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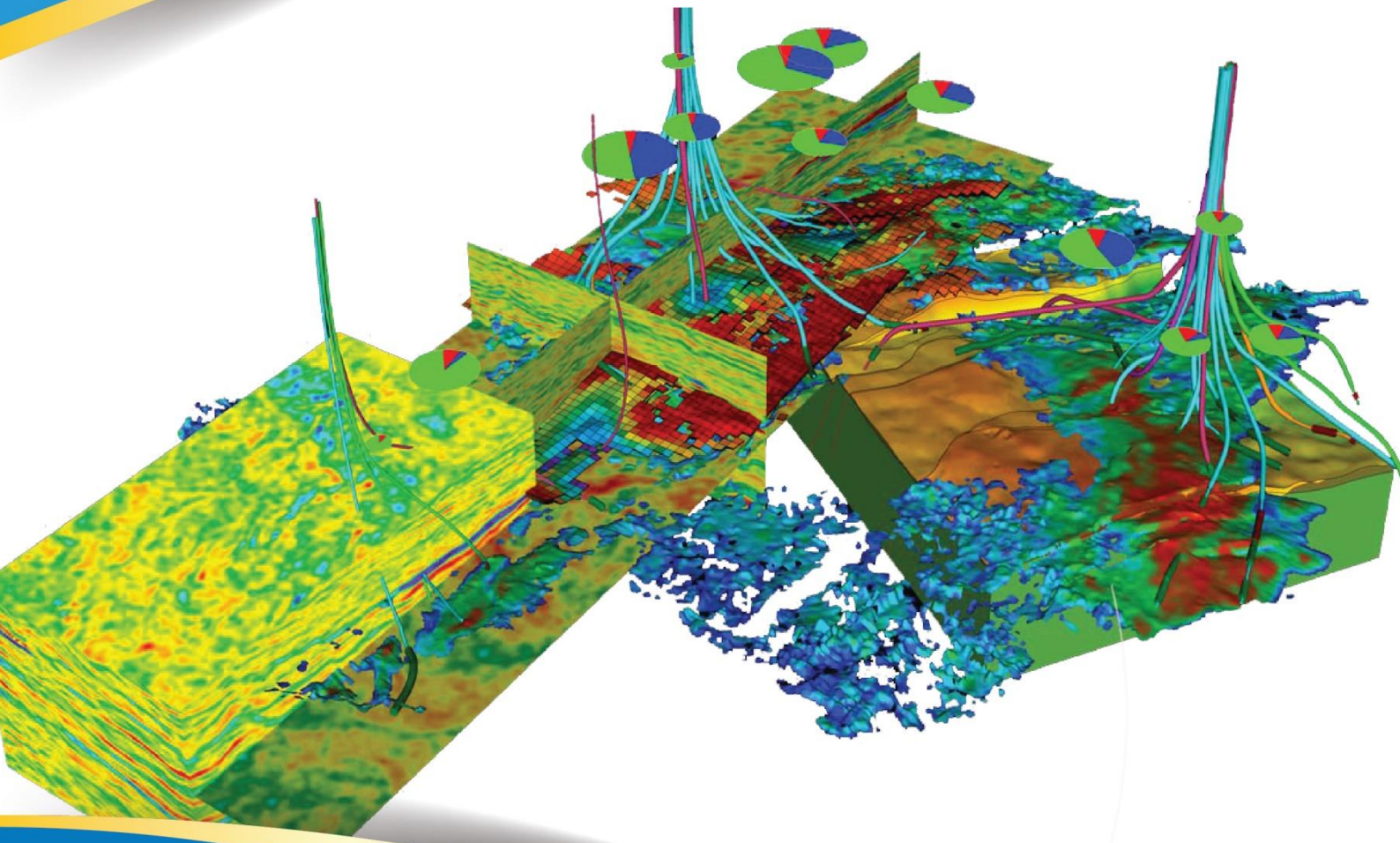

RESERVOIR MANAGEMENT

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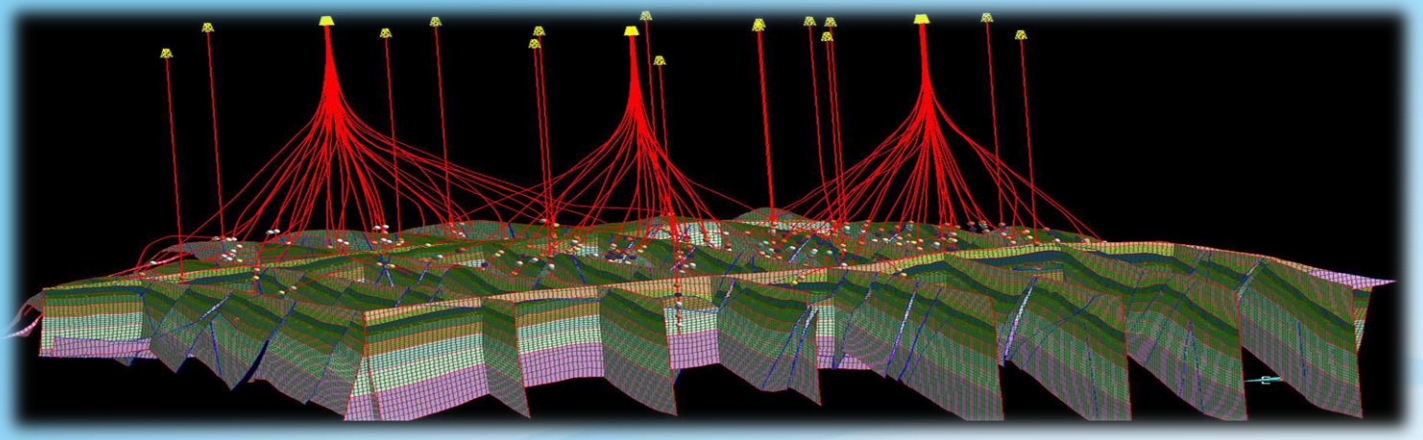
RESERVOIR MANAGEMENT

