

Upstream & Downstream



Welcome Letter

Welcome to TechnoTrain! We are proud to be recognized by The Daily Telegraph for our innovative approach to training and development. TechnoTrain is UniHouse's professional training brand, created specifically to build strong, skilled, and safe workforces within the oil and gas industry.

With over 25 years of experience, we have partnered with leading companies worldwide, including BP, Shell, Hyundai Engineering, JGC Japan, Shimizu Japan, Gazprom, PetroChina, Lukoil, SONANGOL, and UNDP. Our expertise in engineering, management, and oil and gas enables us to deliver comprehensive training solutions tailored to support the success and growth of companies across this critical industry.

TechnoTrain's programs cover all essential areas for a successful career, from technical skills to essential soft skills, addressing all major oil and gas competencies. Our team of trainers comprises seasoned professionals from various backgrounds and nationalities, enriching each course with a diverse wealth of knowledge.

We proudly partner with some of the world's top learning and research centers in the UK, the US, and Canada. Our training facilities are equipped with the latest technology, allowing participants to learn and practice on state-of-the-art industry equipment.

At UniHouse, we prioritize customer satisfaction, welcoming every client as part of our family. We are committed to offering customized programs, whether for a small group or hundreds of employees, no matter where in the world you are located. TechnoTrain provides individual courses or complete training programs to help clients achieve their goals.

What We Offer

TechnoTrain's globally accredited programs are trusted in over eighty countries and support career growth across numerous industries. Our services include:

- Curriculum Design & Development
- Training & Capacity Building
- Framework Design for Training and Quality Assurance
- Technical Knowledge Transfer
- Managing Technical Training Centers
- Vocational Training & Competency Building
- Engineering Standards Training
- On-the-Job Training

Our courses cover areas like Power, Upstream & Downstream, Mechanical, Supply Chain, Health & Safety, and Soft Skills, addressing the needs of technical staff and management alike. TechnoTrain is more than just training; it is a pathway to success for every level within the oil and gas sector.

Join us at TechnoTrain to take the next step toward a successful and sustainable future in the oil and gas industry.

Sincerely,

The UniHouse Team





Drilling

Upstream



These courses have been designed for participants at various competency levels: Beginner – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their existing competencies.

The *Basic Drilling Engineering* and *Geothermal Drilling Technology* courses are considered fundamentals and are designed to be a prerequisite for new drilling engineers. For participants looking to increase their knowledge levels, the *Mud Logging* and *Stuck Pipe Prevention & Fishing* courses are recommended. The *Advanced Casing Design* and *Advanced Directional & Horizontal Drilling* courses are designed for participants seeking to increase their skills levels.

Section Courses

1. Advanced Casing Design
2. Advanced Direction & Horizontal Drilling
3. Basics of Drilling Engineering
4. Equipment, Applications, Types, Installation & Workovers
5. Geothermal Drilling Technology
6. Introduction to Drilling Fluid Technology
7. Introduction to the Oil & Gas Industry
8. Mud Logging
9. Stuck Pipe Prevention & Fishing
10. Well Engineering



Advanced Casing Design

UHUDL001



This course reviews casing designs and builds upon them to address well design challenges associated with deep, extended reach and HPHT. Participants will develop an understanding of the composition and properties of drilling and completion fluid systems and additives.

This course is designed for drilling engineers seeking to develop an advanced understanding of casing design.

Course Objectives:

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

- Know how to optimise preliminary casing design.
- Perform casing seat selection to satisfy a range of well performance parameters and barrier standards.
- Select suitable casing sizes to meet well completion objectives.
- Produce a workable casing scheme utilising casing strings, liners and expandable tubular technology.

Course Content:

- Overview of casing classifications and definitions
- Data required for casing design industry standards and specifications
- Formation strength, kick tolerance and casing seat selection
- Pipe performance, tolerances and properties
- Casing connection qualifications and selection
- Installation, drilling and service loads for casing
- Casing design and safety factors
- Wellhead selection
- Special design considerations

Related Courses:

- Well Completion
- Well Design

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction, Course Objectives

1. Functions of casing
2. Well construction standards
3. The casing design process
4. Casing design data requirements

Preliminary Casing Design

1. Pore pressures and formation strengths
2. Kick tolerance and casing seat selection
3. Casing setting depth and sizing for well construction (seat selection)
4. Barriers
5. Well abandonment considerations

Day 2

Oil Field Tubulars

1. Industry standards, specifications and documentation
2. The manufacturing process
3. API 5CT
4. Mechanical properties and temperature effects
5. Application of ISO 15156 – materials for use in sour service

Casing Performance Properties

1. Conventional casing strength limits as per API bulletin 5C3
2. Alternative limits proposed in ISO/TR 10400
3. Modes of failure, burst, collapse, axial, tri-axial and joint integrity
4. Buckling – resistance and effective tension
5. Design and safety factors

Casing Connections

1. Introduction to casing connections
2. ISO 13679 connection testing
3. Selection of pre-qualified connections

Day 3

Casing Loads

1. Overview of design loads
2. Fluid gradients and applied pressures
3. Critical internal and external pressure scenarios
4. Load case selection
5. Production casing loads
6. Intermediate casing loads
7. Surface casing loads

Manual Design Process

1. Uniaxial pipe selection
2. Installation loads
3. As cemented loads

Day 4

Service Loads

1. Load identification, production thermal profiles
2. Thermal effects on fluids, pipe strength and tension
3. Trapped annular pressures
4. Impact of cement on buckling
5. Biaxial collapse assessment
6. Triaxial burst assessment
7. Pressure testing

Day 5

Special Design Considerations

1. Accounting for casing wear and corrosion
2. Deterministic vs probabilistic casing design
3. Casing design for thermal wells
4. Casing design for HPHT wells

Advanced Directional & Horizontal Drilling

UHUDL002



This course will cover advanced areas of drilling engineering such as horizontal and extended reach drilling. The course is designed to review some fundamental areas, such as: trajectory design, torque and drag calculations, and hydraulics. The course will provide the necessary foundations to understand the drilling process from spud to well completion.

This course is designed for senior drilling personnel working in operations.

Course Objectives:

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

- State the major theoretical aspects of horizontal drilling.
- Select the horizontal well type for specific purposes: select appropriate down-hole tools.
- Demonstrate an understanding of the actions required for planning, designing and managing drilling projects, analyzing well shapes, interpreting surveys, and plotting positions on the well plan.

Course Content:

- Recording the wellpath, doglegs, and dogleg severity
- Applications of well design
- Deviated well design
- Borehole surveying
- Fixing hole position by calculation
- Drilling telemetry
- Deviation control
- Drilling problems in deviated holes

Related Courses:

- Well Design
- Well Completion

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction

1. Scope
2. History

Applications of Well Design

Day 2 and 3

Deviated Well Design

1. Horizontal section
2. Vertical section

Borehole Surveying

1. Magnetic
2. Factors affecting magnetic survey data
3. Correcting azimuths

Fixing Hole Position by Calculation

Day 4 and 5

Drilling Telemetry: Measurement While Drilling

1. Wireline conductors
2. Mud pulse systems

Deviation Control

Drilling Problems in Deviated Holes:

1. Friction effects
2. Keyseating
3. Differential pressure sticking

Basics of Drilling Engineering

UHUDL003



This course is specifically designed to give a technical overview of the science and art of drilling operations. The course also will expose participants to terminology, concepts, processes, and equipment used to drill oil and gas wells.

This course is designed for newcomer drilling engineers and other technical disciplines.

Course Objectives:

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

- State the major components of the art and science of drilling operations.
- Identify and differentiate onshore and offshore drilling techniques.

Course Content:

- Rig selection and basic planning steps
- Types of wells and rigs
- Well costing
- Basics of formation pressure
- Real time diagnostics of pore pressure
- Overburden gradient estimation
- Fracture gradient estimation and LOT analysis
- Drilling fluid and hydraulics design
- Types and functions of drilling fluids
- Drilling fluid properties
- Solids analysis
- Basics of a hydraulic system design
- Hole cleaning in vertical and deviated wells
- Casings and drill string design
- Casing functions, types, and connections
- Casing specification and strength properties
- Casing design principals and design factors
- Drill string components (tool joints, HWDP and drill collars)
- Hole problems (loss of circulation, shale problems, stuck pipe and well control)

Related Courses:

- Drilling Fluids
- Casing Design

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction to the Rig and its Component Systems

1. The hoisting system
2. The circulating system
3. The power system
4. The well control system

Preparations for Drilling

1. Site preparation
2. Drilling crew assignment
3. Rig preparation
4. Support equipment brought in and assembled
5. Final preparations completed

Day 2 and 3

The Drilling Operation

1. Drilling for oil and gas
2. 'Making Hole'
3. Straight hole drilling
4. Directional drilling
5. Controlling drilling operations
6. Special drilling operations

Day 4 and 5

Drilling the Well - The Process

1. Starting the drill stem
2. Adding drill collars
3. Attaching the Kelly
4. Adding drill pipe
5. Tripping in and out of the hole
6. Running casing
7. Cementing
8. Drilling to final depth
9. Basic Drilling Treatment
10. Add
11. Intro
12. 12- Pipe Racking
13. B.O.P.
14. Prep
15. Safety Systems

Equipment, Applications, Types, Installation & Workovers

UHUDL004



This course is designed to provide participants with a thorough knowledge of completion equipment and operational procedures required for converting a drilled well into an efficient and safe producer. It includes a practical approach for the various completion types, specific applications, completion installation and workovers.

This course is designed for drilling, completion, and intervention engineers.

Course Objectives:

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

- List well data needed for well completion activities.
- Illustrate different types of completions.
- Describe the application of different completion fluids.
- Prepare a list of down hole and surface completion equipment.
- Describe the procedure for running a completion.
- Describe different methods of well workovers.
- Identify wellheads, trees, valves and chokes.

Course Content:

- Applications
- Types of downhole completion equipments
- Types of surface completion equipment
- Running the completion (installation)
- Workovers

Related Courses:

- Well Completion
- Sand Control

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Application

1. Upper and lower completions
2. Definitions
3. Tubing architecture
4. Sand control completions
5. Horizontal completions
6. Multi-lateral & intelligent completions

Day 2

Types of Downhole Completion Equipment

1. What is the function of each component?
2. Why is it run?
3. Is it essential?
4. Is it safety critical?
5. What problems might be encountered during the installation of each item of equipment?
6. Reliability/operability concerns

Day 3

Types of Surface Completion Equipment

1. Wellheads, tubing hangers, and trees
2. Chokes
3. Surface safety valves
4. Remote shut-down systems
5. Range and gasket classification

Day 4

Running the Completion (Installation)

1. Off-site preparation
2. Rig-site preparation
3. Running the completion

Day 5

Workovers

1. Common applications for workovers
2. Workover well control issues
3. Main problem associated with workovers

Geothermal Drilling Technology

UHUDL005



The course is structured by presenting the basic drilling technology and then linking it with the features of geothermal drilling activities. The course will cover the following drilling aspects: the design and evaluation of well drilling systems; identification and solution of drilling problems; wellbore hydraulics, well control, casing design; well cementing.

This course is designed for engineers with little or no background in drilling technology or petroleum science.

Course Objectives:

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

- Understand the basics of drilling engineering related to geothermal applications.
- Understand the interdependency between geothermal well drilling and the oil and gas business.
- Understand the specific tools to drill a well in general, and specifically for geothermal drilling.
- Have a broad knowledge of the technologies involved to-date at drilling rig side.
- Have an overview about drilling costs.

Course Content:

- Drilling engineering
- Geothermal engineering
- Drilling methods
- Drilling rigs classification
- Effect of geothermal reservoir on the rock mechanics process
- Drilling fluids
- Drill bits
- Drill string components
- Downhole motors
- Mud circulation system
- Casing and cementing of geothermal wells
- Well completions for geothermal applications
- Well control

Related Courses:

- Basics of Drilling
- Well Completion
- Well Control

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Short History of Drilling Engineering

1. Introduction to geothermal engineering
2. Drilling a well and drilling methods
3. Drilling rig components and drilling rigs classification

Day 2

Overview of Rock Mechanics Process

1. Effect of geothermal reservoirs on the rock mechanics process
2. Drilling fluids and wellbore hydraulics
3. Drill bits and their application
4. Drill string components

Day 3

Downhole motors and downhole tools

1. Prime drivers, rotary system
2. Hoisting system, mud circulation system
3. Casing and cementing of geothermal wells

Day 4

Well Completions for Geothermal Applications

1. Special aspects of geothermal drilling
2. Effect of high temperature on drilling mud
3. Economic aspects of geothermal drilling

Day 5

Well Control

1. Drilling problems related to geothermal drilling
2. Special drilling techniques for geothermal drilling

Introduction to Drilling Fluid Technology

UHUDL006



The participants in this course will learn about the fluid systems and additives developed to meet drilling demands, as well as basic introductions to drilling fluids, clay chemistry, and polymer chemistry.

This course is designed for drilling supervisors and engineers, tool pushers, managers.

Course Objectives:

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

- Have an understanding of the composition and properties of drilling and completion fluid systems and additives.
- Understand how things work, and where they do not work.
- Be familiar with grounding in clay chemistry and polymer chemistry, and their importance to drilling fluid design.
- Have an appreciation of the importance of efficient solids control.

Course Content:

- Basic geology
- Pressure detection
- Fracture gradient
- Introduction to drilling fluids
- Rheology & hydraulics
- Basic chemistry & drilling fluids chemistry
- Clay chemistry
- Polymers
- Water base drilling fluid
- Solids control
- Mud remedies

Related Courses:

- Well Workover
- Drilling Operations

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Basic Geology

1. Porosity & permeability
2. Reservoir properties
3. Hydrocarbon reservoirs and origins

Pressure Detection

1. Development and causes of abnormal pressure
2. Overview evaluation of abnormal pressure

Day 2

Fracture Gradient

1. Introduction – What is a fracture gradient?
2. Fracture gradients – Importance

Introduction to Drilling Fluids

1. History of drilling fluids (MUD)
2. When / How 'MUD' came to be used in the oil & gas industry
3. Functions of drilling mud

Day 3

Rheology & Hydraulics

1. Physical properties of drilling 'muds'
2. Bit hydraulics

Basic Chemistry & Drilling Fluids Chemistry

1. Concepts & terminology
2. Chemical types and reactions
3. Water chemistry
4. pH and alkalinity

Day 4

Clay Chemistry

1. Fundamental clay structure
2. Interaction with water control

Polymers

1. Types
2. Use

Water Base Drilling Fluid (WBM)

1. Components
2. Miscellaneous specialty functions
3. Clays
4. Loss circulation
5. Different WBMs
6. Contaminates
7. Common calculations used in WBM

Day 5

Oil Base Drilling Fluids or Non-Aqueous Fluids (OBM)

1. Types
2. Common calculations used in oil base muds

Solids Control

1. During drilling a well
2. Analysis
3. Equipment

Common Drilling Problems and Mud Remedies

1. Formation damage
2. Loss circulation
3. Stuck pipe
4. Kick
5. Blowout
6. Corrosion

Introduction to the Oil & Gas Industry

UHIDL007



This course will provide a comprehensive and clear understanding of the technical and commercial operations of the oil & gas industry. The course will look at the industry principles, such as: exploration and production, geology, transportation, storage, prices, and legal and commercial systems.

This course is designed for new executives to the industry, commercial managers, various engineering disciplines, HR managers, marketing, sales, and legal & commercial managers.

Course Objectives:

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

- Understand the oil & gas chain and learn how the industry and departments work and integrate together in the company.
- Know new terminology in the oil and gas industry and improve communication between departments in the company.
- Understand the current technical, commercial and operation issues.
- Be familiar with all engineering and development aspects of the industry.
- Be familiar with various geological and geophysical exploration methods.
- Be able to explain the principal objectives and some key challenges in petroleum industry.

Course Content:

- Oil & gas industry overview
- Oil & gas geology
- Exploration phase
- Drilling operations
- Conventional and unconventional oil and gas resources
- Formation evaluation
- Well completion
- Oil & gas production facilities
- Reservoir management
- Pipeline and other transportation modes
- Gas storage facilities
- Fundamentals of LNG production and transportation
- Crude oil refinery production and processes
- Commercial & legal issues
- Oil and gas prices' volatility
- Oil & gas trading and transportation
- Roles of NOC, IOC, I-NOC

Related Courses:

- Oil and Gas Production Engineering
- Exploration & Production Logistics
- Oil Supply and Trading

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Overview of the Oil & Gas Industry

1. The main value creation steps: from exploration to end-user products
2. Upstream, midstream, and downstream sectors
3. Geographic distribution of resources
4. Main consumption markets
5. Industry and market participants
6. Important industry trends

Day 2 and 3

Upstream Sector

1. Origins of oil & gas
2. Physical and chemical quality characteristics of oil & gas
3. Conventional and unconventional oil & gas resources
4. Obtaining commercial access to resources
5. Creating value by locating oil & gas reservoirs
6. Creating value by turning resources into bookable reserves
7. Basics of oil & gas production
8. Enhancing the value of mature resources
9. Arrangements for sharing risk, investment, and rewards
10. Roles of national oil companies and independent oil companies

Day 4

Midstream Sector

1. Marine transportation of oil
2. Pipeline and other oil transportation modes
3. Oil storage logistics
4. Creating value by getting gas to markets
5. Fundamentals of LNG production and transportation
6. Gas pipeline operations
7. Gas storage facilities
8. Creating value through the use of transportation and storage
9. Wholesale trading of crude oil, LNG, and natural gas

Day 5

Downstream Sector

1. Refining processes and the main petroleum products
2. Economics of refinery operations
3. Blending and storage of refined products
4. Biofuels and additives
5. Regulation of end-user markets
6. Retail and wholesale marketing of transport fuels
7. Retail and wholesale marketing of natural gas
8. Lubricants, asphalt, and other specialty oil products
9. Overview of petrochemicals' markets
10. Trading of refined products

Mud Logging

UHUDL008



The course will provide a clear picture on the degassing process, techniques, gas analysis technology, new technologies, gas corrections and interpretation technologies.

This course is designed for drilling engineers, wellsite geologists and operation geologists.

Course Objectives:

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

- Have a clear understanding on how gases are generated during drilling.
- Understand how gases are carried to surface, and the technology to extract the gas from the drilling fluids.
- Use gas analysis technologies and best practices for the interpretation of gas data, in order to better reflect what is happening downhole.

Course Content:

- Origins of gas in mud
- Degassing process
- Different degassing techniques
- Gas analysis technology
- Gas interpretation generalities
- New technologies
- Gas corrections
- Interpretation methodologies
- Degassing case studies

Related Courses:

- Mud Logging

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Origin of Gas in Mud

1. Liberated gas
2. Produced gas
3. Connection and trip gas
4. Contamination gas
5. Recycled gas

Degassing Process

1. Equilibrium calculation for extracting from mud
2. Material exchange
3. Equilibrium limit
4. Volume, kinetics and thermal effects
5. Multipass degassing

Day 2

Different Degassing Technologies Available

1. Conventional degassers
2. Constant volume degassers
3. Constant volume/temperature fluid extractors
4. Improved gas extraction stirring vs temperature

Different Types of Gas Analyser Technology Available

1. Classic detectors – standard FID, rapid FID
2. New detectors – MS
3. Calibration
4. Advantages/inconveniences

Day 3

Gas Interpretation Generalities

1. Petroleum fluids
2. Petroleum fluids composition
3. Fluid rather than gas logging
4. History of gas interpretation
5. Gas ratio

Day 4

Lag Time Calculation

1. Synchronisation
2. Gas in correction
3. Booster pump
4. Contamination correction

Day 5

Case Studies with High-End Degassers

1. Drilling fluid contamination
2. Offshore results
3. Multiwell studies
4. Fault zones
5. Reservoir compartmentalisation

Stuck Pipe Prevention & Fishing

UHUDL009



This course will cover: hole pack-off and bridging, differential sticking, formation and wellbore geometry related problems, hole cleaning, tools, equipment and systems, operational optimization, first and preventative actions, and introduction to fishing.

This course is designed for drilling engineers, drilling supervisors and superintendents.

Course Objectives:

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

- Understand how drill pipes become stuck and what they can do to prevent the situation from occurring.
- Know what the driller should do regarding their "First Actions" upon becoming stuck.
- Understand the contents of the driller's stuck pipe prevention.

Course Content:

- Stuck pipe prevention
- Hole pack-off & bridging
- Differential sticking
- Formation & wellbore geometry
- Hole cleaning
- Tools, equipment & systems
- First & preventative actions
- Fishing
- Assessing
- Downhole operations

Related Courses:

- Formation Damage
- Drilling Operations

Duration

5 Days

Level

Intermediate

Programme Schedule

Day 1

Introduction

1. Stuck pipe definition
2. Statistics
3. Most common causes of stuck pipe

Hole Pack-Off & Bridging

1. Definition
2. Main causes
3. Indicators
4. First response
5. Prevention

Differential Sticking

1. Definition
2. Causes
3. Dynamic filter cake
4. Pressure – time effect
5. Freeing differentially stuck pipes
6. Prevention
7. Multiple problems
8. Avoidance

Day 2

Formation & Wellbore Geometry

1. Rock type effects
2. Wellbore geometry considerations
3. Formation & wellbore geometry
4. Effects combined

Hole Cleaning

1. Associated problems
2. Successful hole cleaning
3. Flow regime
4. Other key considerations
5. Hole cleaning charts

Day 3

Tools, Equipment & Systems

1. Drilling fluids
2. Silicate mud
3. New pressure tools
4. Jars & accelerators
5. Freeing worksheet

Operational Optimization

1. Prevention of stuck pipe during routine operations
2. Preventing drill string failure
3. Secondary freeing procedures

Day 4

First & Preventative Actions

1. Solids induced pack-off
2. Differential sticking
3. Mechanical & wellbore geometry

Fishing: Assessing the Situation

1. Downhole conditions
2. Determining where the string is stuck

Day 5

Downhole Operations

1. Upper string recovery
2. Lower string (fish) recovery
3. Junk
4. Lost side-wall sample bullets
5. Freeing stuck logging tools & stuck wireline
6. Jacker fishing
7. Stuck casing
8. Casing milling guidelines
9. Milling

Well Engineering

UHUDL010



This course introduces basic geology, petrophysics, exploration methods, completions, and well intervention to highlight their interface with drilling operations; providing participants with an introduction to the terminology, equipment, operations and process during well construction.

This course is designed for new drilling engineers, supervisors and managers moving into drilling engineering and well construction, wellsite geologists, geophysicists, and production engineers.

Course Objectives:

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

- Have an increased competency in drilling and well construction.
- Understand the basic calculations that address the power requirements, strength of components, equipment sizing, and drilling parameters.

Course Content:

- Sources of hydrocarbons
- Exploration techniques
- Types of drilling rigs
- Types of wells
- Major rig equipment
- Drill string components
- Drill bits and bit technology
- Drilling fluids
- Drilling fluids management
- Wellbore and reservoir evaluation techniques
- Securing the borehole, wellheads, x-mas trees, casing and cement
- Wellhead systems
- Specialist techniques; directional drilling, casing & cementing, stuck pipe avoidance and fishing
- Problem areas and avoidance of non-productive time, (kicks, losses, stuck pipe)
- Well control equipment and well control methods
- Behaviour and management of influxes in the well

Related Courses:

- Basic Drilling Engineering
- Pipe Stuck
- Directional Drilling

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

The Language of Well Construction

1. Understanding the terminology used in the office and at the well site

The Source of Hydrocarbons

1. Origins
2. Migration
3. Reservoir rock
4. Sealing mechanisms
5. Time and temperature to maturation
6. Conventional and unconventional resources

Types of Rigs

1. Onshore
2. Offshore
3. Types of wells drilled from these rigs
4. Systems comprising a drilling rig

Day 2

Rig Systems

1. Hoisting
2. Rotating
3. Circulating and control

Drill String Components

1. Drill pipe
2. Bottom hole
3. Assemblies
4. Drill bits
5. Special drill string components

Drilling Fluids Management

1. The role of drilling fluids
2. Types
3. Composition
4. Solids control
5. Waste management and disposal

Securing the Wall

1. Wellheads and x-mas trees
2. The role of casing and cement

Day 3

Directional Drilling

1. Position of the well bore
2. Surveying
3. Measurement and equipment

Sources of Lost Time

1. Stuck pipe
2. Bit and drill-string failures

Day 4

Introduction to Well Control

1. Statistics about well control events, where blowouts occur and why
2. Understanding pressures in the wellbore
3. Barriers and maintaining control
4. Well control equipment
5. Well control methods

Overview of the Completion Process

1. Zonal isolation
2. Tubing
3. Packers & completion equipment

Day 5

Recap of the Well Construction and Delivery Process

1. Project management
2. Well-planning and the well construction sequence
3. Drilling the well
4. Reaching the targeted reservoir, required accuracy & realistic tolerances
5. Responding to unplanned events, losses, and stuck pipes
6. Securing the wall
7. Evaluating the reservoir, mud logging, petrophysical logging, coring, sampling
8. Completing the well and putting on steam or abandonment



These courses have been designed for participants at various competency levels: Basic – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Development Geology* and *Integrated Sequence Stratigraphy* courses are considered fundamentals, and are designed to be a prerequisite for new geologists. For participants looking to increase their knowledge levels, the *Geology Operations* and *Modeling for Reservoir Characterization* courses are recommended. The Application of *Structural Geology in Seismic Interpretation* and *Integrated Field Development Planning for Offshore Fields* courses are designed for participants seeking to improve their skills levels.

Section Courses

1. Application of Structural Geology in Seismic Interpretation
2. Basic Structural Geology
3. Carbonate Reservoir Geology
4. Development Geology
5. Geology Operations
6. Integrated Field Development Planning for Offshore Fields
7. Integrated Sequence Stratigraphy
8. Introduction to the Oil & Gas Industry
9. Introduction to Reservoir Characterization and Modelling
10. Play Fairway Mapping & Exploration Strategy



Application of Structural Geology in Seismic Interpretation

UHUGL001



Seismic interpretation requires understanding of structural development and its interrelation with the stratigraphic system. This course covers a variety of modern structural concepts and techniques, and their role in the interpretation of seismic data.

This course is designed for geologists, petrophysicists, geophysicists, reservoir engineers, and exploration & production managers.

Course Objectives:

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

- Understand the role of tectonics and deformation in the formation of various types and orientations of geologic structures.
- Understand the interaction of the structural system with the stratigraphic and sediment logic environment for better prediction of reservoir formation.
- Integrate data from the large seismic scale to subseismic scale, including seismic anisotropy, to understand better the overall petroleum system.
- Be aware of the common pitfalls of interpretation.

