



# D412: A Critical Guide to Reservoir Appraisal and Development (Distance Learning)

Tutor(s): Stephanie Kape and Pete Smith

5 Days

Competence Level:  
Skilled Application



Virtual Course



Computer Usage

## Summary

**Business Impact:** Participants will be empowered to **collaborate between disciplines** and add value in the **development of upstream assets**.

This course is designed to address the decision-based technical workflow that is a pre-requisite to appraisal and development investments. Participants will learn the background theory behind all aspects of reservoirs, from the micro- to seismic-scale, integrating the static and dynamic domains and how to model them. The course covers a range of disciplines, using an integrated subsurface approach with reference to a robust business and commercial framework.

## Learning Outcomes

Participants will learn to:

1. Assess the sources of the wide range of data which contribute to the understanding and development of hydrocarbon reservoirs, their use and associated uncertainty.
2. Understand the different scales of data and how to bring it together into a decision-based workflow including; the pore-scale properties of a reservoir, depositional heterogeneities, fracturing and dual porosity systems, compartmentalisation, seismic-scale uncertainty and how they may influence development decisions.
3. Evaluate how to combine uncertainties for projects at different stages of the E&P lifecycle and select key variables in a probabilistic evaluation to manage uncertainty by acquiring additional data (appraisal) or design of interventions (contingency) within a Value of Information framework.
4. Discuss and analyse the controls and uncertainty of the hydrocarbon distribution in a reservoir (properties, contacts and saturations).
5. Evaluate the use of both static and dynamic reservoir models as part of the decision making process.
6. Assess the pitfalls and best practices in building and using simulation models for appraisal and development decision making and hence assess the implications of the construction, structure and limitations of reservoir simulators.
7. Understand the importance of assessing fluid properties and fluid and rock PVT for reservoir description, material balance and flow assurance.
8. Evaluate how reservoir energy (including aquifers), fluid responses, drive mechanisms and EOR processes are assessed and managed to maximise planned recovery.
9. Understand the technical aspects of well testing and its use in both appraisal and development decisions as well as the potential to deepen understanding of the reservoir description.
10. Develop an understanding of the resources and reserves booking philosophy as it appertains to reservoir appraisal and development.

## Duration and Training Method

A virtual classroom course divided into 10 webinar sessions, comprising lectures, discussion, case studies, and practical exercises to be completed by participants during and between sessions.



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## Who Should Attend

The course is designed for experienced geoscientists who have been involved in field appraisal and development. It is also aimed at petrophysicists and reservoir engineers wishing to gain a greater insight into the geoscience input to reservoir models as well as deepen the knowledge of how subsurface data is integrated into providing a complete picture. Team leaders and asset managers involved in the planning and execution of subsurface reservoir modelling projects will also benefit.

## Prerequisites and Linking Courses

Ideally participants should have some field appraisal and development experience prior to their participation. N012 (Reservoir Modelling Field Class) is a field class examining the construction and uses of stochastic reservoir models at the Skilled Application Level and complements course N412. N033 (Characterisation, Modelling, Simulation and Development Planning in Deepwater Clastic Reservoirs - Tabernas, Spain) are also recommended follow-up courses, which review field-based reservoir development and modelling analogues.

## Course Content

### Webinar 1

- Introduction
- Heuristics Quiz
- Business Framework
- Risk and Uncertainty
- Decisions with Uncertainty

### Webinar 2

- Data
  - Measured and Interpreted Data
  - Seismic Data and Mapping Topics
  - Wireline & MWD data
  - Core data

### Webinar 3

- Micro scale structure of the reservoir
  - Characteristics of pores
  - Clastic reservoirs
  - Controls of depositional setting on pore structure
  - Compaction, diagenesis and effective stress
  - Exceptional porosity preservation
  - Carbonate & Chalk Reservoirs
  - Processes that modify carbonate pore structure
  - Clays and Fine grained reservoirs



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## Webinar 4

- Fluids & Contacts
- Flow Zones
  - Analogue studies showing different flow zones in a reservoir context
- Heterogeneous Reservoirs
  - Reservoir architecture and its impact on connectivity
  - Fluvial Reservoirs and case examples
  - Turbidite reservoirs and case examples

## Webinar 5

- Fluids and PVT data
- Multi-Phase Flow
- Reservoir Mechanisms
- Secondary and Tertiary Recovery
- Secondary Recovery and Geological heterogeneity
- Gas and Aquifers
- Well Productivity

## Webinar 6

- Range Estimation
- Answers to Heuristic Quiz
- Value of Information (Appraisal)
- Value of Information (Intervention)
- Alpha Exercise 2.2

## Webinar 7

- Static Modelling
  - Framing the problem
  - Model construction and gridding
  - Well correlation and scenarios (analogue Field case study)
  - The Scale problem
  - Geological variance and the use of core data
  - Population of properties
  - Uncertainty, scenarios and workflows
  - Grids, Layering and Upscaling
  - Distributing the physical properties of the reservoir
  - Connectivity and architecture
  - Upscaling
  - Multi scale workflows
  - Modelling output



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## Webinar 8

- Reservoirs in Contractual belts
- Faults and Fractured Reservoirs
  - Architecture of faults and damage zones
  - Fault Rock properties
  - Breakdown of fault rocks
  - Naturally Fractured Reservoirs
  - Geomechanics of fracture formation
  - Fracture density
  - Modelling fractured reservoirs
- Reservoir Seals
  - Controls on seals
  - Mudrocks as seals
- Alpha Exercise 3.3

## Webinar 9

- Probability Estimation
- Static to dynamic – upscaling and dynamic properties
- Reservoir Dynamic Modelling
- Matching the dynamic model to the static model
- History matching and forward prediction
- Well testing
  - From an engineering perspective
  - Interpretation from a geological perspective
- Alpha Exercise 4.4

## Webinar 10

- Well, Reservoir and Field Management
- Development planning and optimisation
- Reserves and Resources
- Wrap-up