COURSE CODE/NO	COURSE TITLE	COURSE DURATION
UETMT- RES- 101	Fundamentals of Reservoir Engineering	5 days
UETMT- RES- 102	Applied Reservoir Engineering	5 days
UETMT- RES- 103	Fundamentals of Reservoir Modelling	10 days
UETMT- RES- 104	Integrated Reservoir Modeling	10 days
UETMT- RES- 105	Reservoir Characterization: A Multi Disciplinary Team Approach	10 days
UETMT- RES- 106	Applied Reservoir Characterization of Heterogeneous Reservoirs	10 days
UETMT- RES- 107	Basic Reservoir Simulation	5 days
UETMT- RES- 108	Advanced Reservoir Simulation	5 days
UETMT- RES- 109	Reservoir Simulation- Practical	5 days
UETMT- RES- 110	Applied Reservoir Simulation of Complex Fields using Eclipse (100) Software	10 days
UETMT- RES- 111	Reservoir Management	5 days
UETMT- RES- 112	Advanced Gas Reservoir Management	5 days
UETMT- RES- 113	Fractures and Fractured Reservoirs	5 days
UETMT- RES- 114	Fundamentals of Reservoir Drive Mechanism	5 days
UETMT- RES- 115	Naturally Fractured Reservoirs: Geologic and Engineering Analysis- Advanced	5 days
UETMT- RES- 116	Gas Reservoir Engineering	5 days



FUNDAMENTALS OF RESERVOIR ENGINEERING

UETMT- RES- 101

Program Duration: 5 days

PROGRAM OVERVIEW

Reservoir characterization integrates the technical disciplines associated with exploration and production. Participants will, therefore, be given an interdisciplinary synergistic approach to efficient reservoir engineering with emphasis on reservoir modeling, predicting well behavior and reviewing past reservoir performance.

TARGET AUDIENCE

- Geologists
- Geophysicists
- Productions Engineers
- Newly- appointed Reservoir Engineers

TARGETED COMPETENCIES

- Reservoir Modeling
- Reservoir Simulation
- Fluid Flow
- Hydrocarbon Recovery
- Dipmeter and Borehole Well Imaging Tools

PROGRAM OBJECTIVES

- Clear understanding of reservoir engineering vs. reservoir management concepts.
- Exposure to newest technologies and techniques in reservoir characterization.
- In-depth familiarity with the dynamic models for prediction of performance.

PROGRAM CONTENT

- Introduction to reservoir modeling for field development and reservoir simulation.
- Farm-in Exercise – intended to bring home the control that geological features can have on hydrocarbon recovery and economics.
- Impact of geological features on fluid flow and hydrocarbon recovery.
- Reservoir architecture and the problem of correlation.
- Correlation of distributary channel –fill reservoir.
- Application of 3-D seismic to reservoir characterization.
- Analysis of structural configuration and hydrocarbon distribution in an early appraisal stage reservoir (exercise).
- Influence of faults on reservoir continuity.
- Estimating sealing capacity of normal faults in a sandstone/shale formation.
- Coring policy and core analysis.
- Core description (exercise).
- Principles of determining lithofacies and permeability distribution in non- cored wells.
- Application of dipmeter and borehole well imaging tools.
- Estimating permeability distribution (exercise)
- Non-geological methods to calibrate permeability estimates.
- Geostatistics and probabilistic modeling of reservoir architecture and permeability distribution.
- Converting geological models into engineering models.
- Preparation of reservoir simulation input data (exercise).
- Estimating vertical permeability in a reservoir.
- Computing vertical permeability in a fluviatile reservoir containing discontinuous shale streaks.
- Analysis of fractured reservoirs.
- Reservoir geological aspects of field development with horizontal wells.
- Comparing the relative merits for use of horizontal wells three different reservoir configurations (exercise) .
- Case histories of successful integrated reservoir studies for field development planning.
- Research subjects and future developments in reservoir geology.

APPLIED RESERVOIR ENGINEERING

UETMT- RES- 102

Program Duration: 5 days

TARGET AUDIENCE

- Reservoir engineers management and simulation, petroleum engineers, geoscientists, geomodelers, reservoir geologists, petrophysicists, reservoir managers.

TARGETED COMPETENCIES

- Reservoir Fluid
- Pressure-Temperature Diagram
- Gas Reservoirs
- Fluid Flow Equations

PROGRAM CONTENT

Fundamentals of Reservoir Fluid Behavior

- Classification of Reservoirs and Reservoir Fluids
- Pressure-Temperature Diagram,
- Oil Reservoirs,
- Gas Reservoirs,
- Undefined Petroleum Fractions,

Fundamentals of Reservoir Fluid Flow

- Types of Fluids
- Flow Regimes,
- Reservoir Geometry,
- Number of Flowing Fluids in the Reservoir,
- Fluid Flow Equations,
- Darcy's Law,
- Steady-State Flow,
- Linear Flow of Incompressible Fluids,
- Linear Flow of Slightly
- Compressible Fluids,
- Linear Flow of Compressible Fluids (Gases),
- Radial Flow of Incompressible Fluids,
- Radial Flow of Slightly Compressible Fluids
- Radial Flow of Compressible Gases,
- Horizontal Multiple-Phase Flow,
- Unsteady-State Flow,
- Radial Flow of Slightly Compressible Fluids,
- Constant-Terminal-Pressure Solution,
- Constant-Terminal-Rate Solution,
- Radial Flow of Compressible Fluids,
- Pseudosteady-State Flow,
- Radial Flow of Slightly Compressible Fluids,
- Radial Flow of Compressible Fluids (Gases),
- Skin Factor,
- Turbulent Flow Factors
- Principle of Superposition,
- Effects of Multiple Wells,
- Effects of Variable Flow Rates,
- Effects of the Reservoir Boundary,
- Transient Well Testing,
- Drawdown Test,
- Pressure Buildup Test,

The Material Balance Equation

- Basic Assumptions in the MBE,
- The MBE as an Equation of a Straight Line,
- The Straight Line Solution Method to the MBE,
- Case 1. Volumetric-Under-saturated Oil Reservoirs,
- Case 2. Volumetric-Saturated Oil Reservoirs,
- Case 3. Gas-Cap Drive Reservoirs,
- Case 4. Water Drive Reservoirs,
- The Pot-Aquifer Model in the MBE,
- The Steady-State Model in the MBE,
- The Unsteady-State Model in the MBE,
- Tracy's Form of the Material Balance Equation,
-