Course Content:

- Strain concepts
- General seismic interpretation
- Fault plane mapping, including automated
- Velocity analysis and reprocessing
- Seismic attributes for structural analysis
- Faults
- Borehole seismology
- Growth analysis
- Fault seal analysis
- Balancing and restoration

Related Courses:

- Introduction to Seismic Processes
- Seismic Acquisition, Processing, and Interpretation

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Strain Concepts

1. Understanding the deformation environment
2. Force, stress, and strain/deformation
3. Strain ellipse concepts

Exploration Example

1. Rock mechanics
2. Modes of failure

General Seismic Interpretation

1. General principles of seismic acquisition, processing, and interpretation
2. Seismic versus well resolution
3. 2D interpretation techniques and pitfalls
4. 3D interpretation techniques and pitfalls

Fault Plane Mapping, Including Automated

1. Fault picking; horizon mapping; strata slicing; zero vs. 90 degree phase; texture analysis

Day 2

Seismic Attributes for Structural Analysis

1. Amplitude analysis
2. Dominant attributes for structural interpretation

Faults

1. Fracturing and Faulting
2. Slip vs. separation and their quantification
3. Normal faults and associated tectonic/nontectonic environments
4. Reverse faults and associated tectonic/nontectonic environments
5. Strike-slip faults and associated tectonic/nontectonic environments
6. Displacement analysis
7. Subseismic fault prediction
8. Fault restoration

Day 3

Folds

1. General fold concepts
2. Modes/styles of folding
3. Folds and associated tectonic/nontectonic environments
4. Closure mapping and quantification
5. Fold restoration

Fracture ID

1. Seismic anisotropy analysis
2. Fracture mapping
3. Well data integration

Day 4

Borehole Seismology

1. Overview of borehole seismic measurements and techniques
2. Acoustic logs, well bore seismic (VSP, cross-well, seismic MED)

Growth Analysis

1. Understanding and quantifying syndeformational growth sedimentation
2. Growth in extensional, compression and other structural regimes

Day 5

Fault Seal Analysis

1. Understanding and quantifying aspects of fault seal

Balancing and Restoration

1. Balancing techniques, structural modeling, and restoration

Basic Structural Geology

UHUGL002



Geological structure is the study of the permanent deformation and rock failure created by the changes in stress through geologic time. It is by far the most important aspect of geology for engineers to understand. Tectonic processes are responsible for the many discontinuity planes (fractures, faults, joints) that permeate rock masses controlling their strength, stress-strain characteristics and the transmission and storage of fluids.

This course is designed for geologists and oil & gas professionals who need an enhanced understanding of structure. This includes geologists, petroleum engineers, and geophysicists involved in the development of oil and gas reservoirs.

Course Objectives:

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

- Understand the significant aspects of structural geology.
- Know the different stress regimes, deformation process, and micro- and meso-scale structures.

Course Content:

- Introduction to geo-mechanics
- Introduction to structural geology
- Stress, strain, and deformation
- Extensional tectonics
- Strike-slip tectonics
- Compressional tectonics
- Salt tectonics
- Fracture systems and its mechanics
- Cross section construction, balancing

Related Courses:

- Development Geology
- Geology Operations

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Structural Geology and Structural Analysis

1. Approaching
2. Structural geology and tectonics
3. Structural data sets
4. Remote sensing
5. Seismic data
6. DEM, GIS and google earth
7. Numerical modeling

Day 2

Deformation

1. Components and deformation
2. Homogenous and heterogeneous
3. Mathematical description of deformation
4. One-dimensional aspects of deformation
5. Strain in two dimensions
6. Three-dimensional strain
7. Simple and subsimple shear
8. Progressive deformation and flow meters
9. Velocity field
10. Steady-state deformation
11. General three – dimensional deformation

Day 3

Strain in Rocks

1. Why perform strain analysis?
2. Strain in one dimension
3. Strain in two dimensions
4. Strain in three dimensions

Stress

1. Stress on a surface
2. Stress at a point
3. Stress component
4. Stress tensor
5. Deviatoric stress and mean stress

Day 4

Rheology

1. Idealized conditions
2. Elastic materials
3. Plasticity and flow permanent deformation
4. Combined models
5. The role of temperature, water, etc...

Fracture and Brittle Deformation

1. Types of fractures
2. Failure and fracture criteria
3. Micro defects and failure
4. Fracture termination and interaction
5. Deformation bands and fractures in porous rocks

Day 5

Salt Tectonics

1. Salt tectonics and halokinesis
2. Salt prosperities and rheology
3. Salt diapirism in the extensional regime
4. Salt diapirism in the contrational regime

Balancing and Restoration

1. Basic concepts
2. Restoration of geologic sections
3. Restoration in three dimensions

Carbonate Reservoir Geology

UHUGL003



This course is designed for participants to develop their skills in understanding the geometry and petrophysical characteristics of carbonate reservoirs. Depositional fabric, grain type and size and subsequent diagenetic modifications are the major controls on carbonate reservoir behaviour. The course demonstrates the value of the reservoir model in volumetric assessment and development of carbonate reservoirs. Extensive practical sessions can utilise your own data or Robertson CGG Company's extensive non-exclusive data.

This course is designed for petroleum geologists, explorationists, petrophysicists, geophysicists, and engineers involved with exploration of carbonate plays and development of carbonate reservoirs.

Course Objectives:

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

- Recognise and model controls on reservoir quality and pore systems, including diagenesis and fracturing.
- Understand and apply carbonate seismic stratigraphy and sequence stratigraphy.
- Interpret log responses.

Course Content:

- Carbonate reservoirs
- The reservoir model - depositional and diagenetic characteristics
- Carbonate diagenesis
- Carbonate sequence stratigraphy
- Log response in carbonate rocks
- Reservoir assessment

Related Courses:

- Sequence Stratigraphy
- Reservoir Engineering

Duration

5 Days

Level

Intermediate

Programme Schedule

Day 1

Introduction to Carbonate Sedimentology

1. Environmental factors controlling carbonates
2. The carbonate factory and complexity of pore systems
3. Regional variations in distribution

Constituent Components of Carbonates

1. Carbonate mineralogy
2. Skeletal grains
3. Non-skeletal grains
4. Carbonate mud

Environmental Analysis

1. Classification of carbonates
2. Ichnology and ecology
3. Carbonate facies and depositional models

Classification of Carbonate Platforms

1. Platform models
2. Shelf-ramp models
3. Other platform models
4. Genetic classification of platforms

Day 2

Depositional Environments

1. Paleogeography and depositional evolution

Aeolian and Lacustrine Facies

1. Characteristics of aeolian facies
2. Economic importance
3. Characteristics of lacustrine facies
4. Economic importance

Barrier Shoals and Lagoons

1. Shelf facies in core and thin-selection
2. Shelf facies diagenesis
3. Reservoir potential

Day 3

Reef Models and Play Types

1. General characteristics and classification
2. Processes controlling formation
3. Reef diagenesis
4. Reservoir potential

Pelagic and Redeposited Carbonates

1. Pelagic/planktonic sediments
2. Redeposited sediments
3. Diagenesis
4. Reservoir potential

Carbonates Through Time

1. Changes through time
2. Patterns of evolution through time
3. Responses to sea level variation

Diagenesis and Fracturing

1. Carbonate mineralogy
2. Porosity: creation, reduction, changes and trends
3. Karstification and other mineral cements

Day 4

Karstic Plays

1. Features of subaerial exposure, karst and caliche
2. Recognition of surfaces using seismic and logs

Sequence Stratigraphy – Basic Concepts

1. Facies analysis and lithostratigraphy
2. Chrono and biostratigraphy
3. Seismic and sequence stratigraphy

Carbonate and Evaporite Sequence Stratigraphy

1. Principles of carbonate sequence stratigraphy
2. Principles of evaporate/carbonate cycle sequence stratigraphy

Day 5

Carbonate Seismic Stratigraphy

1. Principles of seismic stratigraphy
2. Examples of carbonate sequences on seismic

Integrating Well Data

1. Rock data – cuttings and cores (sedimentology, analysis, and SCAL)
2. Wireline logs
3. Well testing and the roles of specialists

Carbonate Reservoirs

1. Variety of pore types and relation to permeability
2. Fracture porosity
3. Wettability and capillary pressure

Development Geology

UHUGL004



The course will demonstrate how the appropriate use of geological information can lead to better management decisions and thus improve the value of oil & gas projects.

This course is designed as an introductory course for new hire graduate geologists, geophysicists, or engineers with limited experience of hydrocarbon exploration.

Course Objectives:

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

- Have a clear understanding of the terminology and jargon used by petroleum geologists.
- Understand the sources and reliability of various types of geological information.
- Know what geological questions to ask in order to gain an understanding of the cost, and analyse risk critical elements, of a petroleum project.
- Have the confidence to conduct a basic technical conversation with a petroleum geologist.
- Have an idea of where to look to continue to increase their geological understanding.
- Critically read press releases and simple geological reports.

Course Content:

- Basic rock forming processes
- Time and dating of geological events
- Fundamentals of maps and sections
- Characteristics of petroleum accumulations
- Sedimentary depositional environments
- The process of petroleum exploration
- Geological information from wells
- Fundamentals of production geology
- Managing geological uncertainty
- Field development concepts
- Concepts of reserves

Related Courses:

- Geology Operations
- Basic Structural Geology

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Basic Rock Forming Processes

1. Classification and origin of rocks
2. Burial, lithification and diagenesis

Time & Dating of Geological Events

1. How rocks are dated (absolute and relative time)
2. Importance of time in rock formation and deformation
3. Significance of unconformities
4. Lithostratigraphy and chronostratigraphy
5. Understanding a stratigraphic column

Day 2

Fundamentals of Maps and Sections

1. Concepts of strike and dip
2. Isochores and isopachs
3. Key characteristics of maps and sections
4. Mapping structure and stratigraphy (exercise)

Characteristics of Petroleum Accumulations

1. Nature and origin of traps, sources, seals and reservoirs
2. Structural and stratigraphic traps
3. Petroleum systems
4. Generating leads and prospects (exercise)

Day 3

Sedimentary Depositional Environments

1. Types and origins of sedimentary rocks (clastics and carbonates)
2. Major depositional environments and their importance to exploration
3. Characteristics and distribution of source rocks, reservoirs and seals
4. Facies mapping and palaeogeography

The Process of Petroleum Exploration

1. Basin, play and prospect analysis
2. Remote sensing and the basics of seismology
3. Generating and evaluating prospects
4. Depth converting seismic sections (exercise)

Day 4

Geological Information from Wells

1. Brief overview of drilling and well completion procedures
2. Drilling procedures
3. Sources and reliability of well data (mud logging, well logging, testing)
4. Coring and core analysis
5. Working with well logs
6. Simple well log analysis (exercise)

Fundamentals of Production Geology

1. Role of the production geologist
2. Sources and reliability of information
3. Reservoir geology and approaches to reservoir modeling

Day 5

Managing Geological Uncertainty

1. Prospect risking and ranking
2. Deterministic versus probabilistic approaches to volumetrics

Field Development Concepts

1. Key features of producing reservoirs
2. Reducing uncertainty through appraisal drilling

Concepts of Reserves

1. Sourcing and quantifying uncertainty
2. Definitions of reserves
3. Approaches to reserves estimation

Geology Operations

UHUGL005



The course will look at what information is gathered during drilling from wellsite geology, mud logging and petrophysical logs, and how it is used. At the end of this course, participants are expected to have an understanding of how petroleum is formed, how it migrates and how it is trapped, and of the principles of rotary drilling and the mud circulation system.

This course is designed for exploration, development, well site and operations geologists.

Course Objectives:

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

- Know the information that is obtained during the drilling of a well, its purpose and limitations.
- Know how that information is used to monitor well progress, make decisions during drilling, and mitigate risks, thereby maximizing the company's return on its investment.
- Understand how formation pressure is generated, how it can be predicted, and what can go wrong if it is not properly understood and managed.

Course Content:

- Wellsite geology
- Mud logging
- Petrophysical logs
- Cased hole logging
- Pressure detection
- Coring
- Well testing
- Deep and ultra deep water wells

Related Courses:

- Mud Logging
- Cased-Hole Logging

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction

1. Classes of wells in the petroleum value chain
2. Historical context
3. The stimulus to drilling in challenging environments

Wellsite Geology

1. Well prognoses
2. Functions of the wellsite geologist
3. The information flow, decision making

Mud Logging

1. Traditional mud logging: drilling parameters, oil & gas shows, detection of H₂S and CO₂, pressure detections, lithological description, and sample collections
2. Advanced Mud Logging (AML): "Archie's Dream" and new technologies
3. Modern ultra-deviated well technologies, and bio-steering and geo-steering in modern high-angle wells

Day 2

Petrophysical Logs

1. The logging environment – flushing and invasion
2. Open hole logs: GR, caliper, resistivity and SP, acoustic, neutron and density logs; their operation and response to different lithologies and fluids
3. Cased-hole logging
4. MWD and LWD, the developments and the latest technologies, and integration of the mud-log with MWD and LWD
5. Log analysis of complex lithologies, such as limestone-dolomite mixtures and shale sands

Day 3

Pressure Detection

1. Definition of terms and units – formation pressure, abnormal pressure, geopressured, fracturing gradients
2. Origins of formation pressure, including overpressure and underpressure
3. Pressure prediction ahead of drilling
4. Pressure detection and measurement during drilling

Day 4

Coring

1. Why we cut cores, core types and core analytical programmes
2. Coring methods, including preservation techniques – waxing and freezing

Well Testing

1. Why we test the well and the information we expect to gather
2. Wire-line testing, open hole drill stem testing, cased-hole testing

Day 5

Deep and Ultra-Deep Water Wells

1. Definitions of deep and ultra-deep water and wells
2. Sixth generation of MODUs (Mobile Offshore Drilling Units): construction, characteristics, how they are crewed, and their operation
3. The hazards in drilling today's ultra-deep water wells and ultra-deep wells (HPHT) and how to evaluate, mitigate, and control them
4. Constructing the well and formation evaluation plan for the new era

Integrated Field Development Planning for Offshore Fields

UHUGL006



This course is designed with the intention of demonstrating the degree of integration necessary in developing an offshore petroleum discovery, from field appraisal to development. The course gives a comprehensive account of the methodology, processes and techniques utilized in developing an offshore oil or gas discovery.

This course is designed for project managers, field development and planning engineers, asset managers, petroleum engineers, reservoir engineers, as well as field geoscientists and managers who have an interest in, or are involved in, field development feasibility and planning.

Course Objectives:

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

- Have a comprehensive understanding of key aspects of offshore field development, from appraisal through to development planning, and leading up to sanctions.
- Understand the three key elements: reservoirs, wells and facilities; and the integration of these elements with commercial aspects, and the required management aspects, including uncertainty and risk.

Course Content:

- Reservoir properties, characterization and behavior
- Well options, design and selection
- Facilities concepts
- Integrated field development planning
- Gasfield and deepwater development

Related Courses:

- Reservoir Engineering
- Well Integrity

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Reservoir Properties, Characterization and Behavior

1. Introduction to development planning
2. Field appraisal
3. Reservoir performance and recovery factors
4. Field appraisal

Day 2

Well Options, Design and Selection

1. Horizontal and multilateral wells
2. Artificial lift
3. Well performance analysis

Day 3

Facilities Concepts

1. Overview and basis of design
2. Fixed structures
3. Subsea options

Day 4

Integrated Field Development Planning

1. Project feasibility and management
2. Resources and reserves estimation and management
3. Project economic evaluation
4. Risk management

Day 5

Gasfield and Deepwater Development

1. Gasfield development
2. Introduction and how to monetise gas
3. Gas well performance
4. Gas reservoir performance
5. Facilities considerations
6. Production profiles and contracts

Deepwater Development

1. Location and geology
2. Challenges
3. Facilities overview

Integrated Sequence Stratigraphy

UHUGL007



This course is designed to introduce participants to the concepts of sequence stratigraphy. It ranges from a review of the development of this discipline, to the principles behind the theory, examples of its application to the prediction of lithofacies and stratal architecture.

This course is designed for explorationists, geologists, stratigraphers and geophysicists who wish to extend their knowledge through integration of seismic sequence stratigraphy, with well log sequence stratigraphy and the application of biostratigraphy to sequence stratigraphy.

Course Objectives:

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

- Understand sequence stratigraphic concepts and controls.
- Identify system tracts and stratigraphic sequences from depositional facies, well logs and seismic facies.
- Construct a sequence stratigraphic model by integrating lithological, biostratigraphical, seismic and well data.

Course Content:

- Introduction to sequence stratigraphy
- Principles of stratigraphic analysis
- Seismic geometries
- The sequence stratigraphic model
- Sequence formation
- Depositional architecture
- Seismic stratigraphy and well log interpretation
- Sedimentary processes
- Depositional environment
- Sequence stratigraphy and sea level change
- Clastic sedimentology and sequence stratigraphy
- Carbonate sedimentology and sequence stratigraphy

Related Courses:

- Seismic Stratigraphy and Well Log Interpretation
- Carbonate Sedimentology
- Sequence Stratigraphy

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Methods for Analysis of Sedimentary Basins

1. Well log sequence stratigraphy
2. Systems tract and sequence identification in well logs
3. Integration of well and paleontological data
4. Biostratigraphy and implications for sequence stratigraphy
5. Lithostratigraphic and biostratigraphic expression of sequences and systems tracts

Day 2

Controls on Deposition in the Sedimentary Rock Record

1. The building blocks of sequence stratigraphy
2. Orders of cyclicity
3. Parasequences and cycles
4. Stacking patterns
5. System tracts and important surfaces

Day 3

Seismic Stratigraphy

1. Methodology
2. Seismic facies

Day 4

Sequence Stratigraphy in Siliciclastic Depositional Systems

1. Fluvial
2. Paralic (shelfal)
3. Deep marine

Day 5

Sequence Stratigraphy of Carbonate Systems

1. Concepts and controls
2. Systems tracts and geometry
3. Sequence stratigraphy of evaporitic systems
4. Sequence stratigraphy and petroleum exploration

Introduction to the Oil & Gas Industry

UHUGL008



This course will provide a comprehensive and clear understanding of the technical and commercial operation of the oil & gas industry. The course will look at the industry principles, such as: exploration and production, geology, transportation, storage, prices, and legal and commercial systems.

This course is designed for new executives to the industry, commercial managers, various engineering disciplines, HR managers, marketing, sales, legal and commercial managers.

Course Objectives:

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

- Understand the oil & gas chain, and learn how industry and departments work and integrate together in the company.
- Know new terminology in the oil and gas industry, and improve communication between departments in the company.
- Understand the current technical, commercial and operational issues.
- Be familiar with all engineering and development aspects of the industry.
- Be familiar with various geological and geophysical exploration methods.
- Be able to explain the principal objectives and some key challenges in the petroleum industry.

Course Content:

- Oil & gas industry overview
- Oil & gas geology
- Exploration phase
- Drilling operations
- Conventional and unconventional oil and gas resources
- Formation evaluation
- Well completion
- Oil & gas production facilities
- Reservoir management
- Pipeline and other transportation modes
- Gas storage facilities
- Fundamentals of LNG production and transportation
- Crude oil refinery production and processes
- Commercial & legal issues
- Oil & gas prices' volatility
- Oil & gas trading and transportation
- Roles of NOC, IOC, I-NOC

Related Courses:

- Oil and Gas Production Engineering
- Exploration & Production Logistics
- Oil Supply and Trading

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Overview of the Oil & Gas Industry

1. The main value creation steps: from exploration to end-user products
2. Upstream, midstream, and downstream sectors
3. Geographical distribution of resources
4. Main consumption markets
5. Industry and market participants
6. Important industry trends

Day 2 and 3

Upstream Sector

1. Origins of oil & gas
2. Physical and chemical quality characteristics of oil & gas
3. Conventional and unconventional oil & gas resources
4. Obtaining commercial access to resources
5. Creating value by locating oil & gas reservoirs
6. Creating value by turning resources into bookable reserves
7. Basics of oil & gas production
8. Enhancing the value of mature resources
9. Arrangements for the sharing of risk, investment, and rewards
10. Roles of national oil companies and independent oil companies

Day 4

Midstream Sector

1. Marine transportation of oil
2. Pipeline and other oil transportation methods
3. Oil storage logistics
4. Creating value by getting gas to market
5. Fundamentals of LNG production and transportation
6. Gas pipeline operations
7. Gas storage facilities
8. Creating value through the use of transportation and storage
9. Wholesale trading of crude oil, LNG, and natural gas

Day 5

Downstream Sector

1. Refining processes and the main petroleum products
2. Economics of refinery operations
3. Blending and storage of refined products
4. Biofuels and additives
5. Regulation of end-user markets
6. Retail and wholesale marketing for transport fuels
7. Retail and wholesale marketing of natural gas
8. Lubricants, asphalt, and other specialty oil products
9. Overview of petrochemical markets
10. Trading of refined products

Introduction to Reservoir Characterization and Modelling

UHUGL009



This course will cover the road map (workflow) used in data preparation and data analysis to build a coherent 3D static model of the reservoir; how geological, petrophysical, seismic, rock properties (SCAL) and dynamic data are integrated in a consistent manner using judicious techniques.

This course is designed for geologists, geophysicists or engineers with 5-7 years of experience. It assumes some basic geoscience and engineering knowledge, but no prior hands-on experience of 3D modelling techniques is required.

Course Objectives:

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

- Understand the integration between static and dynamic data in a coherent and consistent manner.
- Use geological and petrophysical information to understand the depositional environments and the diagenetic processes that affect the rock fabric.
- Characterise the reservoir rock types using mercury injection capillary pressure (MICP) and SCAL data.
- Build a geological framework with a zonation scheme that honours the flow units. Understand how to integrate seismic and faults in the reservoir framework.
- Use deterministic and stochastic algorithms to propagate petrophysical properties in three-dimensions and generate equi-probable realisations.
- Build a saturation model honouring capillary pressures by reservoir rock types and fluid contacts.
- Learn the process of ranking realisations and perform averaging and upscaling of properties.
- Perform volumetric calculations and quantify the uncertainties. Produce P90, P50 and P10 models ready for flow simulation studies.

Course Content:

- Geoscience aspects
- Petrophysical & seismic aspects
- Rock fabric
- Lab data
- Rock-fluid interaction, flow units, geostatistics

Related Courses:

- Introduction to Petrophysics

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Geoscience Aspects

1. Review of sedimentology
2. Diagenesis
3. Pore systems
4. Sequence stratigraphy

Petrophysical & Seismic Aspects

1. Petrophysical review
2. Seismic inputs required to reservoir description

Day 2

Rock Fabric

1. Review of carbonate textures
2. Pore systems
3. Pore throat sizes in line with diagenetic processes

Lab Data

1. Detailed explanation of MICP and its use in rock fabric characterization
2. Review SCAL, NMR, R35 to qualify the different rock fabrics

Day 3

Rock-Fluid Interaction

1. Review wettability, Kr curves, OWC-FWL differences
2. Sensitivity analysis on saturation-height modelling

Flow Units

1. Review zonation
2. Layering
3. Flow unit concepts
4. k/phi
5. FZI
6. Lorenz Plots and the use of flowmeters for validation
7. Introduction to the concept of fracture corridors and fracture modelling

Day 4

Geostatistics

1. Univariate and bivariate statistics
2. PDFs
3. CDFs
4. Cv and spatial statistics
5. Evaluate variogram models (Spherical, Exponential, Gaussian) and the effect of their parameters (range and nugget) on model results

Day 5

3D modeling

1. Comparison of estimation and simulation approaches handling discrete
2. Continuous data
3. Inverse distance
4. Kriging
5. Collocated co-kriging, Gs, SIS and co-simulation techniques

Play Fairway Mapping & Exploration Strategy

UHUGL010



This course is designed to develop the participant's knowledge of the various forms of geological data and establish methods to integrate this data and construct play fairway maps. These play maps, in addition to simple exploration statistics, are then used to develop exploration strategies. This is a 'hands on' team-based course using real data and examples.

This course is designed for geologists, geophysicists, or engineers with limited experience in play map-based hydrocarbon exploration.

Course Objectives:

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

- Know what petroleum systems and play fairways are.
- Understand the key elements of the petroleum system, reservoir, source, seal, trap and timing.
- Identify key reservoir and source depositional environments using core logs and wireline log motifs.
- Have knowledge of the hydrocarbon habitat, and the stages of exploration, exploration, appraisal and production.
- Know how the geology and geophysics team determines where to look for hydrocarbons.
- Organise well data and correlate wells.
- Construct gross depositional environment (GDE) maps.
- Make play maps from GDE maps.

Course Content:

- Petroleum systems / play fairways
- Common risk segment mapping
- Basic petroleum exploration
- Well data organisation
- Mapping
- Exploration statistics analysis
- Appraisal and development geology

Related Courses:

- Development Geology
- Geology Operations

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Petroleum Systems/Play Fairways

1. Using regional geology to define basin type, source, and reservoir distribution
2. Data preparation and organisation
3. Defining stratigraphy relative to geological data
4. Dry hole analysis
5. Gross Depositional Environment (GDE) mapping

Day 2

Basic Petroleum Exploration

1. Play systems
2. Depositional systems
3. Source rock distribution
4. Reservoir quality

Day 3

Well Data Organization

1. Well data organisation
2. Well correlation
3. Organise poorly presented and inconsistent data
4. Confirmation formation tops
5. Where is my play level?

Day 4

Mapping

1. Construct GDE maps from organized well data
2. From the GDE maps, risk and then play maps are produced

Value

1. Calculating block value and realising the value of a newly available 'bid' block

Day 5

Exploration Statistics Analysis

1. Regional geology and region ranking theory

Appraisal and Development Geology

1. What happens after a commercially successful exploration well is drilled?



These courses have been designed for participants at various competency levels: Basic – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Fundamentals of Seismic Processes* and *Exploration Geophysics* courses are considered fundamentals, and are designed to be a prerequisite for new geophysicists. For participants looking to increase their knowledge levels, the *Seismic Data Interpretation* and *Seismic Attributes* and *AVO Analysis* courses are recommended. The *Advanced Seismic Data Processing* course is designed for participants seeking to increase their skill level.

Section Courses

1. Advanced Seismic Data Processing
2. Development Geology
3. Exploration Geophysics
4. Fundamentals of Seismic Processes
5. Introduction to the Oil & Gas Industry
6. Introduction to Petrophysics
7. Seismic Acquisition and Processing
8. Seismic Attributes and AVO Analysis
9. Seismic Data Interpretation



Advanced Seismic Data Processing

UHUGP001



This course deals with advanced processing methods that are often carried out as part of a special study, and involve the integration of data acquisition, processing and interpretation, as well as petrophysics, production geology and reservoir engineering.

