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## N961: Strategic Reservoir Simulation

Instructor(s): Karl Stephen

Format and Duration

Classroom - 5 Days

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### Summary

This course provides an overview of the role of reservoir simulation, giving guidance on the construction, validation and use of simulation models. Rather than focussing on keywords and data structures specific to a single simulator, the course emphasises the modelling workflow with tips and techniques to ensure that models are fit-for-purpose, and that modelling limitations are understood. Additionally, the course introduces the rapidly evolving technology of experimental design, automatic history matching, proxy modelling and handling uncertainty in reservoir simulations.

### Learning Outcomes

Participants will learn to:

1. Evaluate the role of numerical reservoir simulation in the context of reservoir economical development.
2. Predict the physical processes modelled in a reservoir simulation, and the flow equations solved by the software.
3. Assess the strengths and limitations of simulation models.
4. Develop an effective modelling workflow, driven by the objectives of the simulation study.
5. Plan a history matching strategy.
6. Predict how simulation results are affected by data and modelling uncertainties.

### Training Method

This is a five-day classroom course consisting of worked examples, exercises and discussion.

### Who Should Attend

This course is designed for mid to senior level engineers, in addition to production geologists or asset managers involved in integrated modeling projects.

### Course Content

The course aims to address a number of key topics in this area, but there is some flexibility in the formal itinerary depending on the groups preferences. The key topics that are covered include:

- Introduction. Overview of reservoir analysis tools and techniques and their roles
- Simulation model types (full-field models, sector models, cross-section models, single-well models, black oil and compositional simulation models, dual-porosity/dual-permeability models and a range of more specialized simulation alternatives)
- Theory of simulation (fundamental flow equations and their solution)
- Key processes: (Primary depletion, waterflood, immiscible gas injection etc)
- Strengths and weaknesses of reservoir simulation

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- Simulation model objectives and the simulation model workflow
- Simulation model choices (including: model scale, physical processes to include, grid selection and upgridding/upscaling, initialization)
- Error checking / debugging
- Post-processing
- Numerical Issues (convergence problems, and improvements to run speed)
- History matching
- Tips for reviewing a simulation model
- Well test prediction and analysis
- Uncertainty modeling