Predicting Oil Reservoir Performance

- Phase 1: Reservoir Performance Prediction Methods,
- Instantaneous Gas-Oil Ratio,
- The Reservoir Saturation Equations,
- Under-saturated Oil Reservoirs,
- Saturated Oil Reservoirs,
- Tracy's Method,
- Muskat's Method,
- Tarner's Method,
- Phase 2: Relating Reservoir Performance to Time,

Water Influx

- Classification of Aquifers,
- Recognition of Natural Water Influx,
- Water Influx Models,
- Pot Aquifer Model,
- Schilthuis' Steady-State Model,
- Hurst's Modified Steady-State Model,
- The Van Everdingen-Hurst Unsteady-State Model,
- Edge-Water Drive,
- Bottom-Water Drive,
- The Carter-Tracy Water Influx Model,
- Fetkovich's Method,

FUNDAMENTALS OF RESERVOIR MODELLING

UETMT- RES- 103

Program Duration: 10 days

PROGRAM OVERVIEW

- To acquire a thorough understanding of Reservoir Simulation principles and of Data Formatting for Reservoir Simulation

PROGRAM OBJECTIVES

At the end of the course, participants will be able to:

- Prepare Data Sets for Reservoir Simulation
- Perform a Standard Reservoir Simulation Study
- Communicate easily with Production Engineers, Geoscientists and Asset Managers.

TARGET AUDIENCE

- Reservoir and petroleum engineers, geomodelers, petrophysicist, reservoir geologists who are involved in modeling.

TARGETED COMPETENCIES

- Reservoir Simulation
- Reservoir Simulation Study
- Black Oil Model
- Petrophysical Upscaling
- Capillary Pressure

PROGRAM CONTENT

Introduction To Simulation

- Physical and Numerical Aspects
- Flow Equations, Numerical Modeling
- Types of Reservoir Simulation Models:
- Black Oil Model
- Compositional Model
- Thermal Model
- Chemical Model
- Double Porosity Model

From Geology To Dynamic Reservoir Modeling

- Accurate Grid Selection (Cartesian Grid, Corner Point Grid, Hybrid Grids, etc.)
- Layering
- Upscaling Procedure:
- Petrophysical Upscaling
- Vertical Equilibrium Approach
- KYTE and Berry Approach

Petrophysics

- End points Definitions
- Use of Capillary Pressure in the Simulator
- Formalisms used by the Simulator
- Normalized Capillary Pressure and Relative Permeabilities
- Three Phase Relative Permeabilities

PVT Data

- Laboratory Data: Differential Depletion, Constant Volume Depletion
- Composite Data
- Water Properties
- Initial Distribution
- Black Oil PVT Data Set

Production and Well Data

- Historical Well Rates
- GOR and FW Measurements
- Static Pressure
- Bottom Hole Flowing Pressure (BHFP)
- Well Tests Data (PI, skin)
- Numerical PI
- Well Type and Well Constraints
- Production Intervals
- Management Routines
-

Reservoir Simulation Methodology

- History Match
- Goal of history Match
- Data to Match
- Limitations
- History matching Strategies
- Type of Aquifers
- Prediction Case

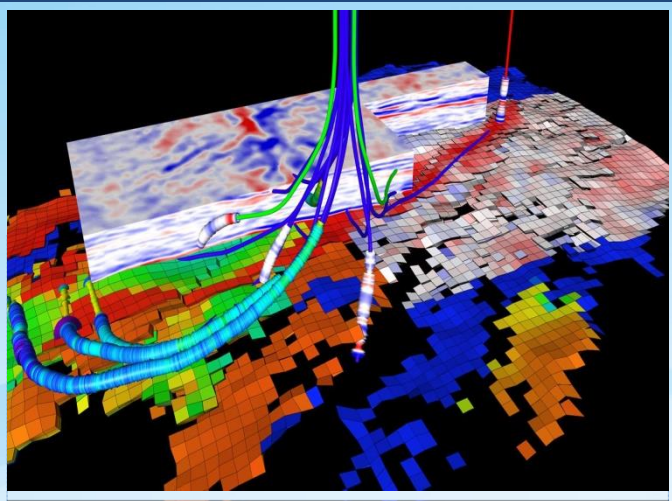
Practice on a Multipurpose Software Package (ECLIPSE)

- Practical Exercises
- Field Case Studies

INTEGRATED RESERVOIR MODELING

UETMT- RES- 104

Program Duration: 10 days



PROGRAM OVERVIEW

As the oil companies define business units and asset teams, it is becoming increasingly important that all the team members understand the workflow in developing integrated reservoir description for that asset. A proper development of reservoir description is not only helpful in managing day to day operations of the asset, but it is also important in long term planning. Integration involves using all the available information about the reservoir to develop better understanding of the reservoir. This process is inherently interdisciplinary and requires understanding and importance of all the disciplines. Although soft skills are important in working in an interdisciplinary team, this course concentrates on the hard skills required to develop a realistic reservoir description.

Starting with collecting information and assessing the need for additional data, the course will cover all the topics from structural and geological modeling, estimation of reservoir petrophysical properties using geostatistical tools, up-scaling to simulator model and finally, proper history matching and future predictions in the presence of uncertainties. This course is important to reservoir modelers involved in any phase of the description work. The course is not intended to make any one an expert geologist, geophysicist or engineer. Instead, it is intended to expose various geoscientists and engineers to the entire process of integrated reservoir description and the geostatistical tools that can be used to achieve the goals. The course will develop improved appreciation of the other disciplines' needs as well as the necessity of the feedback during the integration process.

One personal computer is provided, at additional cost, for each two participants.

TARGET AUDIENCE

- Geologists, Geophysicists, Engineers, Petrophysicists or others involved in Reservoir Modeling

TARGETED COMPETENCIES

- Structural Modeling
- Facies
- Rock Type Modeling
- Petrophysical Properties Simulation

PROGRAM OBJECTIVES

- Develop the work flow in the reservoir integration process
- Evaluate and quantify uncertainties in various sources of data
- Build a geo-cellular model using geostatistical tools and upscale it to capture essential heterogeneities
- Develop criterion for objective history matching
- Utilize seismic data in different phases of reservoir description and integrate them using geostatistics
- Use various description tools in a judicious manner
- Use public domain software to apply many of the techniques discussed in class

PROGRAM CONTENT

- Basic Statistical Principles
- Spatial Modeling
- Structural Modeling
- Estimation of Properties At Well Locations
- Conditional Simulation
- Facies/Rock Type Modeling
- Petrophysical Properties Simulation
- Ranking of Realizations
- Construction of Simulator Input Model
- History Matching
- Future Predictions and Quantification of Uncertainty

RESERVOIR CHARACTERIZATION: A MULTI DISCIPLINARY TEAM APPROACH

UETMT- RES- 105

Program Duration: 10 days

PROGRAM OVERVIEW

The modern team approach to reservoir characterization describes productive zones more reliably through the integration of disciplines, technology and data. Increase your proven reserves, discover by-passed pay, reduce development time and costs, improve production rates, and rejuvenate old fields through the skills learned in this program. The models developed during the program are based on the application of state-of-the-art technical applications within the framework of a multi-disciplinary team approach.