This course is designed for exploration and production managers geoscientists and reservoir engineers, as well as professionals involved in seismic processing or dealing with results of processed seismic data.

Course Objectives:

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

- Have a working knowledge of the full range of representative special processing methods.
- Account for geophysical input in a multi- disciplinary team.

Course Content:

- Modern seismic data acquisition
- Fundamentals of seismic prospecting
- Reflection field equipment
- Basics of 2D survey design
- Basics of 3D survey design
- Reflection field layout
- Reflection field method for land survey
- Seismic data processing

Related Courses:

- Seismic Data Processing and Interpretation

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction

1. Historical perspective
2. Milestones in the seismic industry

Modern Seismic Data Acquisition

1. Land data acquisition
2. Marine data acquisition
3. Transition – zone recording

Fundamentals of Seismic Prospecting

1. Seismic wave fundamentals
2. Characteristics of seismic events
3. Seismic noise

Day 2

Reflection Field Equipment

1. Seismic sources
2. Seismic receivers
3. Seismic instrumentation

Basics of 2D Survey Design

1. Basic concepts in 2D surveys

Basics of 3D Survey Design

1. Why 3D seismic survey?
2. Basic concepts in 3D surveys
3. 3D survey design sequence
4. Land 3-D layouts

Day 3

Reflection Field Layout

1. Split-dip and common midpoint recording
2. Spread types
3. Arrays
4. Resolution

Reflection Field Method for Land Surveys

1. The seismic field party
2. Seismic data acquisition
3. 2D survey parameters
4. 3D survey parameters
5. Experimental surveys
6. 2D survey parameters
7. 3D survey parameters

Day 4

Seismic Data Processing

1. Why processing?
2. Seismic data processing
3. Objectives of data processing
4. Basic data processing sequence

Seismic Data Processing Stage 1

1. Preprocessing
2. Sorting
3. Filtering

Day 5

Seismic Data Processing Stage 2

1. Convolutional model
2. De-convolution
3. De-convolution methods
4. Deterministic de-convolution
5. Statistical de-convolution

Seismic Data Processing Stage 3

1. Velocity analysis
2. Normal move out corrections
3. Dip move out corrections
4. Residual statics corrections

Seismic Data Processing Stage 4

1. Stacking
2. Time variant filtering
3. Migration

Development Geology

UHUGP002



The course will demonstrate how appropriate use of geological information can lead to better management decisions, and thus improve the value of oil and gas projects.

This course is designed as an introductory course for new hire graduate geologists, and geophysicists or engineers with limited experience of hydrocarbon exploration.

Course Objectives:

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

- Have a clear understanding of the terminology used by petroleum geologists.
- Understand the sources and reliability of various types of geological information.
- Know what geological questions to ask in order to gain an understanding of the cost, and analyse risk, of critical elements of a petroleum project.
- Conduct a basic technical conversation with a petroleum geologist.
- Know where to look to continue to increase their geological understanding.

Course Content:

- Basic rock forming processes
- Geological time and dating geological events
- Fundamentals of maps and sections
- Characteristics of petroleum accumulations
- Sedimentary depositional environments
- The process of petroleum exploration
- Geological information from wells
- Fundamentals of production geology
- Managing geological uncertainty
- Field development concepts
- Concepts of reserves

Related Courses:

- Geology Operations
- Basic Structural Geology

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Basic Rock Forming Processes

1. Classification and origin of rocks
2. Burial, lithification and diagenesis

Geological Time and Dating Geological Events

1. How rocks are dated (absolute and relative time)
2. Importance of time in rock formation and deformation
3. Significance of unconformities
4. Lithostratigraphy and chronostratigraphy
5. Understanding a stratigraphic column

Day 2

Fundamentals of Maps and Sections

1. Concepts of strike and dip
2. Isochores and isopachs
3. Key characteristics of maps and sections
4. Mapping structure and stratigraphy

Characteristics of Petroleum Accumulations

1. Nature and origin of traps, sources, seals and reservoirs
2. Structural and stratigraphic traps
3. Petroleum systems
4. Generating leads and prospects

Day 3

Sedimentary Depositional Environments

1. Types and origins of sedimentary rocks (clastics and carbonates)
2. Major depositional environments and their importance to exploration
3. Characteristics and distribution of source rocks, reservoirs and seals
4. Facies mapping and palaeogeography

The Process of Petroleum Exploration

1. Basin, play and prospect analysis
2. Remote sensing and the basics of seismology
3. Generating and evaluating prospects
4. Depth converting seismic sections

Day 4

Geological Information from Wells

1. Brief overview of drilling and well completion procedures
2. Drilling procedures
3. Sources and reliability of well data (mud logging, well logging, testing)
4. Coring and core analysis
5. Working with well logs
6. Simple well log analysis

Fundamentals of Production Geology

1. Role of the production geologist
2. Sources and reliability of information
3. Reservoir geology and approaches to reservoir modeling

Day 5

Managing Geological Uncertainty

1. Prospect risking and ranking
2. Deterministic versus probabilistic approaches to volumetrics

Field Development Concepts

1. Key features of producing reservoirs
2. Reducing uncertainty through appraisal drilling

Concepts Of Reserves

1. Sourcing and quantifying uncertainty
2. Definitions of reserves
3. Approaches to reserves estimation

Exploration Geophysics

UHUGP003



This course covers geophysical methods in petroleum exploration and development, basic principles upon which seismic method is used, seismic reflection surveys in great depth, and various aspects of seismic reflection methods.

This course is designed for geologists, geophysicists and reservoir engineers.

Course Objectives:

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

- Understand geophysical methods.
- Understand seismic reflection.
- Know explanations of particular methods.

Course Content:

- Geophysical methodology
- Seismic procedures
- Electrical and electromagnetic methods
- Gravity techniques
- Subsurface geophysical methods
- Airborne geophysical methods
- Remote sensing
- Engineering vibration investigations

Related Courses:

- Fundamentals of Seismic Processes

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Geophysical Methodology

1. Uses of geophysical surveys

Seismic Procedures

1. General seismic methods
2. Seismic refraction
3. Shallow seismic reflection
4. Surface wave methods
5. Sub-bottom profiling

Day 2

Electrical and Electromagnetic Methods

1. Self-potential methods
2. Equipotential and resistivity methods
3. Induced polarization
4. Time-domain electromagnetics
5. Techniques for resistivity
6. Sounding
7. Frequency-domain electromagnetic methods
8. Terrain conductivity
9. Metal detector surveys
10. Ground-penetrating radar

Day 3

Gravity Techniques

1. Applications
2. Noise evaluation
3. Rock properties
4. Field work

Subsurface Geophysical Methods

1. General in-hole logging procedures
2. General crosshole procedures
3. Surface to borehole procedures

Day 4 and 5

Airborne Geophysical Methods

1. Scope of airborne investigations
2. Airborne geophysical measures

Remote Sensing

1. Capabilities of remote sensors
2. Characteristics of various remote sensors
3. Remote sensor data
4. Sources and characteristics of available and historic data
5. Data set procurement and merging

Engineering Vibration Investigations

1. Earthquake-resistant design
2. Vibration concerns
3. Acoustic emissions
4. Non-destructive testing

Fundamentals of Seismic Processes

UHUGP004



This course covers the entire seismic process from acquisition, through processing to interpretation, the strengths and limitations of the seismic method, the meaning of seismic sections, maps and other products, and an overview of the latest developments in seismic technology.

This course is designed for new geophysicists, geologists, reservoir engineers who liaise with geophysicists, and seismic interpreters with no processing background.

Course Objectives:

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

- Understand the strengths and limitations of the seismic method, and the costs and risks involved.
- Understand the meaning of seismic maps and sections, and know how to judge the quality and limitations of these important exploration tools.
- Have an overview of the latest developments in seismic technology.

Course Content:

- The seismic method
- Seismic theory
- Seismic experiments
- Seismic data acquisition
- Seismic processing
- AVO
- VSP
- 4D
- Shear wave surveys
- Seismic interpretation

Related Courses:

- Basics of Geophysics
- Seismic Interpretation

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction

1. Role and value of seismic data in the E & P chain
2. Overview of the seismic method
3. A simple seismic experiment

Simplified Seismic Theory

1. Elastic waves
2. Wave fronts and ray paths
3. Acoustic impedance – reflection, amplitude and phase
4. Where reflections come from – primary vs multiple
5. Rock properties (especially velocities)
6. Synthetic seismograms

Day 2

Seismic Data Acquisition

1. Common Midpoint Stacking (CMP) technique
2. Field layout - land and marine
3. Seismic sources and source arrays
4. Seismic receivers, arrays and other recording gear
5. 2D, 3D and 4D acquisition geometries and procedures

Day 3 and 4

Seismic Processing Without the Maths

1. Pre-processing
2. Bandwidth and phase of seismic data
3. Frequency filtering
4. Statics and datum corrections
5. Deconvolution
6. Velocity analysis and velocity jargon
7. Residual statics and post-stack processing
8. Seismic migration
9. Seismic data display

Special Topics

1. Seismic inversion
2. AVO: Amplitude vs offset - angle stacks
3. VSP: Well seismic - types of VSP
4. 4D: Time-lapse seismic monitoring
5. Shear wave surveys

Day 5

Seismic Interpretation

1. Structural interpretation
2. Seismic stratigraphy
3. Stratigraphic interpretation
4. Seismic attributes
5. Depth conversion
6. Direct hydrocarbon indicators (DHIs)

Introduction to the Oil & Gas Industry

UHUGP005



This course will provide a comprehensive and clear understanding of the technical and commercial operation of the oil & gas industry. The course will look at the industry principles such as: exploration & production, geology, transportation, storage, prices, legal and commercial systems.

This course is designed for new executives to the industry, commercial managers, various engineering disciplines, HR managers, marketing, sales, and legal & commercial managers.

Course Objectives:

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

- Understand the oil & gas chain and know how departments work and integrate together in the company.
- Know new terminology in the oil & gas industry and improve communication between departments in the company.
- Understand the current technical, commercial, and operation issues.
- Be familiar with all engineering and development aspects of the industry.
- Be familiar with various geological and geophysical exploration methods.
- Explain the principal objectives and some key challenges in petroleum industry.

Course Content:

- Oil & gas industry overview
- Oil & gas geology
- Exploration phase
- Drilling operations
- Conventional and unconventional oil & gas resources
- Formation evaluation
- Well completion
- Oil & gas production facilities
- Reservoir management
- Pipeline and other transportation modes
- Gas storage facilities
- Fundamentals of LNG production and transportation
- Crude oil refinery production and processes
- Commercial & legal issues
- Oil & gas prices volatility
- Oil & gas trading and transportation
- Roles of NOC, IOC, I-NOC

Related Courses:

- Oil & Gas Production Engineering
- Exploration & Production Logistics
- Oil Supply and Trading

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Overview of the Oil & Gas Industry

1. The main value creation steps from exploration to end-user products
2. Upstream, midstream and downstream sectors
3. Geographical distribution of resources
4. Main consumption markets
5. Industry and market participants
6. Important industry trends

Day 2 and 3

Upstream Sector

1. Origins of oil & gas
2. Physical and chemical quality characteristics of oil & gas
3. Conventional and unconventional oil & gas resources
4. Obtaining commercial access to resources
5. Creating value by locating oil & gas reservoirs
6. Creating value by turning resources into bookable reserves
7. Basics of oil & gas production
8. Enhancing the value of mature resources
9. Arrangements for sharing of risk, investment and rewards
10. Roles of national oil companies and independent oil companies

Day 4

Midstream Sector

1. Marine transportation of oil
2. Pipeline and other oil transportation modes
3. Oil storage logistics
4. Creating value by getting gas to market
5. Fundamentals of LNG production and transportation
6. Gas pipeline operations
7. Gas storage facilities
8. Creating value through the use of transport and storage
9. Wholesale trading of crude oil, LNG and natural gas

Day 5

Downstream Sector

1. Refining processes and the main petroleum products
2. Economics of refinery operations
3. Blending and storage of refined products
4. Biofuels and additives
5. Regulation of end-user markets
6. Retail and wholesale marketing of transport fuels
7. Retail and wholesale marketing of natural gas
8. Lubricants, asphalt and other specialty oil products
9. Overview of petrochemicals markets
10. Trading of refined products

Introduction to Petrophysics

UHUGP006



This course addresses the fundamental tenets of petrophysics and formation evaluation, using integrative perspective of multiple datasets; including geological, geophysical, logging and core data.

This course is designed for geologists, geophysicists, log and/or core analysts, exploration & production managers, and reservoir engineers.

Course Objectives:

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

- Understand vital aspects such as volume of shale/ clay, porosity, permeability, and water saturation determinations.
- Select tool combinations to resolve key issues and for specific applications.
- Assess uncertainty in petrophysical measurements and techniques and its influence on reserve estimation.

Course Content:

- Petrophysical analysis
- Rock and fluid properties
- Aspects of drilling and logging
- Core and log analysis
- Seismic petrophysics

Related Courses:

- Fundamentals of Seismic Processes
- Basics of Drilling

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1 and 2

Introduction

1. Petrophysical analysis and formation evaluation
2. Integrated core and log analyses

Day 3 and 4

Rock and Fluid Properties

1. Classification and identification of clastic and chemical sedimentary rocks
2. Impact of weathering, burial, and lithification on sedimentary rocks
3. Cement types and origin
4. Porosity and permeability
5. Impact of grain arrangements, matrix materials, and fluid types
6. Water saturation determination
7. Pressure analysis

Aspects of Drilling and Logging

1. Mud logging
2. Core acquisition and interpretation
3. Wireline and LWD logging and imaging
4. Analogue studies

Day 5

Core and Log Analysis

1. Gamma ray log analysis
2. Porosity log analysis (density, neutron porosity, and sonic)
3. Resistivity log analysis and water saturation
4. Acoustic log analysis (compressional, shear, and Stonely waves)
5. Nuclear magnetic resonance
6. Azimuthal (image) log analysis
7. Calibration of core and log data

Seismic Petrophysics

1. Seismic versus log comparison and data integration
2. Seismic attribute analysis

Seismic Acquisition & Processing

UHUGP007



This course covers acquisition, processing, imaging and extraction of geologic and petrophysical information and pitfalls that effect the interpretation and integration of seismic data and information into E&P workflow.

This course is designed for geophysicists and experienced seismic interpreters.

Course Objectives:

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

- Have a practical understanding of seismic data acquisition and processing.
- Know the principles involved in imaging geologic structures and properties with seismic data, and parameters that affect seismic data quality, cost, and interpretation accuracy.
- Determine whether seismic data has been recorded and processed correctly.
- Apply quality assurance steps.

Course Content:

- Introduction to acquisition and processing
- Seismic wave propagation
- Survey design
- Acquisition geometry
- Data processing factors
- Prestack and velocity analysis
- Statics
- Migration and processing strategies and pitfalls

Related Courses:

- Basic Reservoir Geology
- Introduction to Seismic Processes

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Acquisition and Processing

1. Interpreting seismic data
2. Issues and concerns
3. Basic concepts of seismic surveying

Seismic Wave Propagation

1. Refraction
2. Diffraction
3. Reflection and seismic velocity
4. Properties of seismic wave forms

Day 2

Seismic Reflection Principles

1. Properties of seismic wave forms and traces vertical resolution
2. Lateral resolution amplitude effects

Field Data Acquisition Principles

1. Type of seismic data acquisition
2. Marine
3. Land
4. Borehole
5. OBC
6. Time-lapse
7. Signal and noise
8. Field array design

Day 3

Land Acquisition Systems and Operations

1. Sources
2. Sensors
3. Recording the data

Marine Acquisition Systems and Operations

1. Overall layout
2. Sources
3. Receivers
4. Environmental considerations

Day 4

Data Processing Factors

1. Signal analysis
2. Data conditioning
3. Near-surface distortion
4. Noise attenuation
5. Multiple attenuation
6. Regularization

Day 5

Prestack and Velocity Analysis and Signal Corrections

1. Imaging
2. Velocity model estimation
3. Prestack amplitude analysis
4. Survey design

Seismic Attributes & AVO Analysis

UHUGP008



The understanding and application of AVO and attribute analysis is vital to any seismically driven exploration or development program. This course is for all geoscientists who utilize seismic data in their interpretations. The course will demonstrate key principles and pitfalls related to AVO and seismic attribute analysis including the suitability of seismic data for analysis, preserving amplitudes, properly modeling AVO/AVA and attribute response and matching the predicted response with seismic data, and avoiding pitfalls. These principles control the success or failure of AVO and seismic attributes, and with it the potential success of an exploration program.

This course is designed for interpreters, geophysicists, geologists, technical support personnel, seismic processors, exploration and data processing managers and data acquisition managers.

Course Objectives:

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

- Determine elastic properties from AVO/AVA analysis for fluid and lithologic discrimination.
- Integrate well data through seismic inversion techniques.
- Know the fundamentals of seismic wave propagation and specific attributes of seismic measurements toward enhanced interpretation and petrophysics.

Course Content:

- Fundamentals of rock physics and seismic interpretation
- Seismic attributes for reservoir characterization
- AVO concepts and related factors
- Hydrocarbon detection using AVO
- AVO analysis for reservoir characterization
- Techniques for interpretation of AVO
- AVO cross-plotting techniques
- LMR, EEI and simultaneous inversion for reservoir characterization
- AVO/LMR/EEI inversion for fluid and fracture identification in carbonate
- Seismic attributes and wave factors
- Decon and scaling effect on attributes
- Time and frequency domain attributes

Related Courses:

- Reservoir Characterization
- Seismic Interpretation
- Seismic Fundamentals

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Review of the Seismic Process

1. Review of seismic fundamentals, including rock physics and aspects of propagating seismic waves
2. General seismic interpretation

Seismic Attributes

1. Various attribute types
2. Multi-attribute analysis

Day 2

AVO Analysis

1. Fundamental principles
2. Applications
3. Pitfalls

Borehole Seismology

1. Borehole seismic measurements
2. Techniques and integration into the seismic petrophysical investigations

Seismic Inversion

1. Examination of techniques and benefits of seismic inversion
2. Prestack (elastic) versus poststack inversion
3. Deterministic versus stochastic (probabilistic) inversion
4. Resultant products, including extraction of physical rock and fluid properties

Day 3 and 4

Enhanced Sedimentologic/Stratigraphic Interpretation from Seismic Attributes

1. Extracting more information of the sediment logic/stratigraphic system
2. Wavelet versus layers
3. Seismic geomorphology
4. Intraformational variations and facies analysis
5. 3D Wheeler diagrams.

Enhanced Fault Interpretation from Seismic Attributes

1. Extracting more fault information from seismic data
2. Extracting more fault information from regional studies to role in reservoir characterization

Seismic Anisotropy Analysis

1. Fracture ID
2. Seismic anisotropy analysis and fracture mapping
3. Stress analysis from seismic data
4. Extraction of stress data for prospect seal risking
5. Wellbore stability investigations
6. Reservoir behavior during production

Day 5

Reservoir Characterization and Understanding Risk

1. The role of seismic data and analysis in integrative studies (well, core, other datasets)
2. Reservoir properties and behavior
3. Risk uncertainties
4. Field development and enhanced recovery

Seismic Data Interpretation

UHUGP009



Seismic data interpretation is an essential tool for oil & gas exploration, and an integral part of field development technologies. The main objective of this course is to provide E&P professionals with knowledge on visualization, integration, and interpretation techniques that have been recently developed for seismic data. The participants will gain a solid understanding of the applications and role of the seismic interpretation in studies that involve post-stack seismic attributes, AVO, seismic sequence stratigraphy, seismic geomorphology, 4D time-lapse seismic, and multidisciplinary integration.

This course is designed for exploration and production managers, geoscientists and reservoir engineers, as well as professionals involved in seismic interpretation or dealing with results of the interpretation of seismic data.

Course Objectives:

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

- Have a basic tool set and workflow interpretation.
- Know the principles underlying the interpretation process.
- Know about volumetric interpretation, amplitude variation with AVO, and time-lapse methods.

Course Content:

- The 3D seismic development
- Physical basis of reflection seismology
- Seismic acquisition and processing
- 2D vs 3D seismic data
- Beginning the interpretation
- Stratigraphic interpretation
- Advanced methods

Related Courses:

- Seismic Acquisition and Processing
- Seismic Attributes and AVO Analysis

Duration
5 Days

Level
Intermediate

Programme Schedule

Day1

3D Seismic Development

1. The modern 3D seismic interpreter
2. Seismic methods – a conceptual framework for interpreters

Physical Basis of Reflection Seismology

1. Introduction
2. Reflection and rock properties
3. Seismic resolution

Day 2 and 3

Seismic Acquisition and Processing

1. 2D seismic acquisition and processing
2. 3D seismic acquisition and processing
3. Reprocessing, post-stack processing
4. Coherency processing

2D vs 3D Seismic Data

1. 2D seismic data
2. 3D seismic data – viewing techniques
3. Use of colour

Beginning the Interpretation

1. Project preparation
2. Velocity information, synthetic seismograms
3. Pitfalls
4. Structural interpretation
5. Picking faults
6. Fault visualization
7. Subtle structures

Day 4 and 5

Depth Conversion

1. Concepts
2. Methods

Stratigraphic Interpretation

1. Sequence stratigraphy
2. Seismic stratigraphy
3. Techniques

Advanced Methods

1. Amplitude Variation with Offset (AVO)
2. Seismic Attributes
3. Time-Lapse (4D) seismic method
4. Multi-component seismic method
5. Seismic inversion



These courses have been designed for participants at various competency levels: Beginner – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Surface Field Production Engineering* and *Production Technology* courses are considered fundamentals, and are designed to be a pre-requisite for new production engineers. For participants looking to increase their knowledge levels, the *Artificial Lift Technology* and *Sand Control* courses are recommended. The *Gaslift Design, Operation, & Troubleshooting* and *Integrated Production Optimization Using NODAL Analyses* courses are designed for participants seeking to increase their skills levels.

Section Courses

1. Artificial Lift Technology
2. Cased-Hole Logging
3. Gaslift Design, Operation & Troubleshooting
4. Integrated Production Optimization Using NODAL Analyses
5. Introduction to the Oil & Gas Industry
6. Production Technology
7. Sand Control
8. Surface Field Production Engineering
9. Well Intervention and Productivity
10. Well Stimulation



Artificial Lift Technology

UHUPD001



Artificial lift refers to the use of artificial means to increase the flow of liquids, such as crude oil or water, from a production well. This course is focused on introducing the design and troubleshooting rod pumping, continuous gas lifts, and electric submersible pump systems. Other methods such as: PCP, plunger lift, jet pump, hydraulic pump, and intermittent gas lifts will also be addressed.

This course is designed for engineers, technicians, field supervisors, and others who select, design, install, evaluate, or operate artificial lift systems.

Course Objectives:

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

- Know strategies and best practices for field production optimization and when and how nodal systems analysis can be applied to lift performance optimization.

Course Content:

- Introduction to types of artificial lift
- Progressing cavity pumping systems
- Hydraulic lift systems
- Gas lift systems
- Plunger lift systems
- Electric submersible pumping systems
- Well completion & profile
- Artificial lift screening
- Geographical & environmental conditions
- Reservoir characteristics
- Reservoir pressure & well productivity
- Characteristics of fluids
- Surface constraints
- Economic considerations
- Best practices for installation and maintenance
- Artificial lift maintenance operations

Related Courses:

- Reservoir Engineering
- Well Completions
- Electric Submersible Pumping Systems

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Fluid Flow Fundamentals

1. Black oil PVT
2. Inflow performance relationships
3. Nodal analysis technology

Day 2

Overview of Artificial Lift

1. Comparison of artificial lift systems
2. Artificial lift analysis using measured data
3. Artificial lift selection

Day 3

Beam (Rod) Pump Systems

1. Surface and subsurface equipment
2. Power requirements
3. Dynamometers and troubleshooting
4. Optimization
5. Exercise for designing a SRP system

Progressive Cavity Pumps System

1. Applications
2. Surface and subsurface equipment
3. Geometry of downhole pumps
4. Fit (interference), viscosity, slip
5. Elastomers
6. Power requirements
7. Exercise for designing a PCP system

Day 4

Electric Submersible Pumps (ESP)

1. Applications, design and selection of ESP's
2. Surface equipment
3. Subsurface equipment
4. Installation and operations

Day 5

Gas Lift Systems

1. Principles of gas lifts
2. Gas lift valves
3. Design and operations
4. Intermittent vs. continuous systems

Cased-Hole Logging

UHUPD002



This course comprehensively covers up-to-date traditional wireline diagnostic techniques for the surveillance of cased wells, cased-hole and production log evaluation, plus a loose-leaf workbook.

This course is designed for petroleum, production and reservoir engineers.

Course Objectives:

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

- Understand the cement tools, basics on data review, and full analyses.
- Understand the corrosion tools; basics on phase shift tools, flux and eddy current, the micro-corrosion tools, data resolution and evaluation.
- Use the open hole production logging – vertical & horizontal wells.
- Understand the monitoring tools; basics and advanced data monitoring.
- Understand the noise logging data and well integrity.

Course Content:

- Cement evaluation
- Acoustic measurements (CBL - VDL)
- Ultrasonic measurements
- Other logs (temperature, etc)
- Corrosion evaluation of casing and tubing
- Origins of the corrosion process in the wells
- Corrosion evaluation
- Multi arms caliper: theory of operation and interpretation
- Electromagnetic and potential measurements
- Ultrasonic logging
- Formation evaluation in cased holes
- Introduction to logs for cased hole formation evaluation
- Pulsed neutron capture logs
- Thermal decay time and absorption log
- Reservoir saturation tool
- Other logs (resistivity, etc.)
- Production logging
- Main characteristics (PVT) of the reservoir fluids (oil and gas)
- Production log record
- Determination of the fluid velocities and the fluid densities in the well
- Pressure and temperature measurements
- Flow characterization and modeling
- Production log interpretation

Related Courses:

- Production Logging
- Production Log Interpretation
- Reservoir Engineering

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction to the Reservoir

1. Basic concepts of reservoir engineering
2. The dynamics of flow in wells
3. Review of the major problems associated with well production
4. Introduction to cement evaluation methods and tools
5. Introduction to corrosion monitoring methods and tools

Day 2

Introduction to Logs for Cased-Hole Formation Evaluation

1. Monitoring saturation through casing
2. Basic ideas and methods including pulsed neutron capture and C/O logging
3. The analysis of data and comparison with open hole
4. Basic production logging sensors and their uses

Day 3

Measurement Methods

1. The analysis of single-phase flow in wells
2. Using basic flowmeter logs
3. The analysis of multi-phase flow using fluid density
4. Hold-up measurements in the classical manner

Day 4

Used Techniques

1. The use of the latest measurements to analyse multi-phase flow
2. Introduction to computer based analysis and evaluation models
3. The use of production logging techniques in horizontal wells

Day 5

Reservoir Saturation Tools

1. The analysis of reservoir problems and basic survey planning to maximize useful information
2. A review of perforation techniques including the choice of the methods

Gaslift Design, Operation & Troubleshooting

UHUPD003



The objective of this course is to provide a comprehensive understanding of artificial lift techniques, types of gas-lift, gas lift completions and maintenance, types of gas lift valves, gas lift design, and the troubleshooting of gas lift techniques.

