



RESERVOIR SIMULATION - FUNDAMENTAL TO ADVANCED APPLICATIONS

Course Brochure

OPC - Upstream Energy Consultants

Oil & Gas | CO₂ & Gas Storage

Course Title:	Reservoir Simulation – Fundamentals to Advanced Applications
Company/Traner Provider Name:	Oilfield Production Consultants (OPC) Limited
Location:	West Bay, Doha, Qatar
Duration	5 days
Price:	USD \$3,950 per person for five day course

1. Course Overview

Level: Intermediate to Advanced

Target Audience: Reservoir Engineers, Simulation Specialists, Petroleum Professionals

This five-day course offers a comprehensive introduction to reservoir simulation and modelling, guiding participants from fundamental concepts through to advanced applications. Beginning with the principles of reservoir behaviour, data characterisation, and model foundations, the course progresses through numerical model construction, gridding, and upscaling, before advancing to multiphase flow, compositional modelling, and dynamic simulation techniques.

Delegates will gain hands-on experience in model setup, initialisation, and history matching, and will explore enhanced oil recovery (EOR) processes, aquifer modelling, and uncertainty analysis. The programme concludes with field-scale case studies focused on production optimisation, forecasting, and integrated simulation workflows, equipping participants with the skills to design, run, and interpret reservoir simulation projects in practical, real-world contexts.

2. Learning Objective and Method Used

Standard Format for Delivery Plan & Content

S. No.	Learning objective	Methods and Materials used to deliver the course
1	Build and validate reservoir simulation models from geological and PVT data	- Classroom lectures (PowerPoint presentation) - PETREL/ECLIPSE demonstrations
2	Perform two-phase, three-phase, and compositional simulations	
3	Integrate aquifer and EOR processes into models	
4	Conduct uncertainty analysis and production forecasting	
5	Apply simulation insights to optimise field development strategies	

3. Agenda and Delivery Plan

Agenda & Delivery Plan		
Day	Topics to be covered	Learning Objective
1	<u>Fundamentals and Reservoir Modeling Foundations</u> 1. Introduction to reservoir simulation a. Purpose, scope, and applications b. Drive mechanisms and material balance c. Simulation workflow overview 2. Reservoir Characterisation & Modelling a. Geological and petrophysical inputs b. Static vs. dynamic models c. Geochemistry and fluid characterisation 3. Challenges and best practices in simulation projects Practical Exercise: • Basic model setup and input data organisation	• Understand the role and purpose of reservoir simulation. • Learn the building blocks of reservoir modeling (static & dynamic). • Review data inputs and characterisation methods.
2	<u>Numerical Model Construction and Upscaling</u> 1. Grid Design and Property Upscaling a. Grid geometry, cell size, and property distribution b. Scale transition and heterogeneity handling 2. Mathematical and Numerical Formulation a. Finite-difference methods, flow equations, and boundary conditions b. Time stepping and convergence 3. Solution Methods and Model Stability a. Direct and iterative solvers b. Stability and performance optimisation Practical Exercise: • Construct and initialize a small-scale reservoir model	• Understand model gridding, discretization, and upscaling. • Apply mathematical and numerical principles in simulation • Learn solver techniques and model initialisation
3	<u>Multi-Phase Flow and Dynamic Simulation</u> 1. Two-Phase and Three-Phase Flow Fundamentals a. Saturation, relative permeability, capillary pressure b. Buckley-Leverett and black oil models 2. Multi-Component and Compositional Simulation a. EOS-based models, initialisation, and validation 3. Dynamic Simulation and History Matching a. Model construction and calibration	• Understand two-phase, three-phase, and compositional flow principles • Build and run dynamic reservoir simulations • Interpret production and pressure behaviour

	b. Forecasting and sensitivity analysis Practical Exercise: • Run dynamic simulation and perform basic history matching.	
4	Advanced Simulation Topics and EOR 1. Aquifer Modelling and Water Drive Simulation a. Analytical and numerical water influx b. Aquifer connectivity and boundary conditions 2. Enhanced Oil Recovery Simulation a. Waterflooding, gas injection, WAG, and thermal models 3. Uncertainty and Risk Assessment a. Handling heterogeneity and multiple scenarios 4. Complex Well Simulations a. Multilateral, fractured, and horizontal wells Practical Exercise: Aquifer and EOR case simulation (ECLIPSE)	• Model aquifers and water influx mechanisms. • Simulate EOR processes (water, gas, WAG, thermal) • Handle uncertainty and complex well configurations
5	Field Applications, Optimisation, and Case Studies 1. Reservoir Model Design and Simulation Strategy a. Property selection, grid/time step choice, solver selection b. Model validation and performance metrics 2. Production Forecasting and Field Optimisation a. History matching outcomes b. Greenfield development planning 3. Case Studies and Integration a. Fault transmissibility and aquifer effects b. Full-field simulation examples Practical Exercise: • Full-field case simulation and production optimisation workflow.	• Integrate all elements of reservoir simulation • Optimise production strategies based on simulation results • Perform risk-based decision-making and forecasting

4. Trainers Profile

With over three decades of international experience in reservoir engineering, petroleum operations and training leadership, our trainer brings a strong mix of technical expertise and instructional excellence. Having worked with global energy leaders such as Saudi Aramco, Shell and Elf Exploration, he specialises in reservoir characterization, production optimisation and enhanced recovery methods. His career reflects the ability to combine analytical skills, strategic development and hands-on operations to maximise recovery while meeting long-term business objectives.

Much of his career has focused on training and developing engineers and technical professionals while serving as a Subject Matter Expert (SME). At Saudi Aramco's Upstream Development Centre, he designed and delivered programs on the oil and gas lifecycle, reservoir management and simulation workshops, training thousands of engineers. His approach blends technical depth with interactive teaching using case studies, real projects and competency based frameworks.

He is passionate about mentoring the next generation of engineers, fostering collaboration across disciplines and improving both individual capabilities and organisational performance. Through classroom instruction, workshops and tailored programs, he builds strong technical foundations while inspiring professionals to achieve excellence in the energy industry.