Reservoir Characterization is the process between the discovery phase of a property and the reservoir management phase. The process integrates the technical disciplines of geology, geophysics, reservoir engineering, production engineering, petrophysics, economics, and data management. Key objectives of reservoir characterization focus on modeling each reservoir unit, predicting well behavior, understanding past reservoir performance, and forecasting future reservoir performance. Such factors, in addition to staffing needs and expenditures, assert a strong impact on plans for the development and performance of a field. This program illustrates the reservoir characterization process so that each member of the RC team and each of its customers (other departments and management) can appreciate the resulting interpretations and may even contribute to building the RC model.

The value of modern team practices related to corporate efficiency is demonstrated. Case studies of multi-disciplinary reservoir characterization applications allow participants to benefit from “best practices” that have been gathered from the industry. Numerous team exercises provide hands-on practice to understand the needs of other professionals to collect data, integrate data across disciplines, and appreciate the needs of other disciplines and to develop new reservoir characterization skills. Innovative data sheets are provided to the students to categorize their interpretations within the context of the RC problem.
The program is built around a preliminary map of the RC process built within MS Project; the process starts with defining the organizational objectives followed by setting up the team, confirming the assignment, reviewing the data, reconfirming/refining the assignment, building a static model, confirming the static model through multi-disciplinary data, building the dynamic model and presenting solutions.

TARGET AUDIENCE

- Geologists
- Geophysicists
- Reservoir Engineers
- Production Engineers
- Petrophysicists
- Exploration and Production Managers
- Team Leaders and Research Scientists

TARGETED COMPETENCIES

- Integrated Multi-Disciplinary Reservoir Model
- Reservoir Properties
- Reservoir Performance
- Seismic Data Calibration

PROGRAM GOAL

The program is process-based and focuses upon understanding the applicability of the measurements and interpretations from the participant’s discipline to other adjacent disciplines Understanding information from other disciplines and the uncertainties and risks involved in its gathering/interpretation Awareness of the latest technologies and working principles evolving on the “cutting edge” of the industry Managing a large complex project to solve business problems in the most efficient manner – particularly when working in a difficult environment (multi-disciplinary teams, bosses outside your expertise, cross purposes from disciplines, etc.) Working with multiple working hypotheses throughout the project until conclusively proven otherwise

PROGRAM OBJECTIVES

By the end of the program, the participant will be able to:

- Know how to develop an integrated multi-disciplinary reservoir model that determines the internal and external geometry of the reservoir, distribution of reservoir properties (static model) and flow within the reservoir (dynamic model)
- Know how to predict local variations within the reservoir
- Explanation of past reservoir performance
- Prediction of future reservoir performance of field
- Economic optimization of each property
- Know how to formulate a plan for the development of the field throughout its life
- Know how to convert data from one discipline to another
- Extrapolation of data from a few discrete points to the entire reservoir
- To calibrate seismic data to the reservoir model
- Minimization of development expenditures
- Facilitation of management decisions concerning the property, financial requirements, staffing needs and expenditures
- Development of appropriate and accurate financial models useful to company management
- Know how to make the reservoir characterization team work together more efficiently

PROGRAM CONTENT

- Defining the business purpose: Clarifying the problem, negotiating deliverables, project management in Microsoft Project format
- Data for Reservoir Characterization: Sources, scale of the data/extrapolation to other areas, acquisition planning, cross-disciplinary Applications/integration; quality/error minimization, data management
- Geostatistics in Reservoir Characterization: Applicable techniques, data viability and applicability, multiple working models, ranking of models with multi-source data
- Reservoir Models: Sequence Stratigraphic, Geological, Geophysical, Reservoir Engineering, Flow Unit, Preliminary Production
- Economics and Risking: Volumetrics, Probability of Success, Financial returns of Project
- Organizational Structure: Team Styles, Team Communications
- Assessment and Evaluation: The holistic Reservoir Characterization mode

APPLIED RESERVOIR CHARACTERIZATION OF HETEROGENEOUS RESERVOIRS

UETMT- RES- 106

Program Duration: 10 days

PROGRAM OBJECTIVES

- Show connection between probability and statistics
- Introduce basics of geostatistical application
- Reveal tie between geology and geostatistics
- Benefits of geostatistical procedures
- Principles and practice of characterizing petroleum reservoirs using geologic and engineering data, including well logs, sample descriptions, routine and special core analyses, and well tests.
- More accurate models by Borehole seismic methods which are directed towards practicing seismic interpreters wishing to deepen their understanding of rock physics, petrophysics, and borehole geophysics in order to better link and validate their interpretations.
- Understanding the heterogeneous Reservoirs (e.g. Naturally Fractured and Layered Reservoirs and, their Appraisals and Managements)

TARGET AUDIENCE

- Geologist
- Geophysicists
- Petrophysicists
- Reservoir Engineers

TARGETED COMPETENCIES

- Petrophysical Properties
- Reservoir Modeling
- Stratigraphy
- Borehole Seismic Methods
- Heterogeneous Reservoirs

PROGRAM CONTENT

- The need for statistics and applications of probability
- Petrophysical properties from statistics and Heterogeneity measures
- Regression, Bivariate analysis, Covariance and related measures
- Use of Statistics in Reservoir Modeling and Modeling Geologic Media
- Structure and structurally compartmentalized reservoirs
- Stratigraphy and stratigraphically compartmentalized reservoirs
- Petrophysical properties of reservoirs
- Borehole Seismic Methods -Introduction, Data Acquisition Summary, Data Processing Principles and 3D VSP
- Overview of heterogeneous reservoirs- types, history, issues and solutions,
- Geological characterization from seismic
- Production mechanisms in layered and fractured reservoirs
- Geomechanics issues and techniques -how to evaluate and manage the impacts of in-situ stress on reservoir performance (e.g. fracture permeability, early water breakthrough), Upscaling and static heterogeneous model development -how to predict fracture distribution, build geological and fracture models, and interface with reservoir simulation,
- Dynamic models- how to calibrate the static model with dynamic reservoir Properties
- Reservoir engineering issues and techniques -how to evaluate the model and predict reservoir behaviour, well testing and simulation of heterogeneous Reservoirs (e.g. Dual permeability/porosity)

BASIC RESERVOIR SIMULATION

UETMT- RES- 107

Program Duration: 5 days

PROGRAM OVERVIEW

The purpose of this seminar is to introduce, in an overview fashion, the fundamental concepts and elements of reservoir simulation. Those who want to get an overview of this technology should attend.