This course is designed for artificial lift engineers, field supervisors, production engineers and mid-level managers.

Course Objectives:

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

- Know the fundamentals of the gas-lift completion and the lift process.
- Understand inflow and well outflow performance.
- Know how gas-lift valves work and understand gas-lift valve mechanics.
- Design a gaslift completion.
- Complete gas-lift troubleshooting and surveillance.
- Complete liftgas allocation to multiple wells.

Course Content:

- Inflow performance
- Multiphase flow
- Gas properties
- Types of gas-lift
- Gas-lift completions and maintenance
- Gas-lift valve mechanics
- Gas-lift design
- Gas-lift surveillance
- Troubleshooting
- Liftgas allocation

Related Courses:

- Well Completions
- Introduction to Production Engineering
- Surface Field Production Engineering

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction

1. Outline & introductions
2. Artificial lift and gas-lift

Inflow Performance

1. What is inflow performance
2. The straight line PI and the Vogel equation

Multiphase Flow

1. Holdup and slippage
2. Vertical lift performance
3. Gradient curves
4. Empirical correlations and calibration

Gas Properties

1. Gas properties and the Z-factor
2. Gas gradients
3. Volumes stored in gas-lift systems
4. Gas flow through orifices

Day 2 and 3

Types of Gas-Lift

1. Single string completions
2. Dual string completions
3. Intermittent gas-lift

Gas-lift Completions and Maintenance

1. Running, pulling and setting gas-lift valves
2. SPM types
3. Scaling issues

Gas-Lift Valve Mechanics

1. Types of gas-lift valves: unbalanced & balanced
2. Opening / closing pressure
3. Temperature effects
4. Valve setting recommendations
5. Gaslift valve models

Gas-Lift Design

1. Equilibrium curve
2. Depth of the top valve

Day 4 and 5

Gas-Lift Surveillance and Troubleshooting

1. Common problems
2. Use of the two pen recorders and gradient surveys
3. Gas-lift stability

Liftgas Allocation

1. Allocation of liftgas to multiple wells
2. Allocation technique

Integrated Production Optimization Using NODAL Analyses

UHUPD004



The NODAL analysis views the total producing system as a group of components encompassing: reservoir rock, completions (gravel, pack, open/closed perforations, open hole), vertical flow strings, restrictions, multi-lateral branches, horizontal terrain flow lines/risers, integrated gathering networks, compressors, pump stations, metering locations, and market/system rate/pressure constraints.

This course is designed for production, operations, and reservoir engineers, as well as senior technicians and field supervisors with an engineering background.

Course Objectives:

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

- Optimize the process using an integrated approach, including nodal analysis and identification of major pressure losses.
- Identify constraints and propose recommendations for production optimization.

Course Content:

- Introduction to nodal analysis
- Inflow performance
- Completion performance
- Tubing performance
- Flowline performance
- Future performance prediction
- Artificial lift
- Total system optimization
- Software practice sessions

Related Courses:

- Artificial Lift Technology
- Well Completions
- Surface Field Production Engineering

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Overview of the Production System from Reservoir to Surface

1. Production system and process
2. Well completions
3. Lift methods
4. Gathering systems
5. Separation systems

Day 2

Nodal Analysis

1. Main pressure-drop
2. Components
3. Inflow performance
4. Relationship
5. Completion
6. Tubing system graph
7. Gas well production behavior

Day 3 and 4

Subsurface-surface production operation

1. Integrated vision
2. Procedures
3. Best practices
4. Identification of restrictions
5. Corrective actions
6. Production optimization using automation technology
7. Performance management

Day 5

Integrated Production Systems

1. Software and tools focusing on performance modeling
2. Technology trends
3. Integrated information management for control, monitoring, and automation

Introduction to the Oil & Gas Industry

UHUPD005



This course will provide a comprehensive and clear understanding of the technical and commercial operation of the oil & gas industry. The course will look at the industry principles such as: exploration & production, geology, transportation, storage, prices, legal and commercial systems.

This course is designed for new executives to the industry, commercial managers, various engineering disciplines, HR managers, marketing, sales, and legal & commercial managers.

Course Objectives:

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

- Understand the Oil & gas chain and learn how departments work and integrate together in the company.
- Know new terminology in the oil & gas industry, and improve communication between departments in the company.
- Understand the current technical, commercial and operation issues.
- Be familiar with all engineering and development aspects of the industry.
- Be familiar with various geological and geophysical exploration methods.
- Explain the principal objectives and some key challenges in the petroleum industry.

Course Content:

- Oil & gas industry overview
- Oil & gas geology
- Exploration phase
- Drilling operations
- Conventional and unconventional oil & gas resources
- Formation evaluation
- Well completion
- Oil & gas production facilities
- Reservoir management
- Pipeline and other transportation modes
- Gas storage facilities
- Fundamentals of LNG production and transportation
- Crude oil refinery production and processes
- Commercial & legal issues
- Oil & gas price volatility
- Oil & gas trading and transportation
- Roles of NOC, IOC, I-NOC

Related Courses:

- Oil & Gas Production Engineering
- Exploration & Production Logistics
- Oil Supply and Trading

Duration
5 Days

Level
Basic

Programme Schedule

Day1

Overview of the Oil & Gas Industry

1. The main value creation steps from exploration to end-user products
2. Upstream, midstream and downstream sectors
3. Geographical distribution of resources
4. Main consumption markets
5. Industry and market participants
6. Important industry trends

Day 2 and 3

Upstream Sector

1. Origins of oil & gas
2. Physical and chemical quality characteristics of oil & gas
3. Conventional and unconventional oil & gas resources
4. Obtaining commercial access to resources
5. Creating value by locating oil & gas reservoirs
6. Creating value by turning resources into bookable reserves
7. Basics of oil & gas production
8. Enhancing the value of mature resources
9. Arrangements for sharing of risk, investment and rewards
10. Roles of national oil companies and independent oil companies

Day 4

Midstream Sector

1. Marine transportation of oil
2. Pipeline and other oil transportation modes
3. Oil storage logistics
4. Creating value by getting gas to market
5. Fundamentals of LNG production and transportation
6. Gas pipeline operations
7. Gas storage facilities
8. Creating value through the use of transport and storage
9. Wholesale trading of crude oil, LNG, and natural gas

Day 5

Downstream Sector

1. Refining processes and the main petroleum products
2. Economics of refinery operations
3. Blending and storage of refined products
4. Biofuels and additives
5. Regulation of end-user markets
6. Retail and wholesale marketing of transport fuels
7. Retail and wholesale marketing of natural gas
8. Lubricants, asphalt and other specialty oil products
9. Overview of petrochemicals markets
10. Trading of refined products

Production Technology

UHUPD006



This course covers the technical aspects of production, such as: reservoir drive mechanisms, drilling methods, well and completion types, hydrocarbon in- and outflow performance, formation damage and cleaning mechanisms, well life-cycle, production surveillance, production chemistry, and the latest state-of-the-art technologies.

This course is designed for production engineers, geologists, petrophysicists, production programmers, reservoir and well engineers.

Course Objectives:

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

- Execute roles and responsibilities in E&P's business process model.
- Design wells and their completions, including gravelpack, perforations, and artificial lift systems.
- Establish inflow and outflow performance.
- Optimise production performance, including well intervention, stimulation, and fracking.

Course Content:

- Design of wells
- Drilling, configuration and components
- Introduction to drilling practices
- Flow dynamics
- Conceptual completion design
- Well-reservoir interface
- Artificial lift
- Well intervention
- Well integrity
- Stimulation: acidizing and fracking
- Production chemistry
- Smart wells

Related Courses:

- Artificial Lift Technology
- Well Intervention
- Well Integrity

 Duration
5 Days

 Level
Basic

Programme Schedule

Day 1

Design of Wells

1. Introduction to drilling practices
2. Design of wells

Flow Dynamics: In- and Outflow, Natural and Artificial Flow (Lift Curves)

1. Explanation of the physics of in- and outflow performance of hydrocarbon fluids in the well

Day 2

Conceptual Completion Design

1. Well-reservoir interface (sand exclusion, perforating)
2. Dual/single completion
3. Types of tubing
4. Packer
5. Artificial lift

Integrated Business Process for Production Operations

1. Explanation of the key role that PT plays in the interface
2. Co-ordination of the optimization process

Day 3

Well Intervention

1. Overview of technologies and equipment during workover of wells

Well Integrity

1. Overview of PT's assurance activities for safely operating a well's production

Day 4 and 5

Stimulation: Acidizing and Fracking

1. Overview of stimulation activities, which are designed by the PT

Production Chemistry

1. Overview of the sources
2. Impact of various chemical reactions that impact performance, such as scale, corrosion, wax, hydrates

Smart Wells: Innovative Technologies in Wells

1. Overview of state-of-the-art technologies

Sand Control

UHUPD007



This course discusses concepts related to the selection of sand control methods and treatment design. The course analyses sand control best methods for horizontal wells and water injectors. There are various methods of sand control including: open hole gravel packs, frac packs currently practiced in industry and design procedures. The tools and technology employed in sand control are introduced in the form of theory and practical operations.

This course is designed for completion, production and research engineers, and field supervisors.

Course Objectives:

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

- Understand the nature of sandface and its behaviour.
- Know the causes of sand production and formation damage.
- Know the techniques and practices of formation damage treatment.
- Predict formation behaviour.
- Choose the best sandface completion that maximizes flow.
- Know the well completion practices that give the highest productivity.
- Understand the various sand control techniques.

Course Content:

- Sand control techniques
- Sand management
- Causes of sand production
- Predicting sand production
- Screenless sand control
- Gravel pack design
- Formation damage
- Slotted liners and wire wrapped screens
- Gravel pack completion
- Perforation prepacking and enhanced prepacking
- Frac packing
- Open hole gravel packing
- Expandable screens
- Gravel pack performance
- Horizontal well completions
- Quality control

Related Courses:

- Formation Damage
- Casing and Cementing Systems
- Completion Fluid Technology

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to the Causes and Effects of Sand Production

1. The geology of sedimentary formations
2. The nature of cohesive failure, and contributing issues
3. Terms that describe sanding formations

Prediction of Formation Behavior

1. Formation properties logs used to predict sand propensity
2. Understanding each element of Darcy's Law
3. Drawdown issues, predictions and calculations
4. Time dependence and multiphase flow

Day 2

Productivity and Flow Efficiency

1. The concept of radial vs. linear flow
2. Issues related to near wellbore restrictions

Formation Damage

1. Drilling the well
2. Cementing operations
3. Damage due to perforating
4. Chemistry of formation clays
5. Damage due to mishandling of clays
6. Treatments to minimize clay damage
7. Well treatment chemicals i.e. surfactants
8. In-situ damage compounds; i.e. scales, paraffins and asphaltenes
9. Use and misuse of HCl and HF acids

Evolution of Sand Management Techniques

1. Philosophies vs. results
2. Risk management
3. Handling of produced sand

Day 3

Drill-in and Completion Fluids

1. Chemistry and application of specialty brines
2. Filtration and viscosifying brines
3. Safety video on ZnBr₂ brines
4. Fluid loss tests and what the numbers mean

Mechanical Devices

1. Methods used to manufacture screens & liners
2. Special purpose screen

Formation Sand Sizing Issues

1. Sieve analysis
2. Analysis by electronic instruments

Day 4

Cased-Hole Sandface Completions

1. Fluid filtration techniques
2. Cartridge vs. D.E. filtration
3. Quantifying filtration results
4. Beta ratings

Perforating

1. Gun design and deployment

Evolution of Charge Designs

1. Perforation sizing and shapes
2. Perforation cleaning methods

Types of Gravel Packs

1. Water packs
2. Slurry packs
3. Discussion about polymers used to viscosify gravel pack fluids
4. Carrier fluid selection

Day 5

Gravel Placement Techniques

1. Over-the-top method
2. Through-tubing gravel packs
3. Inside pressure pack
4. Perforation packing
5. How fluids selection relates to tool design

Tool Designs to Achieve Void-free Packing

1. Components of a gravel packing tool string & purpose of each
2. Multi-position gravel pack packers

Introduction to Frac Packing in Cased Completions

1. Completing frac-packs
2. Comparing frac-packs with other methods
3. Introduction of the Dusterhoft Application Selection Chart
4. Hydraulic fracturing concepts

Chemical Consolidation Methods

1. Consolidation resins used in pre-pack screens
2. Epoxy resin consolidation systems
3. Furan resin consolidation systems
4. Fracturing Fluid Systems
5. Water packs

Surface Field Production Engineering

UHUPD008



The purpose of this course is to present an overview and fundamental understanding of the wide range of oilfield production handling and treatment equipment. The fundamental principles of fluid behavior are first introduced, then applied to all of the various equipment and systems comprising production operations. Emphasis is placed on understanding the internal workings inside the piping, valves and vessels.

This course is designed for production, operations, facilities and petroleum engineers, as well as field production supervisors and surface equipment technicians, who interact with field facility engineers/operators.

Course Objectives:

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

- Know the wide range of equipment used to process, treat, transport, and store oilfield produced fluids.
- Understand the physical properties and phase behavior of crude oil and natural gas that govern production operations.
- Know the basics of oilfield corrosion prevention, detection and treatment.
- Determine and minimize pressure drop in pipelines, valves and pressured vessels; know the internal workings of separators, pumps, compressors, valves and other treating equipment.
- Know the processes and equipment used to handle acid gases.
- Have a basic understanding of a wide range of produced fluid volume measurement and metering devices.

Course Content:

- Introduction to surface facilities
- Hydrocarbon properties
- Well control and safety systems
- Pipeline systems: series, parallel, looped, loopless
- Pigging
- Valves
- Separation system
- Oil treatment
- Water treatment
- Gas treatment
- Pumps
- Natural gas compression
- Hydrocarbon measurements
- Acid gas treatment
- Corrosion

Related Courses:

- Introduction to Production Engineering
- Corrosion Control

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Properties of Produced Fluids

1. Impact of pressure and temperature
2. Fluid on key hydrocarbon parameters
3. Fluid behavior

Valves

1. Api valves, chokes, regulators, and flow control devices
2. Principle of operation and effect on fluid condition

Safety Systems and Surface Safety Control Systems

1. Relief valves
2. Pressure ratings
3. Api recommended practices

Day 2

Flowlines

1. Manifolds and gathering systems
2. Full wellstream production
3. Two and three phase fluid flow
4. Pigging
5. Slugs
6. Foam and emulsions

Mechanical Equipment

1. Pumps
2. Compressors
3. Heaters
4. Sour and acid gas treating
5. Pressured vessels, storage facilities and other surface and subsurface treating/fluid handling equipment

Day 3

Gas Separation / Treating

1. Two and three phase separation
2. Free water removal
3. Treatment of emulsions
4. Hydrate prevention and treatment
5. Vapor recovery
6. Gas conditioning for sales
7. Injection or field usage

Day 4

Oil / Water Separation and Treatment

1. Two and three phase separation
2. Emulsion breaking, asphaltenes
3. Solids control
4. Removal of residual oil-in-water
5. Water-in-oil to meet pipeline specifications or injection / disposal
6. Requirements, hydrocyclones
7. New water / oil treating equipment

Fluid Measurement and Instrumentation

1. Liquid and gas metering using positive displacement meters
2. Orifices, sonic meters, mass measurement meters, three phase flow measurement and new metering devices

Day 5

Acid Gas Treatment

1. Field handling and treatment of sour and acid gases
2. Safety considerations
3. Api standards

Corrosion

1. Fundamental principles
2. Detection, prevention and treatment

Well Intervention and Productivity

UHUPD009



The course covers well production, impact of completion design on interventions, production problems identification, operations, and well intervention methods.

This course is designed for petroleum engineers, well intervention engineers, reservoir and drilling engineers, production operators, wellsite supervisors, and geologists.

Course Objectives:

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

- Be more aware of the problems that can arise in the planning and execution of well interventions.
- Identify problems in wells and effective interventions.

Course Content:

- The economic importance of well productivity
- An overview of well production
- Fluids
- Completion architecture production problems
- Operations
- Well intervention methods

Related Courses:

- Well Completion
- Formation Damage
- Artificial Lift System

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introductions

1. Course objectives
2. Economic importance of well productivity

Overview of Well Production

1. Influence of geology
2. How wells produce
3. Formation damage – skin
4. Types of formation damage

Day 2 and 3

Fluids

1. Drilling fluids
2. Completion fluids
3. Workover fluids and kill pills

Completions

1. Reservoir completions
2. Upper completions
3. The importance of completion design in relation to the ability to carry out interventions
4. Planning Interventions in a range of different completion types

Production Problems and their Identification

1. Water and gas production
2. Corrosion
3. Wax and paraffin
4. Asphalines
5. Hydrates
6. H₂S
7. Fines migration – phase related permeability reduction
8. Scale
9. Emulsions

Day 4

Operations

1. Artificial lift
2. Cementing and cement evaluation
3. Perforating and re-perforation
4. Remedial sand control
5. Acid stimulation
6. Hydraulic fracturing
7. Sidetracks and laterals
8. Underbalance drilling
9. Water/gas shut off
10. Acid stimulation
11. Hydraulic fracturing
12. Sidetracks and laterals
13. Underbalance drilling
14. Water / gas shut off

Day 5

Well Intervention Methods

1. Rig workover
2. Coiled tubing
3. Hydraulic workover

Wireline

1. Intervention in subsea wells
2. Interventions in HPHT wells

Well Stimulation

UHUPD010



This course discusses the various well stimulation treatments that are frequently used to stimulate old or poorly producing wells. It will cover the stimulation techniques as tools to help manage and optimize reservoir development. The course includes: acidizing and fracturing quality control, conducting the treatment, monitoring pressures, and other critical parameters, during and after the treatment.

This course is designed for production, completion, reservoir and drilling engineers, as well as field supervisors, production foremen, engineering technicians and geologists.

Course Objectives:

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

- Understand the impact of formation damage on well performance.
- Gauge the effectiveness of well stimulation treatments, technically and economically.

Course Content:

- Introduction to formation damage
- Acid techniques
- Corrosion inhibitor
- Hydraulic fracturing application
- Hydraulic fracturing geometric model
- Fracturing pressure analysis
- Hydraulic fracturing design

Related Courses:

- Acid Stimulation
- Formation Damage
- Hydraulic Fracturing

 Duration
5 Days

 Level
Intermediate

Programme Schedule

Day 1

Introduction to Formation Damage

1. Damage caused by drilling mud
2. Damaged caused by production well systems
3. Damage caused by well geometry
4. Well damage modelling
5. Damage measurement
6. Pressure build-up tests
7. Pressure drawdown tests
8. Multi-rate tests
9. Rock mechanics
10. Overburden stress
11. Flow reign and fluid rheology

Day 2

Acid Placement Techniques

1. Acid fracturing
2. Acid chemical reactions
3. Acid reaction with carbonate rocks
4. Acid flow to mineral surfaces
5. Acid spreading into rocks
6. Additives in acidizing
7. Surfactant

Corrosion Inhibitor

1. Iron control
2. Alcohol
3. Mutant solvent
4. Clay stabilizer

Day 3 and 4

Hydraulic Fracturing Applications

1. Fluid fracturing and its additives
2. Fluid fracturing composition
3. Basic fluids choice

Other Additives

1. Frac. Propanant
2. Formation break down
3. Step rate test
4. Shut-in decline test

Day 5

Hydraulic Fracturing Design

1. Input data
2. Hydraulic fracturing optimization
3. Hydraulic fracturing operation evaluation



These courses have been designed for participants at various competency levels: Beginner – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Basic Reservoir Engineering* and *Enhanced Oil Recovery* courses are considered fundamentals, and are designed to be a prerequisite for new reservoir engineers. For participants looking to increase their knowledge levels, the *Reservoir Management* and *Gas Reservoir Engineering* courses are recommended. The *Well Testing & Pressure Transient Analysis* course is designed for participants seeking to increase their skill level.

Section Courses

1. Applied Reservoir Engineering
2. Basic Reservoir Engineering
3. Chemical-Enhanced Oil Recovery
4. Enhanced Oil Recovery
5. Gas Reservoir Engineering
6. Introduction to the Oil & Gas Industry
7. Reservoir Management
8. Well Testing & Pressure Transient Analysis



Applied Reservoir Engineering

UHURV001



Our applied reservoir engineering course offers the practicing engineer and engineering student a full description, with worked examples, of all of the kinds of reservoir engineering topics that the engineer will use in day-to-day activities.

This course is designed for reservoir and production engineers, and those involved in reservoir evaluation, reserve determination and recovery optimization.

Course Objectives:

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

- Determine critical properties of reservoir rock fluid (oil, water, and gas) PVT relationships.
- Calculate hydrocarbons initially in place using several methods.
- Assess reservoir performance with dynamic techniques.
- Determine the parameters that impact well/reservoir performance over time.
- Analyze well tests using standard well testing principles and techniques.
- Characterize aquifers.
- Determine reservoir drive mechanisms for both oil & gas reservoirs.
- Apply oil & gas field development planning principles.

Course Content:

- PVT fundamentals and EOS tuning
- Reservoir rock properties and rock-fluid interaction properties
- Inflow performance relationship determination
- Material balance in oil & gas reservoirs using MBAL software
- Pressure transient application
- Production forecast using decline analysis
- Secondary and tertiary recovery schemes
- Numerical simulation theory and practices
- Production forecast
- Field development planning

Related Courses:

- Basic Reservoir Engineering

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Rock Properties

1. Porosity, permeability, compressibility, capillary pressure and wettability
2. Relative permeability and averaging reservoir property data

Rock Properties

1. Phase behavior of reservoir fluids, gas properties, oil properties, water properties and PVT sampling
2. Understanding PVT laboratory reports

Day 2

Volumetric Calculation of Reservoir Fluids in Place

1. Oil in place, gas in place, uncertainty and probabilistic methods
2. Recovery efficiencies

Material Balance Methods

1. Oil recovery material balance, Havelena-Odeh method
2. Gas material balance, volumetric, compaction and water drive
3. Compartmentalized reservoirs

Oil Well Testing

1. Radial flow theory, wellbore storage and skin, drawdowns, buildups, curve shapes and type curve solutions
2. Interference testing, pseudo steady state, steady state, average pressure estimates, PI and IPR relationships

Day 3

Gas Well Testing

1. Pressure, pressure squared and real gas pseudo pressure solutions
2. Rate sensitive skins, multi-rate testing, gas and well deliverability

Immiscible Displacement

1. Fluid displacement process, fractional flow, Buckley Leverett and Welge

Coning, Cusping, Over/Under Running

1. Description of each process, critical rates calculations
2. Breakthrough times, horizontal well applications

Day 4 and 5

Horizontal Wells

1. Applications and uses, analysis techniques and industry experience

Reservoir Types and Drive Mechanisms

1. Gas reservoirs
2. Oil reservoirs
3. Critical reservoirs
4. Fluid reservoirs

Reservoir Simulation

1. Why simulate? Various simulation models, simulator types
2. Setting up a simulator model

Production Forecasting

1. Types of forecasts, purposes, methods, tools, practices and procedures

Field Development Planning

1. Gas field developments
2. Oil field developments

Basic Reservoir Engineering

UHURV002



The course is considered to be a direct application of petroleum engineering that applies scientific principles to the drainage problems that arise during the development and production of oil & gas reservoirs, so as to obtain a high economic recovery. The working tools of the reservoir engineer are subsurface geology, applied mathematics, and the basic laws of physics and chemistry governing the behavior of liquid and vapor phases of crude oil, natural gas, and water in reservoir rocks.

This course is designed for geoscientists and engineers. It is intended to provide an introductory course in the field of basic reservoir engineering.

Course Objectives:

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

- Understand the physics of oil & gas fields.
- Have an awareness of modern reservoir engineering principles and practice.
- Develop subsurface skills for integrated analysis of rocks, pores and fluids.
- Solve problems associated with identifying and exploiting reserves.
- Understand various methods applied to predict reservoir performance and to enhance recovery.
- Apply tools for analysis of the underlying uncertainty and assumptions used in many reservoir analysis techniques.
- Understand various processes for solving reservoir engineering problems and analyses.
- Predict reservoir performance and to determine recoverable reserves using different techniques.

Course Content:

- Rock and fluid properties
- Basics of recovery mechanisms
- Types of reservoirs
- Basics of fluid flow in porous media
- Performance analysis
- Forecasting production decline
- Enhanced oil recovery processes
- Introduction to reservoir simulation

Related Courses:

- Applied Reservoir Engineering
- Enhanced Oil Recovery

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Reservoir Rock and Volumes

1. Introduction
2. Reservoir rock properties, permeability and fluid flow
3. Distribution of hydrocarbon fluids, fluid gradients and contacts
4. Volumetric Oil in Place and Gas in Place calculations (STOIP and GIIP)
5. Reserves basic principles

Day 2

Fluid Behaviour and Material Balance

1. Fluid properties of oil & gas, composition and phase behaviour
2. Oil material balance and drive mechanisms
3. Gas material balance and applications

Day 3

Well Behaviour and Well Tests

1. Radial flow
2. Well, inflow performance, skin
3. Oil well testing, pressure draw
4. Down and build-up analyses
5. Gas well testing
6. Decline curve analysis, production forecasting

Day 4

Recovery and Sweep

1. Relative permeability and capillary pressure, movable oil
2. Displacement and recovery, sweep, heterogeneity
3. Reservoir development

Day 5

Reservoir Modelling

1. Reservoir simulation – basic principles
2. Fractured reservoirs

Chemical-Enhanced Oil Recovery

UHURV003



This training course addresses the subsurface concepts of chemical-enhanced oil recovery. It will explain the displacement characteristics and design criteria for a chemical EOR process. It also covers low-salinity water flooding, polymer, surfactant flooding, ASP flooding, and a short introduction in microbial EOR.

