# N913: Petroleum Geology for Engineers

Instructor(s): Randi Martinsen

| 5 Days | Competence Level: Foundation |
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| | Classroom Course |

## Summary

This course introduces petroleum engineers to the vocabulary, tools and methods used by geoscientists to explore for, evaluate and develop hydrocarbon reservoirs. Topics include depositional setting (clastic and carbonate reservoirs), trap development, the type of oil and gas charge and reservoir heterogeneity. Reservoir characterization is covered to describe how geology is used to build a high-resolution geological model that can be upscaled for reservoir simulation.

## Learning Outcomes

Participants will learn to:

1. Categorize various components of geology, including the earth's crust, rocks and minerals, geologic time, stratigraphic relationships, plate tectonics and rock deformation.
2. Examine geologic methods and data that are used to describe reservoir properties and geometry, and to monitor production.
3. Differentiate depositional environments of reservoirs and relate how environment affects reservoir geometry and reservoir quality.
4. Illustrate the usefulness of sequence and seismic stratigraphy in exploration and production.
5. Examine the geologic factors that control porosity and permeability.
6. Analyze petroleum formation, with reference to organic matter, maturation, migration, preservation and alteration.
7. Categorize the essential elements and processes in a petroleum system.
8. Demonstrate how an understanding of petroleum systems helps to manage risk and uncertainty in exploration and production.
9. Relate how geology impacts reservoir heterogeneity and sweep efficiency.
10. Demonstrate the value of high resolution geologic models (HRGM) in reservoir simulation.

## Duration and Training Method

A five-day classroom course comprised of lectures supported by mapping and seismic exercises. Participants work in groups on some exercises.

## Who Should Attend

Petroleum and reservoir engineers with 0 to 10 years of experience who have a limited understanding of the methods geologists use to quantitatively describe reservoirs and their behavior during production.

## Prerequisites and Linking Courses

No prerequisites. This course can serve as an introduction to many of the geoscience courses within the Nautilus Training Alliance. These are fully described on the website training.rpsgroup.com.

## Course Content

Participants will gain an understanding of key geoscience topics, including:

- The importance of recognizing the environment of deposition of a reservoir and how it affects reservoir geometry and quality;
- The sedimentary properties of clastic and carbonate pore systems;
- How seismic techniques are applied to describe reservoir geometry and properties and to monitor producing reservoirs. Examples are shown of the impact of 3D seismic surveys on production geology;
- Core lab methods that provide data to evaluate and characterize reservoirs; and
- How reservoir characterization leads to full-scale dynamic model for efficient reservoir management.

## Topics Covered

### 1. Foundations of Geology

- Geologic Time
- Plate Tectonics
- Sedimentary Rocks
- Rock Deformation
- Geoscientific Methods and Data

### 2. Depositional Systems

- Clastic Continental
- Clastic Shallow Marine
- Clastic Deepwater
- Sequence and Seismic Stratigraphy
- Carbonates

### 3. The Reservoir

- Porosity
- Permeability
- Reservoir Fluids
- Subsurface Conditions

### 4. The Petroleum System

- Formation of Petroleum
- Migration and Trapping
- Petroleum Systems: Managing Risk and Uncertainty

### 5. Conventional Hydrocarbon Traps

- Structural
- Stratigraphic
- Hydrodynamic and Combination

### 6. Unconventional Resources

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## 7. Reservoir Characterization and Modeling

- Heterogeneity
- Nugget Case Study
- Building the 3D HRGM