TARGET AUDIENCE

- Those who have had little exposure to this technology and need a "quick start" on the learning curve; challengers will especially benefit

TARGETED COMPETENCIES

- Reservoir Simulation Model
- Well Modeling
- Simulation Run Management

PROGRAM OBJECTIVES

- Why and how a model is built and the source of data
- How wells are modeled and what to look for in a reservoir simulation study
- The various phases of models (from model building through prediction) and types (single-well, sector, full-field)

PROGRAM CONTENT

- The elements of a reservoir simulation model
- Types of reservoir simulations
- Coordinate geometries and model types
- Reservoir simulator features
- Well modeling overview
- Building the model
- Managing the simulation run
- Defining initial conditions
- History matching
- Prediction
- Process and specialty
- Simulators used in industry

ADVANCED RESERVOIR SIMULATION

UETMT- RES- 108

Program Duration: 5 days

PROGRAM OVERVIEW

Reservoir Simulation Strategies is an applied simulation program. The program stresses preparing and critiquing the data that is input into a simulator, and running and analyzing several types of field cases. You will analyze past reservoir behavior and predict future performance. This program, for both the neophyte and the experienced person, will enable you to apply reservoir-engineering principles to black-oil and dry gas reservoir problems that are better solved with simulation techniques. The intent is to chart a path toward the use of any simulator, but more importantly, toward its intelligent use. The program is not a theoretical or mathematical simulation program. Equations will only be presented when necessary for a particular application. The program provides hands-on use of one or more simulators with data sets prepared by the participant.

TARGET AUDIENCE

- Reservoir and petroleum engineers who are actively involved in reservoir studies, geomodelers, petrophysicist, and reservoir geologists who are involved in modeling.

TARGETED COMPETENCIES

- Fluid and Rock Property Data
- Reservoir Engineering
- Numerical Well Test Analysis
- Hydraulic Fracture Optimization

PROGRAM OBJECTIVES

- Apply the principles of Reservoir Engineering to Numerical Modeling
- Set up, run, and Analyze the results for single Well, pattern and full-field Models
- Prepare Fluid and Rock Property Data in the Manner required for Simulation Studies
- Perform Numerical Well Test Analysis
- Optimize hydraulic Fracture Length and Conductivity
- History match an existing pattern

PROGRAM CONTENT

- Principles of Reservoir Engineering to Numerical Modeling
- Single Well, pattern and full-field Models
- Buckley Leveret Displacement
- One Dimensional Water Oil Displacement
- Model Components, Types, and Modern Gridding Methods
- Two Dimensional Displacement
- Grid Orientation and Refinement
- Routine and Special Core Analysis
- Pseudo Relative Permeability and Capillary Pressure
- Relative Permeability Manipulation
- PVT Experiments, Aquifer Representation
- Debug a Problem Model
- Recurrent Data, History Matching, and Transition to Prediction Mode
- Well Test History Match and Prediction for Design of extended Test

RESERVOIR SIMULATION- PRACTICAL

UETMT- RES- 109

Program Duration: 5 days

PROGRAM OVERVIEW

This course deals with the practical aspects of Reservoir Simulation without complicated Mathematics or differential equations.

TARGET AUDIENCE

- This course is intended as an introductory course in the art of Reservoir Simulation.
- Geoscientists, Petroleum and Reservoir Engineers should attend this course who wish to improve their understanding of the potential and limitations of this tool. Participants should have a good understanding of Basic Reservoir Engineering

TARGETED COMPETENCIES

- Reservoir Simulation
- Fluid Properties
- Rock Properties
- Grid Types

PROGRAM OBJECTIVES

It is intended for individuals who are interested in making intelligent use of this powerful tool for the Management of Petroleum Reservoirs. Assumptions involved in different Simulation Models and their influence on results will be discussed. The course will include workshop sessions dealing with practical Simulation Problems.

PROGRAM CONTENT

- Introduction and history on Reservoir Simulation
- Classification of Simulators - uses of Reservoir Simulators
- Basic Conservation Equations and mass balance
- Review of Fluid Properties for Simulation - Black-Oil and Compositional Fluid Models
- Rock Properties and Saturation Functions - Porosity, Permeability, Compressibility, relative Permeability, Capillary Pressure, Correlations
- Grid selection and Construction - Introduction to various Grid Types, Aquifer Modeling, Fault Modeling
- Up gridding and up scaling
- Treatment of Wells in Simulators
- Introduction to history matching
- Special Simulation Models - Streamline Simulation, Fractured Reservoirs, Compositional Modeling

APPLIED RESERVOIR SIMULATION OF COMPLEX FIELDS USING ECLIPSE (100) SOFTWARE

UETMT- RES- 110

Program Duration: 10 days

TARGET AUDIENCE

- Reservoir and Petroleum Engineers who are involved in the use of Reservoir Simulation Technology to evaluate Field Performance
- Geologist and Geophysists who involved in Construction Geological Models

TARGETED COMPETENCIES

- Simulation of Fractured Reservoirs
- Simulation of Faulted Reservoirs
- Reservoir Fluid Properties, Rock Properties
- Field Management in Complex Reservoir

PROGRAM CONTENT

WEEK ONE: THEORETICAL PART

Simulation of Complex Reservoirs: including the following:

- Simulation of Fractured Reservoirs
- Simulation of Faulted Reservoirs
- Simulation of Stratified Reservoirs and their different Features

Types of Simulation Models (Based on Phase, Black and Compositional)

- Based on Geometry
- Based on Natural (Physical Numerical, Analogs)
- Types of Commercial Simulators and the difference between them

Reservoir Fluid Properties, Rock Properties and Reservoir Rock Interaction

Conservation of Mass Theory, Conservation of Energy, Darcy Low, Equation of Continuity

Numerical and Analytical Solutions

Types of Flow:

- Steady State, Semi and Unsteady State

Types of Flow Geometries:

- Radial, Linear, Spherical

Basic Differential Calculus

- Finite difference, Finite Element

Building the Model

The new Girding Technologies
Defining the Initial and Boundary Conditions
Well Representation in the Model

WEEK TWO: PRACTICAL PART

Eclipse Features and Overview

- Uses, using Manual and Technical Steps

WHAT IS THE NEW IN ECLIPSE TILL VERSION 2008?