This course is designed for petroleum engineers, reservoir engineers, supervisors and development managers.

Course Objectives:

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

- Appreciate the strengths and weaknesses of chemical EOR and how it can be optimized through specific activities and actions.
- Have an understanding of how chemical EOR techniques are applied in field development planning and project management aspects.

Course Content:

- EOR techniques
- Polymer flooding
- Surfactant flooding
- Alkaline surfactant polymer flooding
- Project management aspects

Related Courses:

- Enhanced Oil Recovery Technologies

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Current EOR Production

1. Landscape of EOR techniques
2. Timing of EOR as part of the field life cycle, and the impact of external conditions

Interplay of Geology and Displacement Processes

1. Complexities to further enhance recovery
2. Fundamentals of displacement by water flooding
3. The concept of low salinity flooding and current state of implementations

Day 2

Polymer Flooding

1. Properties of polymers and operational limitations
2. Flow through porous media and derivation of the benefits
3. Injectivity
4. Some operational aspects
5. Pitfalls and failures
6. Screening criteria

Day 3

Surfactant Flooding

1. Basic principles and desaturation curves
2. Properties of surfactants and phase behavior with oil
3. Role of emulsions and of polymers
4. Adsorption and retention
5. Displacement description in ternary diagrams
6. Screening criteria

Day 4 and 5

Alkaline Surfactant Polymer Flooding

1. Role of alkaline
2. Optimum salinity design
3. Reservoir simulation of ASP flooding
4. Screening criteria

Facility Aspects

1. Pitfalls
2. Pilot testing
3. Design aspects
4. Introduction in microbial EOR

Project Management Aspects

1. Role of well and reservoir management
2. Technical aspects
3. Economical aspects
4. Organization aspects
5. Political aspects
6. Commercial aspects

Enhanced Oil Recovery

UHURV004



This course covers EOR methods of three main processes: thermal, miscible, and chemical. It includes CO₂ and hydrocarbon miscible gas injections practices, chemical technologies of polymer, surfactant and alkali-surfactant floods, and thermal methods of steam injection.

This course is designed for petroleum engineers, reservoir engineers.

Course Objectives:

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

- Calculate injection requirements for a reservoir.
- Estimate the reservoir response and recovery.
- Design wells, surface installations and monitoring systems.
- Understand when and where it is appropriate to use certain techniques.

Course Content:

- EOR fundamentals
- Thermal recovery
- Miscible/gas injection processes
- Chemical floods

Related Courses:

- Chemical-Enhanced Oil Recovery

Duration
5 Days

Level
Basic

Programme Schedule

Day 1 and 2

Introduction and Fundamental Processes

1. EOR: What, why and how
2. Screening criteria
3. Viscous, capillary and gravity forces
4. Pore scale trapping/displacement
5. Mobilisation of trapped oil
6. Phase mobility
7. Geologic factors in EOR
8. Areal and vertical sweep efficiencies
9. Displacement efficiencies
10. Fractional flow theory and linear displacement

Day 3

Thermal Recovery

1. Introduction to thermal EOR
2. Heat transfer in reservoirs
3. Steam generation and properties
4. Heat losses in flow lines and in wellbores
5. Reservoir heating
6. Steam drive

Day 4

Miscible/Gas Injection Processes

1. Minimum miscibility determination
2. First contact miscible vs multi-contact miscible
3. Optimising WAG ratios
4. Hydrocarbon: LPG, enriched gas and lean gas
5. VAPEX/Heavy Oils
6. CO₂ properties and required volumes
7. Estimating recovery
8. Well and facility requirements
9. Corrosion protection

Day 5

Chemical Floods

1. Common chemical and properties
2. Thermal stability
3. Adsorption/chemical loss
4. Slug size requirement
5. Polymer/water viscosity
6. Surfactant/reducing IFT
7. Alkali and ASP floods
8. Microbia

Gas Reservoir Engineering

UHURV005



This course provides an overview of the evaluation, completion, stimulation, and development of tight gas reservoirs. Topics covered include: geologic characteristics of tight gas reservoirs, formation evaluation in tight gas reservoirs (including log and core analysis, in-situ stress tests, and welltests), estimating reserves and well performance, hydraulic fracture treatment design and execution, and field development considerations.

This course is designed for engineers actively involved in 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.

Course Objectives:

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

- 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.

Course Content:

- Introduction to tight gas reservoirs
- Gas reservoir fluid properties
- Reservoir considerations
- Geological and development consideration
- Gas reservoir fluid flow and well testing
- Well completion for gas wells
- Prediction of future performance and ultimate recovery

Related Courses:

- Well Completion for Gas Wells

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Gas Reservoir Fluid Properties

1. Gas condensate
2. Sampling and understanding laboratory reports

Gas Reservoir Fluid Flow and Well Testing

1. Deliverability testing and non-darcy flow
2. Testing for hydraulically fractured wells, horizontal wells
3. Gas condensate reservoirs

Day 2

Determination of Original Gas-In-Place

1. Material balance techniques for various drive mechanisms
2. Reservoir types
3. Alternate plotting technique
4. Production decline type curves

Day 3

Gas Flow in Wellbores and Pipelines

1. The gas production system
2. Pressure drop in wellbores and flowlines
3. Restrictions to gas production

Day 4

Prediction of Future Performance and Ultimate Recovery

1. Decline curves, coupled material balance and deliverability techniques
2. Reservoir simulation
3. Gas well spacing
4. Infill drilling

Day 5

Special Topics

1. Reservoir management of water-drive gas reservoirs
2. Predicting gas condensate performance
3. Coalbed methane reservoirs

Introduction to the Oil & Gas Industry

UHURV006



This course will provide a comprehensive and clear understanding of the technical and commercial operation of the oil & gas industry. The course will look at the industry principles such as: exploration and production, geology, transportation, storage, prices, legal and commercial systems.

This course is designed for new executives to the industry, commercial managers, various engineering disciplines, HR managers, marketing, sales, and legal and commercial managers.

Course Objectives:

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

- Understand the oil & gas chain, and learn how departments work and integrate together in the company.
- Know new terminology in the oil & gas industry and improve communication between departments in the company.
- Understand the current technical, commercial and operational issues.
- Be familiar with all engineering and development aspects of the industry.
- Be familiar with various geological and geophysical exploration methods.
- Explain the principal objectives and some key challenges in the petroleum industry.

Course Content:

- Oil & gas industry overview
- Oil & gas geology
- Exploration phase
- Drilling operations
- Conventional and unconventional oil & gas resources
- Formation evaluation
- Well completion
- Oil & gas production facilities
- Reservoir management
- Pipeline and other transportation modes
- Gas storage facilities
- Fundamentals of LNG production and transportation
- Crude oil refinery production and processes
- Commercial & legal issues
- Oil & gas prices' volatility
- Oil & gas trading and transportation
- Roles of NOC, IOC, I-NOC

Related Courses:

- The Natural Gas Industry
- The Oil Industry
- Oil Supply and Trading

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Overview of the Oil & Gas Industry

1. The main value creation steps from exploration to end-user products
2. Upstream, midstream and downstream sectors
3. Geographical distribution of resources
4. Main consumption markets
5. Industry and market participants
6. Important industry trends

Day 2 and 3

Upstream Sector

1. Origins of oil & gas
2. Physical and chemical quality characteristics of oil & gas
3. Conventional and unconventional oil & gas resources
4. Obtaining commercial access to resources
5. Creating value by locating oil & gas reservoirs
6. Creating value by turning resources into bookable reserves
7. Basics of oil & gas production
8. Enhancing the value of mature resources
9. Arrangements for sharing of risk, investment and rewards
10. Roles of national oil companies and independent oil companies

Day 4

Midstream Sector

1. Marine transportation of oil
2. Pipeline and other oil transportation modes
3. Oil storage logistics
4. Creating value by getting gas to market
5. Fundamentals of LNG production and transportation
6. Gas pipeline operations
7. Gas storage facilities
8. Creating value through the use of transport and storage
9. Wholesale trading of crude oil, LNG and natural gas

Day 5

Downstream Sector

1. Refining processes and the main petroleum products
2. Economics of refinery operations
3. Blending and storage of refined products
4. Biofuels and additives
5. Regulation of end-user markets
6. Retail and wholesale marketing of transport fuels
7. Retail and wholesale marketing of natural gas
8. Lubricants, asphalt and other specialty oil products
9. Overview of petrochemicals markets
10. Trading of refined products

Reservoir Management

UHURV007



In this course, the principles of sound reservoir management are presented with emphasis on practical applications. Actual case histories are used to study both successes and failures. An interdisciplinary synergistic approach to efficient reservoir management is detailed with the goal of optimized profitability.

This course is designed for reservoir, production and operations engineers, as well as geologists, geophysicists, managers, experienced technicians, and service company personnel responsible for improving the performance of petroleum reservoirs.

Course Objectives:

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

- Apply the principles of sound reservoir management.
- Use the interdisciplinary synergistic approach to efficient reservoir management.
- Understand each reservoir management component and the importance of timing and cost/benefit analysis.
- Develop checks and balances.

Course Content:

- Definition of reservoir management
- Goal setting, planning, implementing, monitoring, and evaluating reservoir performance
- Field development and field operating plans
- Efficient monitoring of reservoir performance
- 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
- Minimizing capital investment
- Risk and operating expenses
- Timing of field implementation of reservoir management plan
- Importance of reservoir characterization

Related Courses:

- Enhanced Oil Recovery
- Applied Reservoir Engineering

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction

1. Sound reservoir management
2. Scope and objective
3. Organization

Reservoir Management Concepts

1. Definitions
2. Fundamentals
3. Integration of geosciences and engineering
4. Integration exploration and development

Day 2

Reservoir Management Process

1. Setting goals
2. Developing plans and economics
3. Surveillance and monitoring
4. Evaluation
5. Revision of plans and strategies
6. Reasons for failure of reservoir management

DATA Acquisition, Analysis and Management

1. Data type
2. Data acquisition and analysis
3. Data validation
4. Data storing and retrieval
5. Data application

Day 3 and 4

Reservoir Model

1. Role of reservoir model
2. Geosciences
3. Seismic data
4. Geostatics
5. Integration

Reservoir Performance Analysis and Forecast

1. Natural producing mechanisms
2. Reserves
3. Volumetric method
4. Decline curve method
5. Material balance method
6. Mathematical simulation

Reservoir Management Economics

1. Economic criteria
2. Economic evaluation
3. Risk and uncertainties

Day 5

Improved Recovery Process

1. Water flooding
2. Enhanced oil recovery process
3. EOR process concepts
4. Thermal methods
5. Chemical methods
6. Miscible methods

Well Testing & Pressure Transient Analysis

UHURV008



This course is designed to give a comprehensive account of methods and techniques used in modern well testing and analysis. Subsequently to outlining well test objectives and general methodologies, the course briefly gives an outline of theoretical aspects; primarily to show limitations, assumptions and applicability of various techniques.

This course is designed for reservoir and production engineers.

Course Objectives:

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

- Understand the key aspects of well testing and analysis.
- Plan and design well tests, including equipment requirements.

Course Content:

- Pressure transient concepts
- Types of tests and models
- Transient solution
- Well and near well effects
- Infinite acting reservoirs
- Pressure build-up analysis
- Bounded reservoirs
- Gas well test analysis
- Layered reservoirs
- Horizontal well testing

Related Courses:

- Applied Reservoir Engineering

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction

1. Testing objectives
2. Pressure transient concepts
3. Types of tests and models
4. Outline of pressure transient formulation
5. Historic development
6. Interpretation and modelling process

Theoretical Foundation

1. Flow in porous media
2. Radial diffusivity equation
3. Analogous systems
4. Boundary and initial conditions
5. Dimensionless variables
6. Transient solutions

Well and Near Well Effects

1. Wellbore storage and after-flow
2. Skin effect concepts
3. Limited entry and partial penetration
4. Horizontal wells and stimulation
5. Condensate skin

Day 2

Infinite Acting Reservoirs

1. Drawdown response
2. Horner analysis
3. Type curves

Pressure Build-Up Analysis

1. Build-up response and superposition in time
2. Horner and MDH analysis
3. Type curve analysis

Bounded Reservoirs

1. Concepts and superposition in space
2. Radius of investigation and distance to fault
3. Closed drainage analysis (MBH and Dietz)
4. Productivity index (PI)

Day 3

Theoretical Foundation

1. Non-darcy flow
2. Diffusivity equation for gas flow
3. Superposition of rates

Gas Well Test Analysis

1. Concepts and parameters
2. Modified Essis-Thomas method
3. Deliverability relationship

Naturally Fractured Reservoirs (Dual Porosity)

1. Concepts and parameters
2. Formulation
3. Test analysis

Day 4

Layered Reservoirs

1. Two-layered commingled system
2. Cross flow system
3. Two-layer composite example

Hydraulically Fractured Reservoirs

1. Concepts and parameters
2. Cross flow situations
3. Two-layer composite example

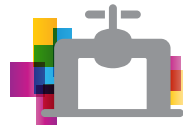
Day 5

Introduction to Horizontal Well Testing

1. Concepts and parameters
2. Formulation and flow regimes
3. Analysis methods

Overview of Interference and Pulse Testing

1. Interference tests
2. Pulse tests



These courses have been designed for participants at various competency levels: Basic – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Fundamentals of Distribution Systems* and *Electrical Documentations & Drawing Standardizations* courses are considered fundamentals, and are designed to be a prerequisite for new electrical engineers. For participants looking to increase their knowledge levels, the *Fundamental Overhead Transmission Line Design* and *Electric Grounding & Lighting Electrical Safety Systems* courses are recommended. The *Electrical Protection Relays and Systems* and *Variable Speed Drivers (VSD) for Industrial Control* courses are designed for participants seeking to increase their skills levels.

Section Courses

1. Distribution Network Design and Planning
2. Electric Grounding & Lightning Electrical Safety Systems
3. Electrical Circuit Fundamentals
4. Electrical Documentations & Drawing Standardizations
5. Electrical Installations in Hazardous Areas
6. Electrical Protection Relays and Systems
7. Fundamentals of Distribution Systems
8. Fundamental Overhead Transmission Line Design
9. Uninterruptible Power Supply (UPS) and Battery Maintenance
10. Variable Speed Drives (VSD) for Industrial Control



Distribution Network Design and Planning

UHDET001



This course is designed to develop skills in understanding distribution and power generation systems, design, calculating new plans and network losses, and designing new technologies in view of acquiring more energy efficient system.

This course is designed for senior electrical engineers who are involved in the planning, design, operation, maintenance, protection, and control of power utilities and industrial plants and are responsible for overhead transmission lines problems and maintenance.

Course Objectives:

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

- Understand how future electrical loads can be integrated in the existing power utilities networks, industrial as well as oil & gas plants, to meet high quality supply.

Course Content:

- Introduction to distribution systems
- Planning and design
- Materials and equipment
- Other design considerations

Related Courses:

- Maintenance & Protection of Transformer Stations
- Fundamentals of Distribution Systems
- Design, Installation and Protection of Underground Cables

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction

1. Distribution systems
2. Distribution description
3. Main concepts of transmission and distribution system planning
4. Power generation systems
5. How to improve the quality of supply

Day 2 and 3

Planning and Design

1. Load characteristic
2. Electrical design
3. How to design, calculate, and evaluate a new plan
4. Circuit breakers and fuses types and operation
5. How to select switchgear rating
6. Power cables selection and parameter effect in its operations
7. How to calculate network losses
8. System modelling and analysis
9. Metering system - active and reactive metering
10. Urban design and new technologies for more energy efficient system

Day 4 and 5

Materials and Equipment

1. Conductors
2. Poles, cross arms, pins, racks and insulators
3. Transformers, surges and arrestors
4. Regulators, capacitors, switches and reclosers

Other Design Considerations

Electric Grounding & Lightning Electrical Safety Systems

UHDET002



This course has been designed to develop participants' skills in understanding grounding and lightning systems' procedure, and to recognize lightning protection methods and protect equipment by grounding applications. This course also covers static electricity and protection.

This course is designed for electrical engineers, project engineers, design engineers, plant engineers and technicians. It is also applicable for persons who have a considerable understanding of electrical grounding and are responsible for the engineering, design, construction, installation, inspection, operation, or maintenance of electrical grounding systems in an industrial or commercial utility.

Course Objectives:

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

- Recognize specific grounding problems and consequences relating to fires, safety of personnel and damage to equipment.
- Know the influence of rods on grounding grid performance in stratified soil.
- Identify types of ground power systems.
- Identify various standardized earthing systems.
- Know testing procedures for grounding systems.
- Understand transformer grounding and grounding of DC power systems.

Course Content:

- Introduction and basics
- Grounding of power supply systems
- Equipment grounding
- Lightning, its effect on electrical systems, and protection against lightning
- Static electricity and protection
- Ground electrode system

Related Courses:

- Basics of Electrical Engineering
- Safety Practices in Handling & Installing Electrical Systems
- Power System Protection

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction and Basics

1. Basics of grounding
2. Lightning and its effects electrical systems
3. Ground electrodes and factors affecting their efficacy
4. Surge protection of electronic equipment

Day 2

Grounding of Power Supply Systems

1. Underground systems
2. Solidly grounded systems
3. Impedance grounding using neutral reactors
4. Purpose of grounding

Day 3

Equipment Grounding

1. Grounding of equipment
2. Operation of protective devices
3. Induced voltage problems
4. Mitigation by reduction of conductor spacing
5. Sensing of ground faults

Day 4

Lightning, its Effect on Electrical Systems, and Protection Against Lightning

1. Incidence of lightning
2. Methods of lightning protection
3. Planning and improvement

Static Electricity and Protection

1. Introduction
2. Generation of charge
3. Dangers of static electricity build up
4. Control of static electricity

Day 5

Ground Electrode System

1. Grounding electrodes
2. Soil resistance
3. Measurement of soil resistivity
4. Resistance of a single rod electrode
5. Corrosion problems in electrical grounding system
6. Maintenance

Electrical Circuit Fundamentals

UHDET003



The fundamentals of electric circuits course provides the participants with an understanding of the concepts and techniques of characterizing electrical circuits and their components. This course introduces the participants to the basic concepts of current, voltage, power, electromagnetism, and basic laws and theorems for the analysis of electric circuits. Pulse-response and resonance are also covered.

This course is designed for new electrical engineers, technicians, plant engineers and mechanics, electricians, service technicians, contractors, energy auditors, and layout professionals.

Course Objectives:

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

- Understand fundamental circuit analysis techniques.
- Be familiar with circuit equivalence and modelling.
- Develop physical insight and intuition for problem solving.
- Know how to operate different simulators.

Course Content:

- Basic electrical circuits and digital circuit simulators
- Electric circuit analysis and applications
- Power calculations (using computer programs), transformers and amplifiers
- Instrumentation amplifiers and I-V converters
- Response to DC and AC forcing functions
- Basic RC and RL circuits
- Transients in first-order networks
- AC responses of the basic elements
- Phasor algebra applications
- Frequency-domain analysis
- AC power and maximum power transfer

Related Courses:

- Operation and Maintenance of Circuit Breakers and Switchgears
- Electrical Engineering
- Maintenance & Protection of Transformer Stations

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Basic Electrical Circuits

1. Units and notation, basic electric quantities
2. Electric signals and circuits
3. Kirchhoff's laws
4. Circuit elements and sources
5. Resistance, series and parallel combinations
6. Basic resistive circuits
7. Practical sources and loading
8. Introduction to digital circuits simulators

Day 2

Electric Circuits Analysis

1. Circuit solution by inspection
2. Nodal analysis
3. Loop analysis
4. The superposition principle
5. Source transformations
6. One-ports
7. Circuit theorems
8. Circuit theorem applications

Day 3

Power Calculations (Using Computer Programs), Transformers and Amplifiers

1. Dependent sources
2. Circuit analysis with dependent sources
3. The ideal transformer
4. Amplifier concepts (using computer programs)
5. The operational amplifier, the op amp rule
6. Summing and difference amplifiers

Day 4

Instrumentation Amplifiers and I-V Converters

1. V-I converters, current amps (using computer programs)
2. Capacitance and inductance
3. Natural response
4. Response to DC and AC forcing functions
5. Basic RC and RL circuits
6. Transients in first-order networks
7. RC circuits using op amps (using computer programs)
8. Sinusoids and phasors

Day 5

AC Responses of the Basic Elements

1. Time-domain analysis of first-order AC circuits
2. Phasor algebra
3. Phasor algebra applications
4. AC impedance
5. Frequency-domain analysis
6. AC circuits using op amps (using computer programs)
7. AC power and maximum power transfer

Electrical Documentations and Drawing Standardizations

UHDET004



This course introduces the participants to the basic concepts of electrical diagrams and documentation, and understanding electrical symbols and basic layout. Transmission and distribution lines systems are also covered.

This course is designed for electrical technicians, field engineers, project managers, inspectors, contractors, and journeyman electricians.

Course Objectives:

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

- Read and understand the electrical diagrams and documentations, recognize equipment and verify the integrity of the existing schematics.
- Understand electrical symbols, one-line and three-line electrical schematics and their content, including basic layout and legends.
- Participate in exercises in schematic reading, diagram verification and the steps required for creating and maintaining accurate one line diagrams.

Course Content:

- Assembly drawings and working drawings
- Drawing of electrical instruments
- Electrical machine drawing
- Panel wiring diagrams
- Transmission and distribution lines
- Plant and substation layout

Related Courses:

- Basics of Electrical Engineering
- Distribution Network Design and Planning
- Fundamentals of Distribution Systems

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Assembly Drawing and Working Drawing

1. Standard definition
2. Types of valid standards (IEC, IEEE, NEMA, Code, ...)
3. Standard of control of hazardous energy
4. Standard of safe-guarding machinery
5. Manufacturer standards
6. Electrical symbols
7. Sectional views

Day 2 and 3

Drawing of Electrical Instruments

1. Drawing of common electrical instruments
2. Connection diagrams of electrical Instruments
3. Familiarization with the layout of different schematics and one line diagrams
4. Transferring the information to the one line diagram
5. Verifying electrical prints and making changes to existing diagrams
6. Creating and maintaining regulatory compliant electrical diagrams

Electrical Machine Drawing

1. DC Machines
2. AC Machines

Day 4 and 5

Panel Wiring Diagram

1. DC generator panels
2. Alternator panels

Transmission and Distribution Lines

1. Poles
2. Steel towers
3. Arrangement of conductors
4. Foundation details for poles and towers

Plant and Substation Layout

1. Layout diagrams of distribution substations
2. Layout of power plants

Electrical Installations in Hazardous Areas

UHDET005



The basic objective of area classification is to identify the possibility of an explosive atmosphere existing in a given location, and more importantly, to influence the design of any plant or facility to minimize such risks. This course introduces the participants to the main concepts of area classification, and identifying hazardous area procedures which need to be undertaken.

This course is designed for technicians, engineers and safety personnel. All personnel working in other disciplines in oil & gas fields may benefit from this course.

Course Objectives:

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

- Identify the main principles of hazardous areas, risks, and ignition properties.
- Differentiate types of protection for electrical apparatus in flammable atmospheres.
- Know the essentials of installation requirements, equipment, certification, and information on the different types of protection for hazardous area electrical apparatus.

Course Content:

- Conduct area classification
- Conduct area classification practice for gases, vapors and mists in freely ventilated situations
- Conduct area classification practice for gases, vapors and mists which are not in a freely ventilated situation
- Design philosophy for electrical apparatus for explosive atmospheres
- Develop an apparatus using protection concepts: oil immersion and powered filling, flame proofing, increased safety and intrinsic safety
- Know other methods of protection and future apparatus requirements
- Selection of power supply and apparatus for gas/vapor/mist risk
- Complete documentation, inspections, tests and maintenance of explosive protected apparatus, systems and installations

Related Courses:

- Fundamentals of Electrical Equipment
- Safety Practices in Handling & Installing Electrical Systems
- Basics of Electrical Engineering

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Area Classification

1. Basic properties of flammable and combustible materials
2. Basics of area classification
3. General approach to area classification
4. Hazardous zonal classification
5. Collection of information
6. Procedures

Day 2

Area Classification Practices for Gases, Vapors and Mists in Freely Ventilated Situations

1. Containment of flammable materials
2. Generalized method
3. The source of hazard method
4. Other practical well-ventilated situations

Area Classification Practices for Gases, Vapors and Mists Which Are Not in freely Ventilated Situations

1. Typical areas of restricted ventilated
2. Effect of walls on hazardous areas

Day 3

Design Philosophy for Electrical Apparatus for Explosive Atmospheres

1. Protection of electrical apparatus for gas, vapor and mist risks
2. Situation in respected zone Z apparatus
3. Protection of electrical apparatus for dust risk
4. Apparatus construction standards

Day 4

Apparatus Using Protection Concepts: Oil Immersion and Powered Filling, Flame Proof, Increased Safety and Intrinsic Safety

1. Powder filling type equipment
2. Oil immersed type equipment
3. Special type equipment
4. Intrinsically safe techniques

Day 5

Other Methods of Protection and Future Apparatus Requirements

1. Acceptance of technical requirements
2. Essential requirements
3. Use of apparatuses

Selection of Power Supply and Apparatus for Gas/Vapor/Mist Risk

1. Electrical supply systems
2. Electrical protection
3. Selection of apparatus
4. Selection of conduit or cable systems

Documentation, Inspection, Tests and Maintenance of Explosive Protected Apparatus, Systems and Installations

1. Documentation
2. Detailed inspection requirements
3. Routine inspection

Electrical Protection Relays and Systems

UHDET006



Protective relay systems are installed to cause the prompt removal from services of any element of a power system when it suffers a short circuit that might cause damage with effective operation of the rest of the system. This course covers a comprehensive understanding of relay operation and solves problems, as well as faults handling of motors, generators and transformers.

This course is designed for supervisors and engineers who are responsible for maintaining, testing and calibrating protection relays at power plants.

Course Objectives:

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

- Have knowledge of the basic principles of protective systems and common protection practices.
- Understand current transformer design, application and testing.
- Have a comprehension of, and experience in, protection grading methods and relay operations under fault conditions.
- Have specific knowledge of relays and protective systems.

