



# N607: Petroleum Engineering for Non-Engineers

Instructor(s): Saad Ibrahim

4 Days

Competence Level:  
Awareness



Classroom Course

## Summary

This course is designed to provide non-engineering petroleum industry technical professionals with a thorough overview of most key aspects of petroleum engineering technology and its applications. The course addresses engineering issues ranging from initial involvement with explorationists, reserves evaluation and field development, production optimization, and all the aspects of well drilling. The sessions will focus on relevant and practical issues; including real case studies.

## Learning Outcomes

Participants will learn to:

1. Describe the responsibilities of petroleum engineers and other industry professionals in devising field development plans.
2. Identify the geoscience products required by a petroleum engineer.
3. Describe key rock and reservoir fluid properties.
4. List the steps in drilling and completing a well.
5. Discuss reservoir drive mechanisms.
6. List several methods to determine reserve volumes.
7. Discuss the various factors that influence field development decisions.
8. Discuss well performance and challenges to optimizing production.
9. List selection criteria for EOR projects.
10. Discuss the challenges of developing unconventional resources.
11. Explain the components of a field economic analysis.

## Duration and Training Method

This is a four-day course, providing 3.2 CEUs (Continuing Education Credits) or 32 PDHs (Professional Development Hours).

## Who Should Attend

This course is aimed at oil and gas professionals who interact with petroleum engineers. This would include geoscientists, technical assistants, drilling and operations engineers, finance and accounting staff, land and IT staff, and administrative assistants. The course would also benefit new-hire staff who are not familiar with the industry.

## Prerequisites and Linking Courses

There are no prerequisites for this class.

Related courses include N316 (Petroleum Geology for Non-Geologists) and N422 (Reservoir Engineering for Non-Engineers). For more advanced treatment of many of the topics covered in this course, refer to the RPS Training website.



## Course Content

### Day One

#### Morning

1. Overview
  - Oil and gas reserves breakdown
  - The main components of oil/gas field development plans briefing the role of each discipline (engineers, geologists, geophysicists, petrophysicists, landmen, etc.)
2. Reservoir Geology
  - Geologic cycle
  - Depositional environment
  - Types of reservoir rocks
  - Main elements of petroleum reservoirs
  - Geological maps

#### Afternoon

1. Rock properties
  - Types of rock porosity and measurements
  - Definitions of formation permeability and measurements
  - Rock wettability and effect on field performance
  - Capillary pressure
  - Case Study from Ekofisk (Norway)
2. Fluid properties
  - Hydrocarbon classifications and fluid sampling
  - Phase envelopes description of oil and gas field
  - Physical properties of oil and gas fields
  - Methods of fluid sampling and PVT analysis

### Day Two

#### Morning

1. Well drilling and completion methods
  - Background history
  - Well construction/drilling
2. Rotary drilling
  - Description of rotary systems
  - Hoisting system
  - Rotary system
  - Pipe connection, BOP, tubing and casing hangers
  - Top drive method
3. Drilling fluids
  - Function of drill mud



- Physical properties of drill mud
- Water and oil base
- Mud weight, viscosity, fluid loss
- 4. Drill bits
  - Types of drill bits
  - Design and performance
- 5. Other drilling equipments (drill collars, stabilizers, underreamer)
  - Drilling operation/problems
  - Stuck drillpipe (mechanical and differential sticking)
  - Equivalent circulating density (ECD)
  - Swabbing and surging
  - Well kicks and blowout
  - How to increase rate of penetration (ROP)
- 6. Underbalanced drilling and coiled tubing drilling

## Afternoon

1. Horizontal/directional well drilling
  - Stages of drilling and types of Hz wells
  - Design considerations
  - Kickoff points
  - Types of casing
  - Rotary vs sliding drilling
  - Downhole motors and geo-steering technique
2. Offshore drilling
  - Safety considerations
  - Types of drilling rigs
  - Differences between onshore and offshore drilling techniques
3. Well completion techniques
  - Open hole, cased hole, and gravel pack
  - Process of cementing the casing
  - Well perforation
4. Formation Evaluation Techniques
  - Mud logging
  - coring
  - Open hole logs
  - Logging while drilling (LWD) and measure while drilling (MWD)
  - Wireline testing

## Day Three

### Morning

1. Reservoir drives and reserves determination
2. Reservoir derives
  - Primary and secondary recoveries



- Types of reservoir drives and impact on performance
- 3. Reserves determination
  - Reserves classification and definitions
  - Volumetric and material balance methods
  - Decline analysis
  - Probabilistic method
  - Empirical method to estimate recoverable reserves

## Afternoon

1. Reservoir delineation & development
  - Structure of oil companies (past and now)
  - Field development considerations
  - Micro aspects (well design)
  - Macro aspects (number of wells, production profile)
2. Types and applications of artificial lift
  - Impact on field performance
  - Different techniques (advantages and disadvantages)
3. Horizontal well applications
  - Benefits of horizontal wells
  - Geological, completion, and drilling risks
4. Well productivity and case studies

## Day Four

### Morning

1. Production operations and optimization
  - Methods estimating well performance
  - Operational problems (diagnostic and remedy methods)
2. Well testing
  - Equipment used in well testing
  - Objectives setting of well testing
  - Types of well tests
  - Flow/buildup test and analysis
  - Formation damage
  - Drawdown testing and reservoir limit testing (RLT)
  - Case study
3. Well stimulation methods (acidizing and fracing)

### Afternoon

1. Enhanced Recovery Mechanism
  - Oil recovery mechanisms
  - Types of EOR and screening
  - Planning of a waterflood design



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- Monitoring of waterflood project
  - 2. Review chemical and CO<sub>2</sub> floods
  - 3. Unconventional Oil and Gas
    - Oil sands and thermal recovery (steam injection and in-situ combustion)
    - Coal bed methane (CBM)
    - Shale gas and oil shale and the applications of horizontal wells with multi fracturing
  - 4. Economics
    - Input data to economic evaluation
    - The concept of discounting cash flow
    - Various economic profitability indices
    - Example of running economics of well drilling
  - 5. Closing comments