Field Case Study with Training with Eclipse for :

Simulation of Complex Reservoirs such as

- Simulation of Fractured Reservoirs
- Simulation of Faulted Reservoirs
- Simulation of NWM (Near Wellbore Modeling)
- Simulation of Horizontal Wells and Multilateral Wells
- Simulation of LGR and Coarse Girding
- Simulation of Water Influx Models (Aquifers)

Applications for Field Management in Complex Reservoir Simulation

- Building the Model and History Matching
- Drilling new Infill Wells
- Recompletion the Existing Wells
- Using Prediction for Water and /or Gas Flooding
- Different Scenarios for EOR Methods (Polymer Flooding, Water Shut-off Techniques by Gel.)

RESERVOIR MANAGEMENT

UETMT- RES- 111

Program Duration: 5 days

PROGRAM OBJECTIVES

- To enhance the participants' Knowledge, Skills, and Abilities necessary to have a higher level of understanding of Reservoir Management Models and approach mainly through Practical Applications.

TARGET AUDIENCE

- Reservoir, production and field management operation engineers, petroleum engineers, reservoir geologists, geophysicists who are actively involved in reservoir studies, geomodelers, petrophysicist, and reservoir, petroleum engineering managers.

TARGETED COMPETENCIES

- Reservoir Management
- Field Optimization
- Reservoir Performance Monitoring
- Wellbore and Surface Systems

PROGRAM CONTENT

- Definition of Reservoir Management: an Integrated, Interdisciplinary Team Effort
- Goal Setting, Planning, Implementing, Monitoring, and Evaluating Reservoir Performance
- Field Development and Field Operating Plans to optimize Profitability
- Efficient Monitoring of Reservoir Performance
- Minimizing Drilling of unnecessary Wells
- Wellbore and Surface Systems
- Well Testing and Automated Production Systems
- Economic impact of Operating Plans
- Identifying and Acquiring Critical Data, Data Acquisition, and Analysis
- Maximizing Economic Recovery and Minimizing Capital Investment, Risk and Operating Expenses
- Timing of field Implementation of Reservoir Management Plan
- Case Histories and Analysis
- Importance of Reservoir Characterization and Drilling and Operating Plans
- Primary Recovery, Pressure Maintenance, and Secondary and Tertiary Recovery
- Responsibilities for Team Members

ADVANCED GAS RESERVOIR MANAGEMENT

UETMT- RES- 112

Program Duration: 5 days

PROGRAM OVERVIEW

Natural gas production has become a major part of every petroleum company's asset base and continues to grow in importance throughout the world. This course will help students understand the engineering drivers on gas reservoir management and how a gas reservoir's value can be maximized through sound engineering practices. A full spectrum of gas reservoir engineering techniques is addressed and their application to a large variety of gas resource management options is discussed.
This course includes the use of computers, which are provided at additional cost, for each two participants

TARGET AUDIENCE

Engineers actively involved with the operation and management of gas reservoirs; geoscientists working with gas reservoirs in field development and expansion planning would also benefit from attending this course

TARGETED COMPETENCIES

- Gas Reservoir Fluid Properties
- Fluid Flow and Well Testing
- Wellbores and Pipelines

PROGRAM OBJECTIVES

- Evaluate gas reservoir data and prepare this data for engineering calculations
- Apply frequently used gas reservoir engineering techniques
- Perform production decline type curve analysis and use other advanced reservoir calculations such as simulation
- Solve reservoir engineering calculations through the use of many practical exercises

Program CONTENT

- **Gas reservoir fluid properties:** gas condensate sampling and Understanding laboratory reports
- **Gas reservoir fluid flow and well testing:** deliverability testing and non-darcy flow, testing for hydraulically Fractured wells, horizontal wells, and gas condensate reservoirs
- **Determination of original gas-in-place:** material balance techniques for various drive mechanisms and reservoir types, alternate plotting techniques, production decline type curves
- **Gas flow in wellbores and pipelines:** the gas production system, pressure drop in wellbores and flowlines, restrictions to gas production
- **Prediction of future performance and ultimate recovery:** decline curves, coupled material balance and deliverability techniques, reservoir simulation, gas well spacing and infill drilling
- Special topics
- Reservoir management of water-drive gas reservoirs, predicting gas condensate reservoir performance, coalbed methane reservoirs

FRACTURES AND FRACTURED RESERVOIRS

UETMT- RES- 113

Program Duration: 5 days

TARGET AUDIENCE

- Engineers and Geoscientists

TARGETED COMPETENCIES

- Fractured Reservoirs
- Fracturing Process
- Data Acquisition and Processing
- Fracture Analysis and Testing
- Drilling Fluids
- Reservoir Properties

PROGRAM CONTENT

- **Fractured Reservoirs; an Overview**
- **Fracturing Process**
- **Fracture detections (conventional logs, cores, ditch cuttings, Borehole images…etc.)**
- **New Technology; Data Acquisition and Processing**
- **Characterization of Natural Fractures:**
  - Regional Structural Setting and Deformation History
  - Detection and Geometry of Fracture sets
  - Induced Versus Natural Fractures
  - Break out Orientation
  - In-Situ Stress
  - Natural Fracture Orientation and Stress Model.
  - Fold related fractures
  - Fault related fractures
  - Wrench fault tectonic related fractures
  - Fault propagated folds
  - Fracture generation model
- **Attributes of Fractured zones:**
  - Fracture Morphology and Width
  - Fracture Density and Spacing
  - Fracture Porosity
  - Core and Side Wall Cores Integration
  - Contribution of Acoustics
  - Designing approach for predictive fracture distribution
- **Fracture Analysis and Testing**
- **Strategies for drilling and completing Fractured Reservoirs**