Course Content:

- Protection
- Current transformers
- Relay operation
- Faults level calculations
- Unit & time current protection
- Transformer protection overview
- Motor protection
- Generator protection overview
- Feeder protection overview
- Practical work notes

Related Courses:

- Power System Protection
- Maintenance & Protection of Transformer Stations
- Electrical Motors Control & Application

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Protection

1. Principles of protection
2. The basic requirements of a protection system
3. Categories of electrical protection
4. Forms of protection

Current Transformers

1. Safety
2. Measurement and protection of current transformers
3. Specifications of current transformers

Day 2

Overview of Relay Operation

1. Induction relays
2. Attracted armature
3. Thermal, timing, static, and K series relays

Fault Level Calculations

1. Power system impedance
2. Impedance and reactance
3. Generators and transformers
4. Fault level calculations
5. Motor level
6. Earth faults

Day 3

Unit & Time Current Protection

1. Protection discrimination introduction
2. Discrimination by current level
3. Relay setting exercise

Transformer Protection Overview

1. Typical transformer faults
2. Bias differential protection
3. Transformer earth protection
4. Standby earth fault protection

Motor Protection

1. Typical motor duties
2. Types of motor faults
3. Thermal replica relays

Day 4

Generator Protection Overview

1. Generator protection devices
2. Stator faults
3. Over voltage faults
4. Low forward reverse power protection

Feeder Protection Overview

1. Unit of protection feeders
2. System types
3. Insulation requirements

Day 5

Practical Work Notes

1. IDMT relay settings
2. Primary injection of biased differential relay
3. Reverse power relay MWTU
4. Testing field failure relay MYTU
5. Typical block diagram of an AC relay

Fundamentals of Distribution Systems

UHDET007



This course covers all principles of power distribution systems, overhead line issues, underground distribution installation and application, in addition ground system safety and faults.

This course is designed for electrical technicians and engineers who are responsible for distribution systems.

Course Objectives:

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

- Have a good understanding of electrical power circuit analysis and power distribution systems.
- Have the ability to analyze common power circuit problems.
- Understand distribution system problems and power system components, equipment operation, troubleshooting, sizing and applications.

Course Content:

- Fundamental of distribution systems
- Overhead lines
- Underground distribution
- Transformers
- Faults
- Short-circuit protection
- Grounding and safety
- Distributed generation

Related Courses:

- Basic Electricity in the Industry
- Design, Installation Protection of Underground Cables
- Electrical Grounding and Lightning

Duration
5 Days

Level
Basic

Programme Schedule

Day 1 and 2

Fundamentals of Distribution Systems

1. Primary distribution configuration
2. Primary voltage levels
3. Distribution substation
4. Sub transmission systems

Overhead Lines

1. Typical constructions
2. Conductor data
3. Line impedance
4. Line impedance tables
5. Other overhead issues

Day 3

Underground Distribution

1. Application
2. Cables
3. Installations and configurations

Transformers

1. Basics
2. Distribution transformers
3. Single-Phase transformers
4. Three-Phase transformers
5. Loadings
6. Losses
7. Special transformers

Day 4

Faults

1. General fault characteristics
2. Fault calculations
3. External fault causes
4. Equipment fault

Short-Circuit Protection

1. Basics of distribution protection
2. Protection equipment
3. Transformer fusing
4. Station relay and recloser settings
5. Other protection schemes

Day 5

Grounding and Safety

1. System grounding configurations
2. System grounding neutral shifts
3. Ground rods and other electrodes
4. Shocks and stray voltages

Distributed Generation

1. Characteristics of distributed generators
2. Islanding issues
3. Relaying issues

Fundamental Overhead Transmission Line Design

UHDET008



The course covers fundamental electrical and mechanical design environmental effects, voltage stress, insulation and grounding systems.

This course is designed for electrical technicians and engineers who are responsible for overhead transmission lines.

Course Objectives:

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

- Understand the basics of 69-765k transmission lines.
- Understand the basics of component parts of lines and their function.

Course Content:

- Line design overview
- Environmental effects
- Voltage stress
- Insulation
- Conductors
- Catenaries
- Thermal ratings
- Tower grounding
- Project management of line design and construction

Related Courses:

- Transmission Network Design and Planning
- Electrical Grounding and Lightning
- Digital Transmission

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Line Design Overview

Environmental Effects

1. Electric field
2. Magnetic field
3. Audible noise

Voltage Stress

1. Power frequency stress
2. Switching surges
3. Lightning surges

Day 2

Insulation

1. Insulation design
2. Insular types

Conductors

1. Conductor materials
2. Conductor selection
3. Conductor design
4. Conductor resistance

Day 3

Catenaries

1. Sag-tension calculation
2. Ruling span concept
3. Tension stringing
4. Conductor termination and clipping
5. Wind-induced motions

Day 4 and 5

Thermal Ratings

1. Structures/Foundations
2. Typical structures type and designs
3. Structure materials
4. Foundations

Tower Grounding

Project Management of Line Design and Construction

Uninterruptible Power Supply (UPS) and Battery Maintenance

UHDET009



In this course participants will learn about the various options of UPS systems, the principles of operation, and the main energy sources in most of the modern UPS installations; the battery, and its importance.

This course is designed for electricians, maintenance technicians, maintenance managers and supervisors, plant and building engineers, building managers and superintendents.

Course Objectives:

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

- Understand the UPS systems and power conditioners.
- Understand the basic building blocks common to all UPS systems.
- Have knowledge of the construction and operation of the major types of industrial UPS systems.
- Identify the hazards and safe work practices related to UPS systems and batteries.
- Be familiar with basic troubleshooting techniques for UPS systems.
- Learn how to implement preventive maintenance practices including quarterly and annual testing.

Course Content:

- Electrical and electronic fundamentals and UPS Systems
- UPS I/O sections and local control
- Types of batteries
- Monitoring systems
- UPS interface
- PS grounding and neutral configuration
- UPS maintenance and commissioning
- System efficiency calculation
- UPS system applications

Related Courses:

- Fundamentals of Electrical Equipment
- Basic Electrical Control
- Electrical Grounding

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Electrical and Electronic Fundamentals

1. UPS systems
2. Application of UPS systems
3. Types of UPS systems
4. Building blocks of UPS systems
5. Rectifiers, choppers, batteries, inverters, internal bypass static switches, and other components.

Day 2

UPS I/O Sections

1. Local control, displace, relay, SNMP, and different communication bus and interface
2. UPS specification
3. Rectifier and charger operation theory
4. Input requirements and limitations
5. Battery requirements
6. Types of batteries
7. Factors that affect battery performance and life cycle

Day 3

Monitoring Systems

1. Choppers and inverters
2. SCR, transistors and IGBT
3. Static switches
4. UPS interface
5. Standby generator with UPS
6. Potential generator issues

Day 4

PS Grounding and Neutral Configuration

1. UPS maintenance
2. Most common maintenance issues with UPS systems
3. UPS system testing and commissioning.

Day 5

System Efficiency Calculation

1. UPS system applications
2. Factors that affect the UPS application
3. Initial cost, operational cost, footprint, weight, and dimensions
4. Static switch failure
5. Cases studies

Variable Speed Drives (VSD) for Industrial Control

UHDET010



This course covers knowledge on VFD and the principles of electrical devices and circuits, motor types, power electronic converters, and how to select AC converters and install and commission AC variable frequency speed drives.

This course is designed for plant and facility maintenance personnel, maintenance supervisors, and plant engineers.

Course Objectives:

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

- Apply and gain a good working knowledge on variable frequency drives.
- Understand the basic principles of electrical machines, electrical devices, symbols and circuits.
- Examine electric motor types, operations and performance, as well as the 3-phase AC induction motors; including its basic construction, principles of operation, electrical and mechanical performance.
- Study motor speed control, power electronic converters, protection of AC converters and motors.
- Examine the control systems for AC variable frequency drives (VFD).
- Select AC converters and install and commission AC variable frequency speed drives (VFD).

Course Content:

- Fundamental principles
- 3-Phase AC induction motors
- Power electronic converters
- Protection of AC converters and motors
- Control systems for AC variable speed drives
- Selection of AC converter
- Installation and commissioning

Related Courses:

- AC Electrical Drives
- Electrical Motor Control & Application
- Fundamentals of Electric Motor Design

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction

1. Fundamental principals
2. VSD types
3. Mechanical VSD methods
4. Hydraulic VSD methods
5. Electrical VSD methods

3-Phase AC Induction Motors

1. Basic construction
2. Principles of operation
3. AC induction generator performance
4. Efficiency of electric motors
5. Electric motor duty cycle
6. Motor selection

Day 2

Power Electronic Converters

1. Power diodes
2. Power electronic rectifiers (AC/DC converters)
3. Gate commutated invertors (AC/DC converters)
4. Gate controlled power electric devices

Day 3 and 4

Protection of AC Convertors and Motors

1. AC frequency converter protection circuits
2. Electric motor protection
3. Thermal overload protection current sensors

Control Systems for AC Variable Speed Drives

1. Power supply to the control system
2. DC bus charging control system
3. Variable speed drive control loops
4. Vector control for AC drives
5. Current feedback in AC variable speed drives

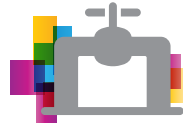
Selection of AC Convertors

1. Basic selection procedure
2. The nature of the machine load
3. The requirements for starting and stopping
4. Control of speed, torque, and accuracy
5. Selection procedures

Day 5

Installation and Commissioning

1. General installation and environment, and requirements
2. Power supply connections and earthing requirements
3. Start/stop control of AC drives
4. Installing AC converters into metal enclosures
5. Control wiring for variable speed drives



These courses have been designed for participants at various competency levels: Basic – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Introduction to Control Systems* and *Basic Instrumentation and Measurement* courses are considered fundamentals, and are designed to be a prerequisite for new instrumentation engineers. For participants looking to increase their knowledge levels, the *Process Control Applied for Rotating Equipment (Compressors & Gas Turbines)* and *Instrumentation System Selection, Maintenance, and Troubleshooting* courses are recommended. The *SCADA Systems & Solutions for the Oil & Gas Industry* and *Advanced Process Control* courses are designed for participants seeking to increase their skills levels.

Section Courses

1. Advanced Process Control
2. Basic Instrumentation and Measurement
3. Instrumentation Installations in Hazardous Areas: Classification and Equipment Selection
4. Instrumentations System Selection, Maintenance, and Troubleshooting
5. Introduction to Control Systems
6. Process Control Applied for Rotating Equipment (Compressors & Gas Turbines)
7. Programmable Logic Controllers; Architecture and Basic Programming PLC
8. SCADA Security
9. SCADA Systems & Solutions for the Oil & Gas Industry



Advanced Process Control

UHDIM001



This course describes the main elements of a control system in: proportional only, proportional plus integral, and plus derivative control. The advantages and disadvantages of each are discussed. The course also describes the principles behind the selection of controller types and controller actions.

This course is designed for process, electrical and instrumentation engineers involved in field or plant operations, plant process control and maintenance, and senior engineers and managers.

Course Objectives:

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

- Specify a controller action for various situations.
- Describe the need for feedback control and explain its imposition.
- Describe open and closed loop methods of controller tuning.
- Calculate steady state gain for a single loop controller.
- Describe dynamic gains for a single loop controller.
- Describe process dead-time.
- Describe the gain and phase of dead-time.
- Implement control loops for each type of controller: P, P+I and P+I+D.
- Describe the limits for each type of control.
- Describe the tuning of a cascade control loop.

Course Content:

- Process models
- Understanding control
- PID control, bringing it all together
- Controller design
- New tuning methods
- Other control methods
- Tuning a cascade control loop

Related Courses:

- Advanced Technology in DCS and SCADA
- Introduction to Control Systems
- PLC and SCADA Technologies

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Process Models

1. Static models
2. Dynamic models
3. Step response models
4. Frequency response
5. Parameter estimation
6. Disturbance models

Understanding Control

1. Negative feedback
2. Steady state response of a system
3. Dynamic response of a control system
4. Loop gain
5. Gain and dead time
6. Process dead time
7. Reverse and direct acting controllers
8. Two step control
9. Two step control with deadband
10. Proportional control action
11. Integral control action

Day 2

PID Control, Bringing it all Together

1. The feedback principle
2. PID control
3. PID algorithms
4. Integral windup
5. Commercial controllers
6. When can PID control be used?

Day 3

Controller Design

1. Specifications
2. Ziegler Nichols and related methods
3. Loop shaping
4. Analytical tuning methods

New Tuning Methods

1. Step response method
2. Frequency response methods
3. Open loop methods
4. Closed loop methods
5. The process reaction method

Day 4

Other Control Methods

1. Cascade control
2. Ratio control
3. Applications of ratio control
4. Feedforward control
5. Fuzzy logic, what is it?
6. Neural networks, what are they?

Day 5

Tuning a Cascade Control Loop

1. A written procedure for loop tuning
2. Identifying the master and slave controllers in a cascade control system
3. Why is cascade control used? What are its advantages and disadvantages?

Basic Instrumentation and Measurement

UHDIM002



Instrumentation is the art of measuring the value of plant parameters, pressure, flow, level or temperature, and supplying a signal that is proportional to the measured parameter. This course covers the instrumentation equipment normally used to measure and provide signals.

This course is designed for newly employed instrumentation and process engineers and technicians.

Course Objectives:

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

- Understand instrumentation terms, concepts, diagrams and symbols.
- Implement an instrument and wiring number system.
- Understand level measurement and the basics associated with it.
- Identify flow measurement techniques.
- Know new technologies such as smart instrumentation.
- Integrate a complete system (considering instrumentation and total errors) as well as selection criteria, commissioning and testing.

Course Content:

- Introduction
- Categories of measurements
- Basic analog DC meters
- Bridge circuits
- Comparison measurements
- Oscilloscope
- Sensors and transducers

Related Courses:

- Flow Measurement
- Gas Measurement and Flow Metering Stations

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction

1. Significant figures scientific notation
2. Average
3. Decibels
4. Basic of measurement

Categories of Measurements

1. Making measurements
2. Accuracy & precision
3. Resolution
4. Measurement errors and distribution analysis

Day 2

Basic Analog DC Meters

1. Taut band meter movement
2. Using basic DC meters
3. Voltage measurement from DC current meters
4. DC analog ohmmeter
5. Analog AC meters
6. Analog multimeters

Day 3

Bridge Circuits

1. DC wheatstone bridge
2. Bridge application
3. DC bridge
4. AC bridge
5. DC null indicators
6. Phase detectors

Day 4 and 5

Comparison Measurements

1. Potentiometers
2. Potentiometers circuits and operation
3. Digital circuits

Oscilloscope

1. CRT oscilloscope
2. Oscilloscope specification
3. Storage oscilloscope

Sensors and Transducers

1. Strain gauge
2. Temperature transducers
3. Thermistars & thermocouples
4. Inductive transducers

Instrumentation Installations in Hazardous Areas: Classification and Equipment Selection

UHDIM003



This course explains the basic concepts of hazardous areas, area classification material and temperature classification, standards, design and selection of suitable protection methods for instrumentation to be used in this area.

This course is designed for electrical, control system, process control and instrumentation engineers. Plant engineers, instrumentation technicians, operations technicians, electrical maintenance technicians and supervisors will also benefit from this course.

Course Objectives:

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

- Understand the fundamentals of hazardous area classifications.
- Understand the fundamentals of gas grouping and temperature classifications to avoid hazards.
- Understand the different methods for explosion protection.
- Understand routine maintenance, modifications and fault diagnostics.
- Understand safety working practices.

Course Content:

- Basic concepts
- Classification
- Methods of protection
- Fieldbus
- Maintenance

Related Courses:

- Safety Relief Valve Devices
- Fire & Gas Systems
- New Emergency Shutdown Approaches

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Basic Concepts

1. Introduction to hazardous areas
2. Flammable materials
3. Fire triangle
4. Explosive limits
5. Ignition energy
6. Dust hazards

Day 2

Classification

1. Classification concepts
2. Area classification of gas
3. Area classification of dust
4. Group classification
5. Temperature classification
6. Classification of hazardous locations
7. Steps to area classification for gases and vapors

Day 3

Methods of Protection

1. Overview of protection philosophy
2. Explosion proof fundamentals
3. Explosion proof advantages and disadvantages
4. Intrinsic safety fundamentals

Day 4

Fieldbus

1. Field bus in hazardous areas
2. Field with traditional explosion proof methods
3. Non-incendive protection
4. Fieldbus bus powered devices
5. Fieldbus using intrinsic safety
6. Topologies FNICO

Day 5

Maintenance

1. Introduction
2. Maintenance –general guidelines
3. Inspection
4. Maintenance of explosion proof instruments
5. Maintenance of increased safety equipment

Instrumentation System Selection, Maintenance, and Troubleshooting

UHDIM004



This training course familiarizes participants with common industrial instrumentation systems and teaches them to setup, calibrate and troubleshoot common sensors, transducers and instrumentation systems. This training course uses a variety of sensors and transmitters and calibration equipment to explain and demonstrate key concepts.

This course is designed for instrumentation engineers and technicians who are responsible for installation, maintenance and troubleshooting such systems.

Course Objectives:

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

- Be familiar to instrumentation systems.
- Understand and maintain instrument devices.
- Read P&ID and symbols.
- Calibrate instruments devices.

Course Content:

- Fundamental principles
- Diagrams, symbols, and specifications
- Maintenance management and engineering
- Pressure and flow instruments
- Temperature devices
- Panel and transmitting instruments
- Analytical instruments
- Calibration

Related Courses:

- Control Valve Selection
- P&ID and PFD Drawings
- Instrument Device Calibration

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Fundamental Principles

1. Maintenance vs. troubleshooting
2. Calibration and reasons to calibrate
3. Troubleshooting

Diagrams, Symbols, and Specifications

1. P&ID
2. Instrument loop diagrams
3. Logic diagram
4. Instrument symbols

Day 2

Maintenance Management and Engineering

1. Maintenance philosophy
2. Planning and scheduling
3. Preventative maintenance
4. Alternative methods of maintenance

Day 3

Pressure and Flow Instruments

1. Level, flow, pressure transmitters
2. Magnetic, mass, vortex and ultrasonic flow meters

Temperature Devices

1. Thermocouples and thermistors
2. Integrated circuits, temperature and infrared transducers

Day 4 and 5

Panel and Transmitting Instrument

1. Panel meters
2. Potentiometers
3. Recorders, transducers and smart transducers

Analytical Instruments

1. Field analytical instruments
2. Maintenance approaches
3. Installation issues

Calibration

1. Field calibration
2. Calibration in hazardous location

Introduction to Control Systems

UHDIM005



The main objective of this course is to give an overview of the classical and modern control theories in continuous and discrete time, and extend their application to control the industrial processes.

This course is designed for automation, electrical, instrumentation and maintenance engineers.

Course Objectives:

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

- Understand the fundamentals of process control and new techniques.
- Tune PID control loops.
- Correct stability problems.
- Understand cascade loops and feed forward control.
- Identify and correct problems with dead time in the process.

Course Content:

- Basic control concepts
- Introduction to sensors and transmitters
- Introduction to control valves
- Basic principles of control systems

Related Courses:

- Fundamentals of Instruments and Controls for Facilities Engineers
- Pneumatic Systems
- Introduction to the SCADA System

Duration
5 Days

Level
Basic

Programme Schedule

Day 1 and 2

Basic Control Concepts

Introduction to Sensors and Transmitters

1. Types of transmitters
2. Types of sensors
3. Field bus application
4. Field network standards and communication protocol

Day 3

Introduction to Control Valves

1. Classification of valves and types
2. Control valve performance

Day 4 and 5

Basic Principles of Control Systems

1. Modelling of systems, block diagrams, signal flow graphs
2. Transient and steady-state analysis of continuous-time linear time invariant systems, system stability
3. Natural and forced response, forced performance
4. Root locus analysis and design
5. Frequency domain analysis and design (Nyquist's plots)
6. State-space analysis and design
7. Digital control analysis and design
8. Analog PID controller design for the LTI process
9. Digital PID controller design
10. Control hardware components

Process Control Applied for Rotating Equipment (Compressors and Gas Turbines)

UHDIM006



This course covers a comprehensive understanding of design, operation, maintenance, and control for rotating equipment (compressors, pumps and energy generators) and troubleshooting.

This course is designed for process engineers, rotating equipment engineers, control engineers and operations supervisors.

Course Objectives:

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

- Understand the different types of pumps, compressors and turbines.
- Operate pumps, compressors and turbines as close as possible to the design efficiency.
- Monitor pump compressor and turbine efficiency, availability and reliability.
- Know selection, operation and maintenance strategies.
- Troubleshoot pump, compressor and turbine problems.

Course Content:

- Types of compressors
- Types of pumps
- Types of energy generators
- Troubleshooting of compressors, pumps and energy generators

Related Courses:

- Calibration Systems
- Introduction to the SCADA System

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1 and 2

Types of Compressors

1. Introduction
2. Hazard assessment
3. Operating requirements
4. Maintenance requirements
5. Control

Day 3

Types of Pumps

1. Introduction
2. Hazard assessment
3. Operating requirements
4. Maintenance requirements
5. Control

Day 4

Types of Energy Generators

1. Introduction
2. Hazard assessment
3. Operating requirements
4. Maintenance requirements
5. Control

Day 5

Troubleshooting of Compressors, Pumps and Energy Generators

Gas Turbine Maintenance

1. Air inlet filtration
2. Compressor blades erosion
3. Compressor fouling
4. Compressor tip clang
5. Inspection schedules
6. Safety precautions
7. Bore-scope inspections
8. Cracks testing
9. Bearings

Compressor Maintenance

1. Motor will not run
2. Oil in discharge gas
3. Knocks or rattles
4. Gas delivery has dropped off
5. Relief valve vents pressure
6. Motor overload trips
7. Compressor runs excessively hot
8. Compressor doesn't come up to seed

Pump Maintenance

1. Not enough water delivered
2. Pump takes too much power
3. Pump leaks excessively at stuffing box
4. Not enough pressure
5. Pump too noisy
6. Pump works for a while then quits

Programmable Logic Controllers; Architecture and Basic Programming PLC

UHDIM007



This course has been designed to improve basic understanding and principles of Programmable Logic Controller (PLC) and conversion of relay logic to a PLC language, it also covers troubleshooting techniques application and practical considerations.

This course is designed for instrumentation, electrical and control first and senior engineers/technicians.

Course Objectives:

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

- Examine the major components of a common PLC.
- Interpret PLC specifications.
- Apply troubleshooting techniques.
- Convert conventional relay logic to a PLC language.
- Operate and program a PLC for a given application.

Course Content:

- PLC hardware
- I/O signals, and modules
- Memory mapping and addressing
- Programme upload and download procedures and precautions
- Ladder programming
- Case studies, and examples applying PLC from different manufacturers; installation and practical aspects

Related Courses:

- Instrumentation and Control Systems
- PLC and SCADA Technologies
- Advanced Process Control

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

PLC Hardware

1. Introduction to PLC functions
2. PLC types
3. PLC architectures
4. Redundancy

Day 2

I/O Signals and Modules

1. Digital contact/voltage modules
2. Digital sinking/sourcing modules
3. Analogue 4- 20 mA modules
4. Analogue hart-field bus modules

Day 3

Memory Mapping and Addressing

1. I/O addressing
2. Software contact, relays, times and counters allocation in memory

Day 4 and 5

Programme Upload and Download Procedures and Precautions

Ladder Programming

1. Timers' instructions
2. Counters' instructions
3. Comparison instructions
4. Moving instructions

Case studies, and Examples Applying PLC from Different Manufacturers; Installation and Practical Aspects

1. PLC sizing and selection
2. Safety consideration
3. Installing in hazard industries
4. Power supply

SCADA Security

UHDIM008



The objective of this course is to familiarize SCADA personnel with the security issues they need to be aware of, and provide detailed knowledge of security threats and recognized solutions. It also presents as a workshop program with a series of SCADA security analysis and design activities.

This course is designed for professionals (managers, planners, support personnel), instrumentation personnel, IT professionals, and SCADA vendors/designers.

Course Objectives:

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

- Identify challenges and define solutions.
- Assure operational integrity of these mission-critical networked services.
- Assess and mitigate security vulnerabilities.
- Understand where unique-to-SCADA approaches are necessary.

Course Content:

- Open systems issues push the agenda
- Points of vulnerability
- SCADA network protocols
- Encryption
- Firewalls and perimeter security
- Intrusion detection and prevention
- Wireless security issues

Related Courses:

- Advanced Control Systems
- PLC and SCADA Technologies

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction

1. Security challenges are universal
2. Increased vulnerability due to open systems trend
3. Increased vulnerability from motivated, knowledgeable attackers
4. Some documented SCADA security failure incidents
5. Oil & gas sector benefits from electrical power industry initiatives

Open Systems Issues Push the Agenda

1. Protocols of the internet architecture
2. Ethernet and other IT-derived networks
3. Fieldbus standards
4. IEC standards
5. Ethernet/IP and CIP
6. Computer operating systems; Windows and Unix/Linux

Day 2

Points of Vulnerability

1. The IT infrastructure
2. Leased and shared infrastructure
3. The sensor/fieldbus networks
4. Wireless LAN systems
5. Rogue (undocumented) dial and wireless links
6. Infected/compromised portable equipment
7. Network management systems

SCADA Network Protocols

1. Features common to most SCADA networks
2. The MODBUS protocol and its lack of security
3. Demonstration/lab: MODBUS dialog
4. The DNP3 protocol and its security limitations
5. The near-universal trend to ethernet-based networks

Day 3

Encryption

1. Starting with a secure physical environment
2. The traditional purpose of assuring privacy is a minor issue
3. Traditional symmetric key cryptography
4. Public key cryptography and RSA
5. Protecting field networks from intrusion with encryption

Day 4

Firewalls and Perimeter Security

1. Firewall design objectives
2. Survey of firewall types
3. Network address translation
4. Creating and populating a SCADA DMZ
5. Field-level firewalls in the SCADA network

Intrusion Detection and Prevention

1. NIDS principles and features
2. Deployment scenarios
3. Packet signature and traffic pattern analysis
4. Strategies for dealing with the volumes of data

Day 5

Wireless Security Issues

1. Wireless technology offers, compelling advantages
2. Early misadventures with wireless security
3. TKIP and the WPA/IEEE 802.11i WiFi standards
4. Private point-to-point wireless services
5. Cellular/mobile data networks; benefits and risks

SCADA Systems & Solutions for the Oil & Gas Industry

UHDIM009



This course is designed to present SCADA and industrial computing personnel with a clear understanding of just how their environment is being affected by the changes in industry best practices.

This course is designed for SCADA systems personnel (intermediate and senior), process engineers and managers, operations and maintenance, managers, engineers and technicians.

Course Objectives:

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

- Know an intensive, systematic treatment of classical solutions, and new developments in SCADA technology.
- Have an up-to-date view of emerging trends in this critical industry segment.

