of field management has shown significant increases in many oil companies worldwide. This requires all team members to understand the workflow in developing integrated reservoir models by integrating geological, geophysical, petrophysical, and engineering information in a consistent manner. A proper development of reservoir models is not only helpful in managing day to day operations, but it is also important in long-term planning. This process is inherently interdisciplinary and requires understanding and importance of all the disciplines.

The objective of this 5-day course is to provide the participants, who is either the beginner or intermediate reservoir modeler, with the solid knowledge needed to develop robust reservoir models.

The course consists of both the necessary background theory and practical session. Combination of research material and field experience are presented to support the building of the modeling workflow. It covers the topics from structural modeling, followed by facies, rock type and property (porosity, permeability, and saturation) modeling, volumetric with uncertainty analysis with static and dynamic ranking criteria, and upscaling. All practical exercises are done using PETREL. The process starts with importing well and other related field data all the way to upscaling, ready for dynamic modeling purposes.

This course is important for reservoir modelers or for any geoscientist/engineers involved in an integrated reservoir study. It is not intended to make anyone an expert geologist, geophysicist, petro physicist, or engineer. Instead, it is intended to expose various geoscientists and engineers to the entire process of integrated reservoir model. The course will develop improved appreciation of the other disciplines’ needs as well as the necessity of the feedback during the integration process.
Day 1
- Introduction and Workflow
- Structure Framework Modeling using Corner Point Gridding Technique
  - Areal Design: Fault Modeling, Pillar Gridding, Grid Size
  - Vertical Design: Horizon, Zonation, Layering and Scale-Up Well Log
- Practical Session 1
  - Data Import
  - Grid Modeling

Day 2
- Facies Modeling
  - Linking Geological Facies with Petrophysical Properties (Porosity, Permeability and Saturation) through Rock Type
  - Integration of Geological Concept and/or Seismic Data for Facies Modeling
  - 3D Facies Modeling: Trend Modeling, SIS, TGS
- Practical Session 2:
  - Facies Trend Modeling
  - 3D Facies Distribution Using SIS / TGS
  - Rock Type Trend Modeling
  - 3D Facies Distribution Using SIS / TGS

Day 3
- Porosity Modeling
  - Gaussian Simulation Process with Geological Constraint
  - Co-Simulation of Porosity with Seismic Data
- Practical Session 3:
  - Data Analysis for Porosity Simulation
  - 3D Porosity Simulation Using Gaussian Simulation
- Permeability Modeling
  - Methodology for Permeability Modeling: Linear Regression, Co-Simulation
  - Predicting Permeability at Uncored Well Location
  - Improving Permeability Model by Integration of Well Test Data
- Practical Session 4:
  - Permeability Modeling using both Linear Regression and Co-Simulation
Day 4
- Volume Calculation
- Uncertainty Analysis: Background, Uncertain Variables, Sampling Technique, Workflow Editor
- Practical Session 5: 3D Saturation Distribution
- Practical Session 6: Volume Calculation and Uncertainty Analysis

Day 5
- Dynamic Ranking using Streamline and Fast Marching Method (FMM)
- Practical Session 8: Dynamic Connectivity using FMM with PETREL Plug-ins
- Upscaling:
  - Vertical Layering Design
  - Scale-Up Structure
  - Scale-Up Properties: Facies, Porosity and Permeability
  - Transmissibility Adjustment
- Practical Session 8: Upscaling with PETREL Plug-ins