Characterization of Formation Damage

1. Drilling Fluids and mud loss (Under-balance drilling…why?)
2. Stimulation Fluids
3. Completion Techniques

- **Matrix Description:**
  - Reservoir Properties
  - Core integration and porosity characterization
  - Petrophysical parameters (porosity, micro-fractures, permeability, water saturation, m & n factors…etc.)
- **Production Potential**
  - Testing Data (Dual packer MDT, DSTs…etc.)

    a. Productivity index

    b. Pressure transient analysis
  - Stimulation(acidizing, fracturing….etc.)
  - Contributing zones and communication(Production logging,
  - Interference Testing, tomography…etc.)
  - Flow Units and hydrocarbon reserves

Case History:

- Fractured Basement
- Fractured Intrusions/Extrusions
- Fractured Carbonates
- Fractured Sandstones

Conclusion and Recommendations:

a) Present Wells

- Re-entry
- Sidetrack-Slant wells, Horizontal trajectory
- Faults plane's morphology (is it safe to intersect?)

b) Future Wells

- Trajectory
- Communication
- Infill drilling
- Non damaging fluids
- Under-balancing Drilling
- Open-hole logs
- Barefoot Completion

Discussion

FUNDAMENTALS OF RESERVOIR DRIVE MECHANISM

UETMT- RES- 114

Program Duration: 5 days

PROGRAM OVERVIEW

This program builds performance competencies in understanding reservoir drive mechanisms through a combination of lectures, discussions, case studies and mentor-guided "team" workshops. These workshops will include pre-assessments and post-assessments that test participants' "before" and "after" knowledge of a subject area, together with simulated job assignments.

TARGET AUDIENCE

- Reservoir, Production and Operations Engineers, Geologists and Geophysicist

TARGETED COMPETENCIES

- Reservoir Engineering
- Material Balance Equation (MBE)
- Gas and Gas Condensate Reservoirs
- Gravity Drainage

PROGRAM OBJECTIVES

By the end of the program, participants will be able to identify primary reservoir drive mechanisms (solution gas drive, water drive, gas cap drive) by observing production and pressure trends, estimate original hydrocarbons in place, using both volumetric and material balance methods, and develop a range of estimates for technical recovery factors and reserves.

PROGRAM OUTLINE

- Basic Concepts in Reservoir Engineering
- Introduction to the Material Balance Equation (MBE)
- Gas and Gas Condensate Reservoirs
- Solution Gas Drive
- Gas Cap Drive
- Water Drive
- Gravity Drainage
- Combination Drive Mechanisms

PROGRAM CONTENT

DAY 1

Basic Concepts in Reservoir Engineering

- Engineering Objectives
- Data Sources
- Reservoir Description and Reservoir Modeling
- Pressure and Temperature
- Porosity, Permeability and Fluid Saturation
- Fluid Flow Equations
- Team Workshop—Reservoir Engineering Fundamental

DAY 2

Introduction to the Material Balance Equation (MBE)

- Conservation of Mass Principle
- Description of Terms
- MBE Advantages, Limitations and Areas of Application
- Team Workshop—General Applications of the Material Balance Equation

Gas and Gas Condensate Reservoirs

- Gas Equations of State
- Dry Gas Reservoirs
- Gas Condensate Reservoirs
- Material Balance Applications
- Examples/Case Study
- Team Workshop—Gas and Gas Condensate Reservoirs

DAY 3

Solution Gas Drive

- Under-saturated Reservoirs
- Saturated Reservoirs
- Reservoir Performance Characteristics
- Recovery Factors
- Material Balance Applications
- Examples/Case Study
- Team Workshop—Solution Gas Drive Reservoirs

DAY 4

Gas Cap Drive

- Reservoir Performance Characteristics
- Material Balance Applications
- Examples/Case Study
- Team Workshop— Gas Cap Drive Reservoirs

Water Drive

- Reservoir Performance Characteristics
- Material Balance Applications
- Examples/Case Study
- Team Workshop— Water Drive Reservoirs

Gravity Drainage

- Reservoir Performance Characteristics
- Material Balance Applications
- Examples/Case Study

DAY 5

- **Combination Drive Mechanisms**
- Reservoir Performance Characteristics
- Material Balance Applications
- Examples/Case Study
- Class Workshop— Combination Drive Reservoirs
- Post-Assessment

NATURALLY FRACTURED RESERVOIRS: GEOLOGIC AND ENGINEERING ANALYSIS- ADVANCED

UETMT- RES- 115

Program Duration: 5 days

PROGRAM OVERVIEW

This program covers geologic and engineering concepts, methodology, and technology used to characterize, evaluate and manage naturally-fractured reservoirs. Applications and limitations of geologic and engineering procedures and tools are discussed. Field examples and case studies demonstrate the importance of integrated geologic and engineering studies in developing effective, economical reservoir management strategies for different types of reservoirs.

TARGET AUDIENCE

- Engineers and geoscientists interested in a multi-disciplinary approach in evaluating and predicting the overall effect of natural fractures on subsurface fluid-flow and subsequent reservoir performance

TARGETED COMPETENCIES

- Mechanical Stratigraphy
- Subsurface Natural-Fracture
- Cores and Well Logs
- Rock Properties
- Fluid-Flow
- Well Performance and Well Testing

PROGRAM OBJECTIVES

- Detect and predict subsurface natural fracture occurrence and intensity from cores and well logs
- Determine fractured rock properties affecting reservoir performance
- Design and analyze pressure transient tests in naturally-fractured reservoirs
- Evaluate reservoir performance in naturally-fractured reservoirs
- Develop and apply numerical simulation models to fluid-flow in naturally-fractured reservoirs
- Apply coupled geomechanics/fluid-flow behavior to reservoir management strategies in naturally fractured reservoirs
- Evaluate the impact of natural fractures on hydraulic fracture stimulation