Course Content:

- Features of industrial computing applications
- Telecommunications services and link protocols
- Local area networks in station and in field switches
- Full duplex ethernet
- Core principles of the TCP/IP
- Architecture
- Reliability, redundancy and safety issues
- Features of RTU
- Automatic local control process
- Instrument and equipment
- Security

Related Courses:

- SCADA Security
- Advanced Process Control
- SCADA Technology

Duration

5 Days

Level

Advanced

Programme Schedule

Day 1

Summary Features of Industrial Computing Applications

1. A prototype view of SCADA systems
2. SCADA, PLC, and DCS systems as used in the oil & gas industry
3. Networked computing issues that apply to SCADA
4. Data communications and computing

Telecommunication Services and Link Protocols

1. Types of SCADA networks
2. Communication media and signals
3. Wireless systems concepts
4. Modern types and features
5. Functions and examples of data

Day 2

Local Area Networks in the Station and in the Field

1. Ethernet networks and configurations
2. Industrial adaptations to Ethernet
3. Hub-oriented LAN configurations
4. Intelligent and switching hubs
5. LAN connectivity: bridges, routers and switches

Solving Distance and Capacity Problems with Full Duplex Ethernet

Day 3

Architecture

1. Features of the internet computing architecture
2. Key elements of The Internet Protocol
3. Transmission control protocol concepts
4. Web-based industrial computing applications

Reliability, Redundancy, and Safety Issues

1. Reliability and availability definitions
2. System reliability models
3. Failure modes
4. Intrinsic safety and electrical hazards

Day 4

Features of RTU

1. Oil/gas wellhead example: typical data points
2. Data representation formats
3. Real time operations: requirements and features
4. Role and typical features of the RTU
5. Packaging issues and designs

Automatic Local Control Process

1. Open- and closed-loop control concepts
2. Relay logic and ladder diagrams
3. Programmable logic controllers
4. The Fieldbus/Modbus architecture
5. Ethernet Industrial Protocol (Ethernet/IP)

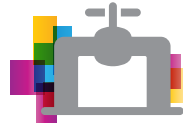
Day 5

Instruments and Equipment

1. Traditional computer interfaces
2. Balanced and unbalanced wiring configurations
3. RS-485 bus architecture features
4. Cross-over cables
5. Analog interfaces and instrument concepts

Security

1. Sampler of oil & gas security incidents
2. Points of vulnerability
3. Overview of encryption and firewalls
4. Access control and intrusion detection
5. Unique challenges of wireless systems



These courses have been designed for participants at various competency levels: Basic – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Basics of Rotating Equipment: Operation & Maintenance* and *Bearing Identification: Fitting and Servicing* courses are considered fundamentals, and are designed to be a prerequisite for new mechanical engineers. For participants looking to increase their knowledge levels, the *Gas Compressor Operations, Maintenance, and Troubleshooting* and *Preventative & Predictive Maintenance and Implementation* courses are recommended. The *Reliability Centered Maintenance (RCM)* and *Risk-Based Strategies for Inspection & Maintenance* courses are designed for participants seeking to increase their skills levels.

Section Courses

1. Basic Hydraulics
2. Basics of Rotating Equipment: Operations & Maintenance
3. Bearing Identification: Fitting and Servicing
4. Gas Compressor Operations, Maintenance, and Troubleshooting
5. Gas Turbine & Turbo Expander: Operation, Maintenance, and Troubleshooting
6. Preventive & Predictive Maintenance and Implementation
7. Reliability Centered Maintenance (RCM)
8. Risk-Based Strategies for Inspection & Maintenance
9. Valves Types & Technology (Control Valves)
10. Welding Technology



Basic Hydraulics

UHDM001



This course is designed to develop skills in understanding basic hydraulic systems, fluid, tanks, directional valves, relief valves, and stating the flow and function of component using a graphic fluid symbols. The participants also learn how to draw hydraulic circuits using ISO symbols.

This course is designed for new mechanical engineers, technicians and chemists whose work is related to the features of oil refining and gas plants.

Course Objectives:

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

- Describe in writing Pascal's Law (relationship between pressure force and area) and calculate force or area when given required values ($F = P \times A$).
- Know types of fluid pumps including positive displacement and non-positive.
- State the three basic type of pumps including gear pump, vane pump, and piston pump.
- Understand the types of hydraulic valves including directional, flow and pressure control valve.
- List the type of hydraulic actuators, such as: hydraulic motors and hydraulic cylinders.
- State the flow and function of component using a graphic fluid symbol.
- Describe the hydraulic load sensing and pressure compensated system.

Course Content:

- Hydraulic tanks
- Function of hydraulic fluid
- Hydraulic pumps
- Pressure control valves
- Directional control valves
- Flow control valves
- Cylinders
- Pilot hydraulics and implement hydraulic systems

Related Courses:

- Maintenance of Hydraulics System
- Control Valve Technology

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction

Hydraulic Tanks

1. Pressurized tanks
2. Vented tanks
3. ISO schematic symbol

Function of Hydraulic Fluid

1. Viscosity
2. Petroleum products
3. Fire resistant fluids

Day 2 and 3

Hydraulic Pumps

1. Pumps
2. Hydraulic motor
3. Non-positive displacement pumps
4. Positive displacement pumps
5. Fixed displacement vs variable displacement
6. Pump ISO symbols

Pressure Control Valves

1. Relief valves
2. Relief valves ISO symbols
3. Sequence valve
4. Pressure reducing valve
5. Pressure deferential valve

Directional Control Valves

1. Directional control valve
2. Open centre directional control valve
3. ISO symbols

Day 4 and 5

Flow Control Valves

1. Orifice
2. Pressure compensated flow control valve
3. Quick drop valve

Cylinders

1. Single acting cylinders
2. Double acting cylinders

Pilot Hydraulic and Implement Hydraulic Systems

Basics of Rotating Equipment: Operation & Maintenance

UHDM002



This course is designed to develop skills in understanding rotating equipment and its components, pumps, compressors and turbine operation and maintenance, as well as bearing, fitting servicing, and troubleshooting.

This course is designed for new mechanical engineers and maintenance technicians.

Course Objectives:

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

- Define safety needs and lockout procedures.
- Identify rotating equipment.
- Identify the major components of rotating equipment and explain their function.
- Identify the auxiliaries equipment required to maintain rotating equipment operation.
- Define inspection and preventive maintenance.

Course Content:

- General safety topics
- Compressors types and maintenance
- Pumps types, components, characteristics, application and maintenance
- Turbines operation, components and maintenance
- Fans and louvers belts safety and maintenance
- Lubrication types and hazards
- Bearings
- Seals types and trouble shooting
- Alignment methods and troubleshooting
- Vibration analysis and cause and effect
- Maintenance types

Related Courses:

- Static and Dynamic Balancing of Rotating Equipment Bearings
- Gas Turbine Operation, Installation and Troubleshooting

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

General Safety Topics

1. Tents of maintenance safety
2. Safety meeting
3. Rotating equipment safety

Compressors Types and Maintenance

1. Introduction
2. Centrifugal
3. Reciprocating
4. Screw

Day 2

Pumps Types, Components, Characteristics, Application and Maintenance

1. Pumps- general
2. Positive displacement pump
3. Centrifugal

Turbines Operation, Components and Maintenance and Gas Turbines

Day 3

Fans and Louvers Belts Safety and Maintenance

Lubrication Types and Hazards

1. Oil
2. Grease
3. ISO and SAE specifications

Day 4

Bearings

1. Purpose
2. Friction
3. Antifriction

Seals Types and Trouble shooting

Alignment Methods and Troubleshooting

Day 5

Vibration Analysis and Cause and Effect Maintenance Types

1. Preventive
2. Predictive
3. Proactive

Bearing Identification: Fitting and Servicing

UHDM003



This course is designed to develop skills in understanding bearing types and how to select and identify the correct bearing, trouble shooting, and handling and storage.

This course is designed for mechanical maintenance engineers and technicians. Senior engineers, leaders and planning personnel could also attend this course.

Course Objectives:

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

- Identify types of bearing and parts.
- Select the correct bearing type for different load conditions.
- Identify the correct bearing fit for different applications.
- Fit and remove an antifriction bearing.
- Identify some common causes of bearing failure by visual inspection.

Course Content:

- Friction
- Bearing loads
- Plain bearing
- Troubleshooting
- Anti-friction bearing
- Trouble shooting: Anti-bearing failures
- Bearing housing
- Handling and storage

Related Courses:

- Rotating Equipment Operation and Maintenance
- Mechanical Sealing

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction

1. Friction
2. Bearing Loads

Plain Bearing

1. Types of plain bearing
2. Plain bearing fits
3. Fitting and removing plain bearing

Day 2

Troubleshooting

1. Wiping
2. Scoring
3. Erosion
4. Fatigue
5. Fretting
6. Misalignment
7. Corrosion and Deposits

Day 3

Anti-Friction Bearing

1. Parts of an anti-friction bearing
2. Types of anti-friction bearing
3. Anti-friction bearing fits
4. Anti-friction bearing materials
5. Anti-friction bearing lubrication
6. Fitting and removing anti-friction bearing

Day 4 and 5

Trouble shooting: Anti-Bearing Failures

1. Wear marks
2. Fatigue
3. Misalignment
4. Damage caused by incorrect fitting
5. Brinnelling and false brinnelling
6. Lubrication failure

Bearing Housing

Handling and Storage

Gas Compressor Operation, Maintenance, and Troubleshooting

UHDM004



This course introduces the participants to the concepts of compression methods and compressors types, selection, operation and maintenance, troubleshooting, as well as preventative maintenance procedures.

This course is designed for engineers and operations staff responsible for operating and maintaining gas compressors.

Course Objectives:

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

- Have a detailed understanding of the natural gas compression process, reciprocating compressor components and hardware.
- Know practical operating guidelines to optimize production and minimize downtime on natural gas compressors.
- Understand compressor sizing fundamentals, performance evaluation, optimized loading curve review and troubleshooting.

Course Content:

- Reciprocating compressors and their applications
- Design and materials
- Operation and maintenance
- Repair of reciprocating compressors
- Troubleshooting
- Preventive maintenance

Related Courses:

- Vibration Management
- Shaft Alignment of Machines
- Gear Boxes

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Reciprocating Compressors and their Applications

1. Introduction
2. Methods of compression
3. Types of compressors
4. Characteristics of reciprocating compressors
5. Compressor selection
6. Reciprocating compressor cylinder arrangement

Day 2

Design and Materials

1. Materials of construction
2. Foundation for reciprocating compressors
3. Compressor piping and pulsation

Operation and Maintenance

1. Lubrication of reciprocating compressors
2. Operational problems of maintenance of compressor control Systems
3. Non-lubricated compressor maintenance

Day 3

Repair of Reciprocating Compressors

1. Compressor alignment
2. Foundation problems and repairs
3. Compressor bearing maintenance and replacement
4. Other compressor component repairs

Day 4 and 5

Troubleshooting

1. Introduction compressor problems
2. Typical compressor problems
3. Troubleshooting lubrication systems
4. Motor controls
5. Compressor services technicians reports

Preventive Maintenance

1. Compressor maintenance
2. Effectiveness of preventative maintenance
3. Compressor preventative maintenance

Gas Turbine & Turbo Expander: Operation, Maintenance, and Troubleshooting

UHDM005



Gas turbines are a significant prime mover in industrial plant application. For this reason it is important for the technicians to understand the principles of operation and maintenance involving gas turbines.

This course is designed for mechanical and instrumentation engineers whom are working in gas turbine operation and maintenance up to a maximum of 10 years of experience.

Course Objectives:

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

- Describe the working principles, components, types, applications, and systems.
- Know startup and shutdown procedures.
- Conduct regular gas turbine maintenance.
- Describe energy transformation in gas turbine engines.
- Describe turbine engine performance and specifications.
- Advanced methods of gas turbine maintenance (bore scope-condition monitoring).

Course Content:

- The gas turbine engine
- Gas turbine engine components
- Energy transformation in gas turbines
- Fluid flow in gas turbine engines
- Gas turbine engine performance and specifications
- Selected topics on gas turbine component design and manufacturing
- Gas turbine maintenance

Related Courses:

- Rotating Equipment: Operation, Maintenance, and Troubleshooting
- Gas Turbine Theory for Technicians
- Diesel Engines

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

The Gas Turbine Engine

1. Basic cycle
2. Advantages and disadvantages
3. Applications

Gas Turbine Engine Components

1. Radial and axial air compressors
2. Combustors and their types
3. Turbines and their type

Day 2

Energy Transformation in Gas Turbines

1. Introduction in thermodynamics
2. Enthalpy and kinetic energy
3. Energy transformation in the air compressor
4. Energy transformation in the combustors
5. Energy transformation in the turbines
6. Examples using thermodynamics equations

Fluid Flow in Gas turbine Engines

1. Surge and rotating stalls
2. Friction and turbulence
3. Chock flow

Day 3

Gas Turbine Engine Performance and Specifications

1. Leading particulars
2. Compressor characteristics
3. Turbine characteristics
4. Component losses and matching
5. Calculation of specific fuel consumption and equivalent speed and flow

Day 4

Selected Topics on Gas Turbine Components Design and Manufacturing

1. Introduction
2. Properties of manufacturing materials
3. Gas turbine cooling
4. Manufacturing of turbine blades and vanes
5. Accessory components

Days 5

Gas Turbine Maintenance

1. Air inlet filtration
2. Compressor blades erosion
3. Compressor fouling
4. Compressor tip clang
5. Inspection schedules
6. Safety precautions
7. Bore-scope inspections
8. Cracks testing
9. Bearings

Preventive & Predictive Maintenance and Implementation

UHDM006



This course covers all the steps required in developing a successful planning and predictive maintenance programme from system development, until a well-managed maintenance system is in place and operational.

This course is designed for planners and engineers in the field of maintenance, or operation personnel whose work is related to preventive and/or predictive activities.

Course Objectives:

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

- Understand how world-class organizations solve common planning problems.
- Improve productivity through use of better, more timely information.
- Implement a practical and effective predictive maintenance effort.
- Improve consistency and reliability of asset information.
- Achieve more productive turnarounds.
- Optimize preventive and predictive maintenance strategies.

Course Content:

- Introduction to maintenance management & reliability
- Effective maintenance strategies
- Maintenance management, leadership, planning, & scheduling
- Failure management & achieving excellence
- Maintenance benchmarking and performance measurement

Related Courses:

- Maintenance Planning, Scheduling, and Work Control
- The Art of Maintenance
- Total Productive Maintenance

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Maintenance Management & Reliability

1. Maintenance management fundamentals
2. Managing equipment reliability
3. Failure mode effect & critical analysis
4. Optimizing maintenance decisions

Day 2

Effective Maintenance Strategies

1. Introduction to maintenance strategies
2. Preventive maintenance strategy, selection and implementation
3. Predictive maintenance strategy, selection and implementation
4. Resources and roles in maintenance: dedicated manpower, contractors and specialist tools

Day 3

Maintenance Management, Leadership, Planning & Scheduling

1. Roles & responsibilities
2. Job planning
3. Scheduling

Day 4

Failure Management & Achieving Excellence

1. Potential Failure Analysis (PFA): Integration of PFA with FMECA & RCM; understanding the P-F interval and deciding which technologies to apply
2. Vibration Analysis: detectable faults, setup parameters, monitoring & protection, and online or offline
3. Supporting Technologies: infrared thermography, passive ultrasonic and oil analysis
4. Steps for achieving maintenance excellence.

Day 5

Maintenance Benchmarking and Performance Measurement

1. Best practice maintenance management
2. CMMS integration & reporting
3. Key performance indicators

Reliability Centered Maintenance (RCM)

UHDM007



RCM is a systematic process used to determine what has to be accomplished to ensure that any physical facility is able to continuously meet its designed functions in its current operating context. This course covers the principles of RCM, as well as implementation, preparation, techniques, and monitoring and trending strategy.

This course is designed for division managers and maintenance-related managers. Maintenance and production engineers will also benefit from this course.

Course Objectives:

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

- Understand Reliability Centered Maintenance (RCM) concepts and principles.
- Know techniques and how to implement RCM.

Course Content:

- Introduction to RCM
- Fundamental RCM concepts
- RCM implementation: preparation and tools
- RCM made simple: implementation process
- RCM task selection process
- RCM for instruments
- RCM monitoring and trending strategy

Related Courses:

- Total Productive Maintenance
- Machinery Failure Analysis and Prevention
- Root and Cause Failure Analysis

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Introduction to RCM

Fundamental RCM Concepts

1. The three phases of an RCM-based preventative maintenance program
2. The three cornerstones of RCM
3. Hidden failures, redundancy, and critical components
4. Economic components
5. Redundant, standby, and backup functions
6. Typical examples of component classifications
7. Failures found during operator functions
8. Component classification hierarchy
9. The defensive strategies of a PM programme
10. Eliminating the requirement for identifying boundaries & interfaces
11. Functions & functional failures at the component level
12. The COFA versus FMEA
13. How do you know when the plant is reliable?

Day 2 and 3

RCM Implementation: Preparation and Tools

1. Preparation
2. The sequential elements needed for the analysis
3. Informational resources
4. Establishing convention
5. Specialized work stations and software
6. COFA Excel spreadsheet versus the FMEA

RCM Made Simple: The Implementation Process

1. Define your asset strategy
2. Understanding the RCM COFA logic tree
3. Completing the COFA worksheet in conjunction with the COFA logic tree
4. Describe the component functions
5. Describe the functional failures
6. Describe the system effect for each failure mode
7. Total productive maintenance
8. Reliability-based maintenance
9. Probabilistic safety analysis

RCM Task Selection Process

1. Understanding preventative maintenance tasks
2. PM task selection logic tree
3. Determining the PM task frequency and interval
4. Common mode failures
5. Different predictive maintenance techniques

Day 4

RCM for Instruments

1. Instrument categories
2. Instrument logic trees

RCM Living Programme

1. Model for the RCM living programme
2. The Graft feedback evaluation element
3. The corrective maintenance evaluation element
4. Root-cause evaluations
5. Industry failure data

Day 5

RCM Monitoring and Trending Strategy

1. The aggregate metrics
2. Weighting factors
3. Performance calculations
4. Final caution
5. Performance graphs
6. Performance graph by system
7. Avoid reliability complacency

Risk-Based Strategies for Inspection & Maintenance

UHDM008



Systematic risk-based inspection can assess the likelihood and potential consequences of the failure of pressure equipment. Risk-based inspection provides an opportunity for companies to prioritize inspection equipment; improve methods of inspection, frequency, resources, develop specific plans for inspection of equipment, and enable the implementation of reliability centered maintenance. This results in improved safety and less risk of failure, forced shutdowns, and reduced operational costs.

This course is designed for operations engineers, maintenance engineers, and engineering managers and supervisors.

Course Objectives:

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

- Know the key aspects of Risk-Based Inspection (RBI), its advantages and limitations
- Understand how RBI is linked to reliability-centered maintenance
- Understand how a fitness-for-service assessment affects risk
- Develop optimum inspection intervals for individual equipment based on the assessment of the active degradation

Course Content:

- Significance of inspection
- Maintenance costs
- Risk-Based Inspection definitions
- API Risk-Based Inspection methodology
- Overview of over 60 damage mechanisms found in refineries
- Inspection planning & guidance
- Inspection history & interpretation
- Inspection interval optimization based on assessed risk

Related Courses:

- Root and Cause Failure Analysis
- Preventive and Predictive Maintenance and Implementation
- The Art of Maintenance

Duration
5 Days

Level
Advanced

Programme Schedule

Day 1

Significance of Inspection in Plant Integrity and Maintenance Costs

1. Common inspection strategies and their limitations
2. Risk-based decision-making fundamentals and tools
3. Understanding and managing risk

Day 2

Risk Based Inspection Definitions

1. Risk-Based Inspection evolution
2. Key Elements of RBI
3. Reasons for implementing Risk Based Inspection
4. API Risk-Based Inspection methodology
5. Impact of RBI on Related API codes, standards, and recommended practices
6. API Risk Based Inspection software

Day 3

Overview of 60+ Damage Mechanisms Found in Refineries

1. Detailed discussion of some common damage mechanisms
2. Identification of deterioration mechanisms & failure modes
3. Selection of suitable materials for specific deterioration mechanisms
4. Integrated asset management

Day 4

Inspection Planning & Guidance

1. Need for some speculative/exploratory inspection
2. RBI implementation
3. Developing equipment and piping systems/circuits Inventory
4. Inspection history & interpretation
5. Equipment database

Day 5

Inspection Interval Optimization Based on Assessed Risk

1. Evaluation of inspection results
2. Fitness-for-service assessments
3. Estimation of consequences of failure

Valves Types & Technology (Control Valves)

UHDM009



This course has been designed to improve the following competencies: tabulating the valve data sheet, assembling and disassembling the valve parts safely, control valve operation (online and offline), interpreting the function of control valves, and installing control valves. This will be achieved through listing the control valve types, describing the valve parts, and practicing valve selection, sizing, and testing.

This course is designed for maintenance and production engineers and technicians.

Course Objectives:

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

- Identify the different types of valves and their classifications.
- Understand applications and needed calculations for valve selection, valve rating standards and performance.
- Be aware of types of actuators and applications, valve installation and maintenance.
- List the different types of linear motion valves and their applications.
- List the different types of rotary motion valves and their applications.
- Size the control valve actuators.
- Define the fail system construction.
- Recognize the limit switch types.

Course Content:

- Introduction to control valves
- Control valve performance
- Valve and actuator types
- Control valves and connections
- Valve body bonnets
- Actuators
- Control valve accessories (positioners)
- Control valve selection
- Control flow characteristics
- Valve sizing
- Non-destructive test procedures
- Installation and maintenance

Related Courses:

- Valve Selection
- Maintenance and Repair Pipeline Engineering
- Non-Destructive Tests

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Control Valves

Control Valve Performance

1. Process variability
2. Dead band
3. Actuator–positioner design
4. Valve response time
5. Valve type and characteristics
6. Valve sizing

Day 2 and 3

Valve and Actuator Types

1. Control valves
2. Globe valves
3. Rotary valves

Control Valves and Connections

1. Screwed pipe threads
2. Bolted casketed flanges
3. Welding-end connections

Valve Body Bonnets

1. Extension bonnets
2. Bellows seal bonnets

Actuators

1. Diaphragm actuators
2. Piston actuators
3. Manual actuators
4. Electric actuators
5. Electric hydraulic actuators

Control Valve Accessories (Positioners)

Day 4 and 5

Control Valve Selection

1. Valve body materials
2. Designation for high nickel alloys
3. Pressure temperature ratings for standard class

Control Flow Characteristics

1. Flow characteristics
2. Selection of flow characteristics

Valve Sizing

1. Sizing valves for liquids
2. Equation constants
3. Determining differential pressure

Non-Destructive Test Procedures Installation and Maintenance

Welding Technology

UHDM010



This course covers welding classification, welding process, welding metallurgy, material welding, weld symbols and weld quality.

This course is designed for new mechanical engineers and technicians, as well as welding and inspection engineers.

Course Objectives:

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

- Define welding.
- List the components of the welding process, including: gas welding, arc welding, resistance welding, and solid phase welding.
- State the type of welding of material, including: welding of cast iron, welding of aluminum, and welding of stainless steel.
- Know welding quality components throughout: porosity, crack, and lack of fusion.
- State the welding procedures and planning processes.
- Conduct non-destructive tests.

Course Content:

- Definition and classification
- Review of the conventional welding process
- Shielded metal ARC welding
- Thermal and metallurgical considerations in welding
- Welding of materials
- Welding procedure and process planning
- Weld quality
- Testing and inspection of welds

Related Courses:

- Radiographic Tests
- Welding and Inspection
- Inspection of CO2 Welding

Duration
5 Days

Level
Basic

Programme Schedule

Day 1

Introduction

1. Definition and classification
2. Importance of welding, and its applications

Review of the Conventional Welding

Processes

1. Gas welding
2. Arc welding
3. Resistance welding
4. Solid phase welding

Day 2

Shielded Metal ARC Welding

1. Principles of operation
2. Welding currents (AC vs DC)
3. Covered electrodes

Thermal and Metallurgical Consideration in Welding

1. General metallurgy
2. Welding metallurgy
3. Thermal and mechanical treatment of welds

Day 3 and 4

Welding of Materials

1. Welding of cast irons
2. Welding of aluminium
3. Welding of stainless steel

Welding Procedure and Process Planning

1. Welding symbols
2. Welding procedures
3. Joint preparations for fusion welding

Weld Quality

1. Discontinuities in fusion welding joints
2. Causes and remedies for fusion weld discontinuities
3. Discontinuities in resistance and solid welds
4. Discontinuities in brazed and soldered joints
5. Significance of weld discontinuities

Day 5

Testing and Inspection of Welds

1. Tensile prosperities
2. Bend test
3. Non-destructive inspection of welds



These courses are designed for participants at various competency levels: Beginner – Intermediate – Advanced. The course descriptions and content will help training managers to determine which courses to select to set up training plans for new staff to develop their knowledge and skills, and for veteran staff to build upon their competencies.

The *Fundamentals of Equipment in the Oil & Gas Industry* and *Fundamentals of Flow Diagrams & Control Systems (P&ID, PFD)* courses are considered fundamentals, and are designed as a prerequisite for new process engineers. For participants looking to increase their knowledge levels, the *Gas Conditioning and Processing* course is recommended. The *HAZOP Applications in the Petroleum Industry* and *Advanced Technology in Distributed Control Systems* courses are designed for participants seeking to increase their skills levels.

Section Courses

1. Programmable Logic Controllers; Architecture and Basic Programming PLC
2. Advanced Technology in Distributed Control Systems
3. Basics of Oil Refining
4. Corrosion Control
5. Fundamentals of Flow Diagrams & Control Systems (P&ID, PFD)
6. Fundamentals of Crude Oil Desalting and Treatment
7. Fundamentals of Equipment in the Oil & Gas Industry
8. Gas Conditioning and Processing
9. HAZOP Applications in the Petroleum Industry
10. Heat Transfer Equipment Operation, Startup, and Commissioning
11. PLC & SCADA Technologies





Programmable Logic Controllers; Architecture and Basic Programming PLC

UHDPE001



This course is designed to develop skills in understanding the fundamentals of PLC systems and PLC types and comprising examples applying PLC from different manufactures.

This course is designed for process, instrumentation, electrical and control (first and senior) engineers/technicians.

Course Objectives:

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

- Examine the major components of a common PLC system.
- Interpret PLC specifications.
- Apply troubleshooting techniques.
- Convert conventional relay logic to a PLC language.
- Operate and program a PLC for a given application.