PROGRAM CONTENT

- Characterization of natural fractures and fracture systems
- Influence of mechanical stratigraphy and structure on fracture development
- Detection and prediction of subsurface natural-fracture occurrence and intensity from cores and well logs
- Fractured rock properties affecting reservoir performance
- Classification of naturally-fractured reservoirs with reservoir examples and potential production problems
- Fluid-flow in naturally-fractures reservoirs
- Well performance and well testing in naturally-fractured reservoirs
- Reservoir performance in naturally-fractured reservoirs
- Numerical simulation of fluid-flow in naturally-fractured reservoirs
- Geomechanics/fluid-flow
- Behavior of naturally-fractured reservoirs
- Stimulation of naturally-fractured reservoirs
- Effects of natural fractures on reservoir permeability anisotropy, drainage area and waterflood sweep efficiency

GAS RESERVOIR ENGINEERING

UETMT- RES- 116

Program Duration: 5 days

TARGET AUDIENCE

- Engineers and geoscientists

TARGETED COMPETENCIES

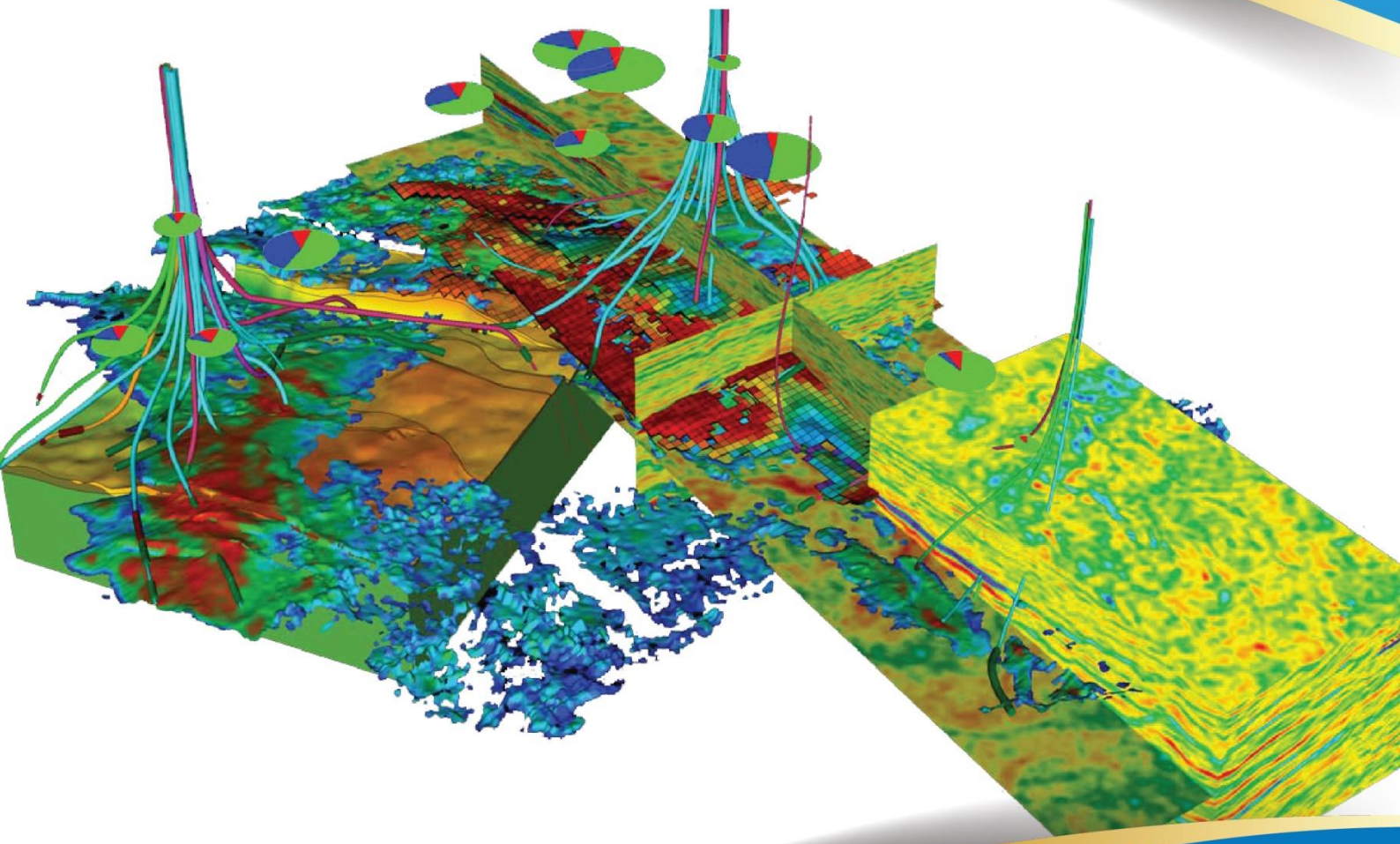
- Volumetric Gas Reservoirs
- Water-Drive Gas Reservoirs
- Gas Condensate Reservoirs
- Gas Field Development

PROGRAM OBJECTIVES

The course objective is to understand and predict the behavior of any type of Gas Reservoirs, to Analyze and Predict Gas Reservoir Performance.

PROGRAM CONTENT

- Estimation of Gas Reserves
- Gas in Place by Volumetric Method
- The Material Balance Method
- General Material balance
- Volumetric Gas Reservoirs
- Water-Drive Gas Reservoirs
- Gas Condensate Reservoirs
- Testing and Sampling
- Behavior in single Phase Region
- Behavior in two Phase Region
- Reservoir Performance Prediction
- Abnormally Pressured Gas Reservoirs
- Gas Well Deliverability Tests
- Semi-steady State Equation
- Transient Flow of real Gases through Porous Media
- The Constant Terminal Rate Solution
- Application of Real Gas Flow Equations
- Average Reservoir Pressure
- Gas Field Development
- The Effect of Gas Production Rate on Ultimate Recovery
- Horizontal Gas Well Performance
- Coalbed Methane “CBM”
- Tight Gas Reservoirs
- Gas Hydrates
- Shallow Gas Reservoirs



UNITED EASTERN
TECHNICAL & MANAGEMENT TRAINING

Liberty Tower, Khalifa Street,
P.O.Box: 7615, Abu Dhabi-UAE
Tel : +971 2 627 2737
Fax : +971 2 627 0048
E-mail: ameneassy@ueg.ae

Al Salemiyah Tower, 1003,
P.O.Box: 8670, Dubai-UAE
Tel : +971 4 221 9911
Fax : +971 4 222 6642
E-mail: sherine@uetmt.ae
admin@uegdxb.ae

Quality Registrar Systems

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