Course Content:

- PLC hardware
- I/O signals and modules
- Memory mapping and addressing
- Programme upload & download procedures and precautions
- Ladder programming
- Case studies and examples in applying PLC from different manufactures
- Installation and practical aspects

Related Courses:

- Introduction to Control Systems
- Introduction to Distributed Control Systems
- Introduction to Instrumentation and Measurement

Programme Schedule

Day 1

PLC Hardware

1. Introduction to PLC functions
2. PLC types
3. PLC architectures
4. Redundancy

Day 2

I/O signals and modules

1. Digital contact/voltage modules
2. Digital sinking/sourcing modules
3. Analogue 4-20 mA modules
4. Analogue hart-field bus modules

Day 3

Memory Mapping and Addressing

1. I/O addressing
2. Software contact, relays, times, and counters allocation in memory

Day 4

Ladder Programming

1. Timers' instructions
2. Counters' instructions
3. Comparison instructions
4. Moving instructions

Programme Upload & Download Procedures and Precautions

Day 5

Case Studies and examples in applying PLC from Different Manufactures

Installation and Practical Aspects

1. PLC sizing and selection
2. Safety considerations
3. Installing in hazard industries
4. Power supply



Advanced Technology in Distributed Control Systems

UHDPE002



This course will cover the practical application of modern distributed control. All control systems are distributed to a certain system, and there are definite advantages of the concepts of DCS, PLC and SCADA, but some superior advantages of DCS are integrity and abnormal situation alarms.

This course is designed for process control, automation, production, process, plant, electrical, and project engineers. Operations managers and IT managers working with networks may also benefit from this course, as well as maintenance engineers and supervisors.

Course Objectives:

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

- Understand the fundamentals of architecture and operation of Distributed Control Systems.
- Know key ergonomic issues in the design of operator displays.
- Apply advanced control strategies to the existing plant control system.
- Make more effective use of the existing DCS process control capabilities.
- Recognize and deal with human problems in interfacing to alarm systems.
- Know tricks and tips in installation and use of industrial ethernet in DCS systems.

Course Content:

- Introduction
- Summary of typical distributed control systems
- DCS versus SCADA versus PLCs
- DCS elements
- Data communications in DCS
- Programming of DCS
- The operator interface
- Distributed Control System reporting
- Distributed Control System configuration

Related Courses:

- PLC and SCADA Technologies
- Introduction to Instrumentation and Control

Programme Schedule

Day 1

Introduction

Summary of Typical Distributed Control Systems

DCS versus SCADA versus PLCs

1. Comparison
2. The smart instrument; the main component in a Distributed Control System

DCS Elements

1. Main difference between a DCS and SCADA/PLC system
2. Requirement of the operator interface within DCS
3. Redundancy in the DCS

Day 2 and 3

Data Communications in DCS

1. Overview of DCS and SCADA
2. Network topology
3. Foundation fieldbus
4. Industrial ethernet
5. TCP/IP

Programming of DCS Systems

1. Block configuration
2. Tips and tricks in programming

The Operator Interface

1. The operators' process "window"
2. The various operator display configurations

Day 4 and 5

Alarm System Management for DCS

1. Philosophies alarm management
2. Human and ergonomic factors
3. Safety integrity levels

Distributed Control System Reporting

1. Alarm reporting, types of alarms generated
2. Data history use in logs and trend displays

Distributed Control System Configuration

1. The organization of system data files
2. Data configuration procedures



Basics of Oil Refining

UHDPE003



This course is designed to develop skills and understanding in the properties, selection, engineering and processing of crude oil, and will include an examination of operating conditions, control variables, chemistry of the processes, catalysts & operating problems.

This course is designed for new process engineers, as well as technicians and chemists whose work is related to the important features of oil refining.

Course Objectives:

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

- Understand sources of refinery feedstock; crude or synthetic.
- Understand the composition of the feeds, their characteristics, desirable properties and selection.
- Identify the effects of crude types on a refinery, and how a refinery matches crude composition to product market demand by selection of process units.
- Know the fundamentals of individual refinery processes, engineering, materials and construction/operational challenges.

Course Content:

- Classification and properties of oil
- Description of the processes
- Desalting of crude oil
- Overview of distillation process
- Atmospheric distillation of crude oil
- Vacuum distillation
- Introduction to advanced processes
- Process monitoring and control/special safety issues

Related Courses:

- Chemical Treatment in the Oil & Gas Process
- Gas Conditioning and Processing
- Introduction to Control Systems

Programme Schedule

Day 1

Classification and Properties of Oil

1. Paraffin base
2. Asphaltic base
3. Mix base
4. Hybrid base
5. API gravity
6. Viscosity
7. Chemical and physical prosperities

Description of the Processes

1. Fractionation
2. Conversion process
3. Treatment process
4. Blending
5. Other refinery processes

Day 2

Desalting of Crude Oil

1. Dilution water injection and dispersion
2. Emulsification of diluted water in oil
3. Distribution of emulsion in the electrostatic field
4. Electrostatic coalescence
5. Water droplet settling

Overview of the Distillation Process

1. Definition
2. System components:
 - 2-1. Columns parts
 - 2-2. Trays devices
 - 2-3. Reboilers
 - 2-4. Condensers
 - 2-5. Heaters/coolers
 - 2-6. Pumps
3. Description of the distillation process diagram

Day 3 and 4

Atmospheric Distillation of Crude Oil

1. Crude distillation
2. Crude distillation operation
3. Operating difficulties
4. Troubleshooting

Vacuum Distillation

1. VDU feed/product
2. Different types of vacuum distillation
3. VDU flow diagram
4. Process equipment
5. Troubleshooting

Day 5

Introduction to Advanced Processes

1. Vice breaking
2. Catalytic cracking
3. Hydro cracking
4. Coking
5. Isomerization
6. Hydro reforming
7. Process monitoring and control/special safety issues



Corrosion Control

UHDPE004



This course is designed for professionals who are working in the field of oil & gas. Guided by leaders in the field, participants will explore principles and protection strategies of corrosion control. The combination of teaching methods – formal lectures, case studies and practical sessions – will maximize the learning process and participants' understanding of the subject.

This course is designed for engineers engaged in the oil & gas industry, and engineers involved with inspection functions and/or corrosion mitigation.

Course Objectives:

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

- Understand corrosion ramifications in oil production operations.
- Recognize the various forms of corrosion attacks.
- Carry out a corrosion failure analysis.
- Utilize the most appropriate method for corrosion control.
- Adopt the most appropriate monitoring techniques.
- Utilize information sources.

Course Content:

- Corrosion principles and forms
- Corrosion aspects and design
- Cathodic protection
- Corrosion failures, analysis procedures, and samples
- Oil refinery and pipelines

Related Courses:

- Cathodic Protection
- Corrosion in the Oil & Gas Recovery Industry

Programme Schedule

Day 1

Corrosion Principles and Forms

1. Overview
2. Economics
3. Corrosion fundamentals
4. Basic corrosion principles
5. Forms of corrosion

Day 2

Corrosion Aspects and Design

1. Corrosion aspects – oxygen
2. Hydrogen sulphide
3. Carbon dioxide, bacterial
4. Corrosion control – design

Day 3

Cathodic Protection

1. Cathodic protection
2. Materials selection
3. Coatings and linings
4. Corrosion management

Day 4

Corrosion Failures, Analysis Procedures, and Samples

1. Corrosion failure analysis
2. Water chemistry
3. Quality assurance
4. Corrosion samples

Day 5

Oil Refinery and Pipelines

1. Corrosion under insulation
2. Pipelines and risers
3. Oil refining
4. Corrosion films



Fundamentals of Flow Diagrams & Control Systems (P&ID, PFD)

UHDPE005



The objective of plant design to define the requirements, piping, instrumentation, and all process requirements needed to build and operate a process plant. This course covers the principles of flow diagrams and piping, and instrument diagram in the basics of control systems and transmitter operation.

This course is designed for process, facilities, mechanical and electrical engineers in refinery and petrochemical operations.

Course Objectives:

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

- Understand the basic principles of flow diagrams.
- Understand piping & instrument diagrams P&ID, PFD.
- Read oil & gas plant piping & instrument diagrams.
- Identify the fundamentals of the process control.
- Understand control loop systems (opens & closed loop systems).
- Understand basic control systems (pressure, level, temperature, flow, etc.).
- Know process control basics and automatic control.
- Read interlock logic diagrams.

Course Content:

- Piping & instrument diagram, P&ID, PFD
- What is process modeling and process controlling?
- Control strategy and practical examples
- Control loop systems (opens & closed loop systems)
- Process control basics and control valves, and other devices

Related Courses:

- Introduction to Instrumentation
- Introduction to Control Systems
- HAZOP Applications in the Petroleum Industry

Programme Schedule

Day 1 and 2

Piping & Instrument Diagram, P&ID, PFD

1. Process engineering fundamentals
2. Preliminary engineering drawings PFD, P&ID and PBD P&ID symbols
3. Drawing and interpretation for P&ID – valves, transmitters, equipment
4. Working with basic design requirements
5. Control systems in P&ID
 - 5-1. Identifying points of measurement and control
 - 5-2. Drawing and interpretation P&ID control and safety systems
 - 5-3. Interpretating basic P&ID with control systems
 - 5-4. Interpretating a detailed diagram
6. Developing P&ID drawing (flow station/production facilities)
7. Engineering drawings' documentation (as-built drawings)

Day 3

What is Process Modeling and Process Controlling?

Control Strategy and Practical Examples

Day 4 and 5

Control Loop Systems (Opens & Closed Loop Systems)

1. Automatic control
2. Control and safety valves

Process Control Basics and Control Valves, and Other Devices



Fundamentals of Crude Oil Desalting and Treatment

UHDPE006



This course presents a comprehensive summary of oil desalting systems. For each technique, theoretical and practical aspects are discussed in detail; including oil desalting operation, equipment and troubleshooting, and separator troubleshooting.

This course is designed for new process engineers and personnel working in operation, troubleshooting and maintenance of crude oil dehydration and desalting systems.

Course Objectives:

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

- Understand the fundamentals of separation and types of separators.
- Understand the operation and troubleshooting of separator problems.
- Operate and troubleshoot vertical heater-treaters, and horizontal heater-treaters.
- Know the operation & troubleshooting of dehydration plants and wash tanks.
- Understand oil desalter operation and troubleshooting.
- Understand practical considerations of crude oil treaters.

Course Content:

- Overview about crude oil origin
- Oil & gas separation
- Crude oil emulsions
- Oil emulsion treatment technology
- Oil desalting systems

Related Courses:

- Oil Production and Processing
- Oil Emulsions Technology

Programme Schedule

Day 1 and 2

Overview about Crude Oil Origin, Chemistry and its Properties

1. Different theories of oil origin
2. Chemical components and impurities
3. Oil classification

Oil & Gas Separation/Fundamentals of Separation in Vessels

1. Separator types
2. Factors effecting separation
3. 3-two phases separation

Oil & Gas Separator Operation and Troubleshooting

1. Inadequate vapor capacity
2. Liquid flow capacity
3. Pressure drops
4. Separation efficiency

Day 3 and 4

Crude Oil Emulsions

1. Definition
2. Types of emulations
3. Emulsion stability and effecting factors
4. Measurement of emulsions

Oil Emulsion Treatment Technology and Equipment

1. Chemical selection/free-water knockouts
2. Gunbarrel tanks/horizontal flow treaters
3. Indirect fired heaters/direct fired heaters
4. Horizontal heater-treaters/electrostatic heater-treaters

Day 5

Oil Desalting Systems

1. Single-stage dehydration
2. Single-stage desalters
3. Two-stage desalters
4. Three-stage desalters
5. Typical operating conditions and performance
6. Factors that affect desalter operation and performance
7. Oil desalter operation and troubleshooting

Practical Considerations



Fundamentals of Equipment in the Oil & Gas Industry

UHDPE007



This course covers the basics of equipment in the oil & gas industry, comprising of: thermodynamic principles and fluids flow, valve types and selection, separation principles with different phases, dehydration operation, stabilization processes and storage tanks types.

This course is designed for process and production operators, technicians and production chemists, and those interested in having an overview about the fundamentals of equipment in the oil & gas industry.

Course Objectives:

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

- Select, size and operate oil & gas equipment.
- Understand practical equipment sizing methods for major process equipment.
- Apply hydrate prevention techniques.
- Select an appropriate storage tank and maintenance.

Course Content:

- Basics of fluid flow
- Pressure losses in pipelines
- Valves types and parts
- Separation processes
- Crude oil dehydration & desalting
- Hydrates and hydrate prevention techniques
- Glycol dehydration
- Stabilization by pressure reduction
- Distillation
- Storage tanks

Related Courses:

- Valve Technology
- Gas Conditioning and Processing
- HYSYS Simulation

Programme Schedule

Day 1

Basics of Fluid Flow

1. Viscosity
2. Laminar flow theory
3. Turbulent flow

Pressure Losses in Pipelines

1. Calculation friction factor

Valve Types and Parts

1. Valves types
2. Gate valves
3. Globe and angle valves
4. Check valves
5. Ball valves
6. Butterfly valves
7. Y-strainer
8. Valves parts: body, bonnet, disc, valve trim and seat rings

Day 2

Selection and Application of Valves

1. Classification of Valves based on:
 - 1-1. Mechanical motion
 - 1-2. Valve size
 - 1-3. Pressure – temperature rating

Valve Categories

1. Isolation valves
2. Regulating valves
3. Pressure – relief devices

Separation Process: Principles, Terminology, Application & Main Parts

1. Separation process
2. Thermodynamics of separation operations
3. Mass transfer and diffusion
4. Single equilibrium stages
5. Cascade and hybrid systems

Separation Troubleshooting

1. Inadequate vapor capacity
2. Liquid flow capacity
3. Pressure drop
4. Separation efficiency

Day 3 and 4

Crude Oil Dehydration & Desalting

1. Free water separation
2. Emulsion
3. Heater treater
4. Electrostatic treater process plant description

Hydrates and Hydrate Prevention Techniques

1. Definition
2. Chemical structures
3. Crystal types of gas hydrate
4. Depressurization process
5. Thermal stimulation process
6. Chemical inhibitor injection process

Glycol Dehydration

1. Glycol dehydration plant description and equipment

NGL Recovery Methods

1. Single stage turbo expander technology
2. Self refrigeration method

Day 5

Storage Tanks

1. Types
2. Operation
3. Safe Cleaning & Maintenance
4. Sampling Measurements
5. Export Systems

Distillation Type Stabilizers: Stabilizer Equipment Operations & Control

1. Stabilization by Pressure Reduction



Gas Conditioning and Processing

UHDPE008



The course is designed to cover sweet gas processing and NGL recovery topics. A comprehensive course exercise based on a typical gas processing facility, which can be applied to either onshore or offshore facilities, is used for this course.

This course is designed for process engineers, technicians, chemists, and those who have a good understanding of basic sweet gas processing operations.

Course Objectives:

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

- Determine water content and hydrate formation conditions.
- Have techniques to prevent hydrate formation.
- Create preliminary designs and evaluation of TEG dehydration.
- Control the hydrocarbon dew point of sales gas.
- Use techniques to optimize mechanical refrigeration systems.
- Use the process simulator for sizing process equipment.
- Understand the key principles of gas dehydration and the fractionation process.
- Understand the principles of absorption, dehydration, and the sweetening process.

Course Content:

- Gas processing systems
- Physical properties of hydrocarbons
- Qualitative phase behavior
- Vapor-liquid equilibrium
- Water-hydrocarbon equilibrium
- Basic thermodynamic concepts
- Separation equipment
- Heat transfer
- Pumps, compressors, refrigeration
- Fractionation/distillation
- Glycol dehydration and absorption systems
- Absorption dehydration and sweetening

Related Courses:

- Heat Transfer Equipment Operation, Startup, and Commissioning
- Gas Dehydration and Fractionation Process
- Chemical Treatment in the Oil and Gas Process

Programme Schedule

Day 1

Introduction

1. Fundamental technology
2. Basic units of management
3. Physical properties

Quantative Phase Behavior

1. Single component systems
2. Multi-component systems
3. Application of phase envelopes

Vapor-Liquid Equilibrium

1. Equilibrium vaporization ratio
2. Some conversion calculations
3. Product specification

Water-Hydrocarbon Phase Behavior

1. Water content of gases
2. Water content application
3. Gas hydrate
4. Hydrate inhibition

Day 2 and 3

Basic Thermodynamic Concepts

1. Basic thermodynamics
2. Energy balance
3. Second law of thermodynamics

Process Control and Instrumentation

1. Control objectives and concepts
2. Control modes
3. Flow and temperature measurement and control

Separation Equipment

1. Fabrication specification
2. Vapor liquid – separation
3. Three-phase separation

Heat Transfer

1. Mechanism
2. Basic balance
3. Determination of heat exchanger
4. Heat exchanger types

Pumps

1. General characterization
2. Pump types

Day 4 and 5

Compressors

1. Compressor power requirements
2. Compressors types

Refrigerator Systems

1. Ammonia absorption system
2. Compression refrigeration
3. Expansion turbine refrigeration
4. Valve expansion refrigeration

Fractionation and Absorption

1. Tray types towers
2. Fractionation and control
3. Absorption

Glycol Dehydration

1. Basic glycol dehydration unit
2. TEG regeneration

Absorption Dehydration and Sweetening

1. Basic systems
2. Nature of absorption
3. Liquid dehydration
4. Gas and liquid sweetening



HAZOP Applications in the Petroleum Industry

UHDPE009



This course will introduce and explain the key facets of the HAZOP technique, as well as provide opportunities for participants to practice and become familiar with the technique and real life examples.

This course is designed for all key process engineers, HSE specialists, mechanical engineers, plant designers, and staff who are involved in HAZOP study.

Course Objectives:

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

- Understand the basics of the HAZOP technique.
- Fulfil roles as competent HAZOP team members.
- Use a risk ranking matrix.
- Understand how hazard identification can predict accidents and incidents.
- Understand how HAZOP complements other hazard identification tools.

Course Content:

- The foreseeability of process accidents
- Overview of hazard identification techniques
- Background to HAZOP
- HAZOP guidewords and parameters
- The basic HAZOP methodology
- Selection of the study node
- Recording the study
- HAZOP recommendations follow-up and sign-off
- Risk ranking methods
- The HAZOP team and its members; team selection
- Setting up a HAZOP study: planning, resources and duration
- Additional features of batch processes
- Other forms of the HAZOP study: procedural, control systems

Related Courses:

- Engineering Design for Process Safety
- P&ID and PFD Diagram
- Introduction to Control Systems

Programme Schedule

Day 1

Introduction

1. Process safety vs. personal safety
2. Industry metrics

HAZOP Background and Terminology

1. Origins of HAZOP
2. Explanation of terminology – parameter, deviation, guideword, study node, design intent, etc...

Mechanics of the HAZOP Process

1. Application of a deviation to a study node
2. Examination of all possible causes
3. Evaluation of the consequences of each cause
4. Evaluation of the safeguards against each consequence
5. Conclusions and recommendations

Day 2 and 3

Causes, Consequences and Safeguards

1. Brainstorming causes
2. Logical development and extension of consequences
3. Critical assessment of the adequacy of existing hard, soft and procedural safeguards

Recording the Study

1. Role of the recorder
2. Recording format
3. Full and exception recording
4. Simultaneous recording and team consensus
5. P & I mark up and sign-off

Syndicate Exercise 1

1. Selection of study node
2. Application of deviations
3. Recording syndicates' findings
4. Debrief of syndicates' HAZOP studies

Other HAZOP Deviations

1. Basic 10 deviations
2. Additional commonly used deviations

Day 4 and 5

The HAZOP Team

1. Members and responsibilities
2. Depth and breadth of experience
3. Availability and continuity of the study

Syndicate Exercise 2

1. Selection of study nodes
2. Application of deviations
3. Recording syndicates' findings
4. Debrief of syndicates' HAZOP studies

Preparing for a HAZOP Study

1. When a HAZOP should be undertaken
2. P&ID drawing status
3. Identifying the team
4. Supporting documents
5. Venue, timing, duration

Writing HAZOP Recommendations

1. Type of recommendations
2. Quality of recommendations: what, why, where
3. Traceability, follow-up, sign-off

Risk Ranking

1. Frequency and consequence matrices
2. Ranking recommendations – why, when & who



Heat Transfer Equipment Operation, Startup, and Commissioning

UHDPE010



This course reviews the selection, basic design, and operation of heat transfer equipment commonly used in the oil & gas industry. Heat transfer equipment discussed will include: shell and tube exchangers, compact heat exchangers, brazed aluminum exchangers, air coolers, and fired equipment (fire-tube and direct-fired).

This course is designed for operators, and new employees who work in oil production facilities, as well as the petrochemical and oil & gas industries.

Course Objectives:

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

- Understand the heat transfer modes.
- Know the function of heat transfer equipment.
- Identify the types of heat exchangers and know their components.
- Know testing procedures of heat exchangers for leaks.
- Identify the heat transfer equipment problems and how to troubleshoot them.
- Have informed techniques & hands-on experience with heat transfer equipment.
- Understand maintenance, safety and inspection of heat transfer equipment.

Course Content:

- Typical process heating & cooling applications
- Fluid properties
- Heat transfer principles
- Shell and tube exchangers
- Compact heat exchangers
- Brazed aluminum exchangers
- Air coolers
- Fired equipment (furnace type & fire-tube)
- Operating problems

Related Courses:

- Heat Exchanger Design, Operation, and Troubleshooting
- Stationary Equipment: Principles and Operation

Programme Schedule

Day 1 and 2

Principles of Heat Transfer

1. Heat transfer thermodynamics
2. Conduction heat transfer
3. Convection heat transfer

Types of Heat Exchangers: Parts and Operations

1. Shell and tube exchangers
2. Double pipe exchangers
3. Air-cooled exchangers
4. Plate heat exchangers

Types of Evaporators: Parts and Operations

1. Horizontal tube film
2. Vertical falling film
3. Forced circulation
4. Combined with hybrid systems

Types of Condensers: Parts and Operations

1. Air-cooled condensers
2. Water-cooled condensers
3. Evaporative condensers

Day 3 and 4

Types of Refrigerators: Parts and Operations

1. Vapor compression refrigeration system
2. Vapor absorption refrigeration system

Types of Furnaces: Parts and Operations

1. Electric furnaces
2. Gas furnaces
3. Gravity furnaces
4. Oils furnaces

Day 5

Safety & Inspection Maintenance of Heat Transfer Equipment

1. Heat Transfer Equipment Troubleshooting



PLC & SCADA Technologies

UHDPE011



This course provides engineers and technicians with the basic theoretical and practical understanding of PLC and SCADA systems. Throughout the course, participants will learn through active participation using exercises, questionnaires, and practical PC-based simulation (LogixPro), covering: basic ladder logic programming, hardware diagnostics, and implementation of various communication strategies.

This course is designed for instrumentation, electrical and process engineers and technicians who are involved in selecting, sizing, specifying, installing, testing and maintaining PLC and SCADA systems.

Course Objectives:

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

- Identify PLC control hardware and installation criteria.
- Examine PLC software structure.
- Write medium level PLC programs (using ladder logic).
- Troubleshoot a typical PLC control system.
- Examine SCADA and PLC control systems.
- Know the essentials of SCADA software configuration.
- Identify tips and tricks in installation of SCADA control systems.
- Know the essentials of telecommunications links.
- Identify the use of industrial ethernet in SCADA systems.
- Examine PLC and SCADA systems.
- Understand SCADA network security issues.
- Troubleshoot SCADA control systems.

Course Content:

- SCADA control overview
- Fundamentals of PLC control software
- SCADA control systems' software
- Good programming habits
- Human Machine Interfaces (HMIS)
- Advanced control with PLC
- Landline media
- Introduction to IEC 61131-3
- Building a PLC panel, as well as general commissioning, testing and upgrading
- Industrial communications protocols

Related Courses:

- Introduction to Control Systems
- Introduction to Distributed Control Systems
- Introduction to Instrumentation and Measurement

Programme Schedule

Day 1

Introduction

1. Purpose
2. Scope
3. References
4. Currency

SCADA Control Overview

Day 2

Fundamentals of PLC Control Software

1. General control
2. Discrete control
3. Analog control
4. Classes of analog controllers
5. Control loops
6. Type of controllers

Day 3

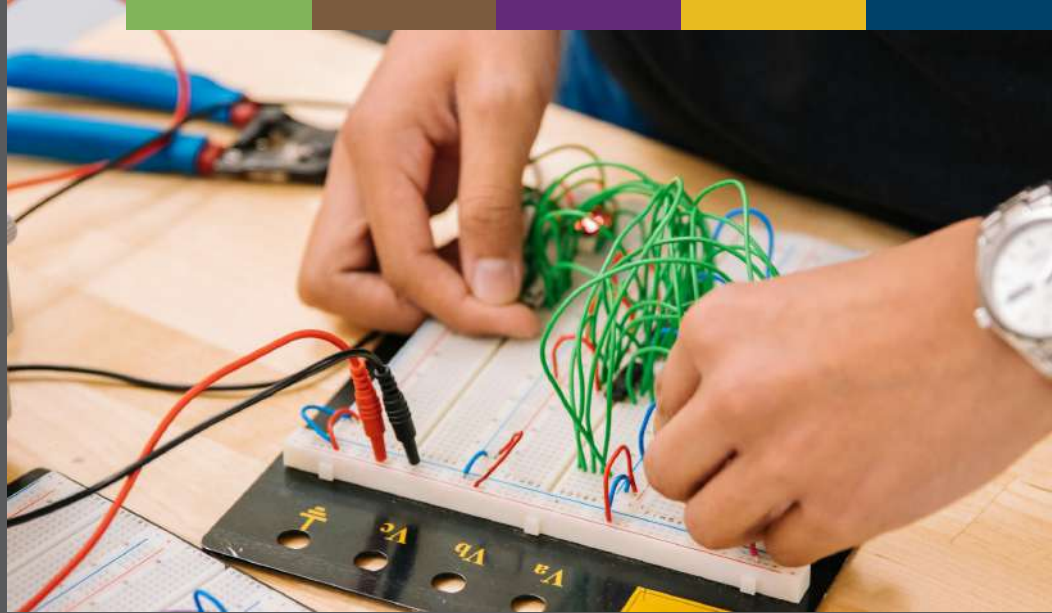
SCADA Control Systems' Software

1. Supervisory control
2. Process control
3. Field instrumentation control

Day 4 and 5

Good Programming Habits

1. Human Machine Interfaces (HMIS)
2. Advanced control with PLC
3. Landline media
4. Introduction to IEC 61131-3
5. Building a PLC panel, as well as general commissioning, testing and upgrading
6. Industrial communications protocols



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