Summary

**Business Impact:** Application of the learnings of this course will empower participants to better **delineate reservoir and pay distribution**, which is of particular use during **reservoir appraisal, development** and **production**.

This course provides participants with the skills to design and execute workflows to achieve optimal seismic reservoir characterisation results. The course addresses seismic conditioning to enhance the data and seismic inversion to make quantitative estimates of reservoir properties. Coloured inversion and a comprehensive review of AVO methods including extended elastic impedance are also covered. Furthermore, the course provides a review of seismic inversion methods, including both conventional deterministic methods and the latest Bayesian probabilistic approaches.

**Learning Outcomes**

Participants will learn to:

1. Construct coherent workflows to estimate reservoir properties and associated uncertainties by integrating seismic data with other data types.
2. Apply seismic conditioning methods to maximise bandwidth and optimise correlation with reservoir properties.
3. Analyse relationships between reservoir and elastic properties to determine what may be estimated from seismic data.
4. Select the appropriate inversion algorithm for any given situation.
5. Appreciate the importance of uncertainty quantification in seismic reservoir characterisation.
6. Select appropriate methods to achieve the objectives based on an assessment of data quality and an analysis of rock properties and reservoir geometry.

**Duration and Training Method**

This is a five-day classroom course using examples, computer exercises, case studies and discussion.

**Who Should Attend**

This course is designed for geoscientists experienced in working with seismic data and who wish to create coherent workflows to achieve specific quantitative objectives.

**Prerequisites and Linking Courses**

Participants need a working knowledge of seismic data processing and interpretation, wire-line logging and reservoir geology. Courses N085 (Introduction to Seismic Interpretation) and N004 (Rock Physics and Seismic Amplitude Interpretation) cover some of the required background.

**Course Content**

1. **Introduction**
Overview and objectives

2. Coloured Inversion
   - Geological studies on bed thickness distributions
   - Frequency domain implications
   - Coloured inversion and blueing
   - Optimising wavelets
   - Frequency slice filtering
   - Well ties and wavelet estimation
   - Stratigraphic filtering
   - Other forms of attenuation - Q & ghosts

3. AVO - Reflectivity
   - AVO in the reflectivity domain; Zoeppritz equations and linearisations
   - Measuring AVO - limitations and uncertainties
   - Seismic conditioning for AVO
   - Intercept-gradient crossplots
   - AVO, moduli and anisotropy
   - Intercept-gradient coordinate rotations

4. AVO - Impedance
   - AVO in the impedance domain
   - Elastic and extended elastic impedance (EI & EEI)
   - AIGI crossplots
   - Choosing chi angles and the effect of gradient measurement errors
   - Rock-physics
   - Bayes theorem & exploration risking

5. Attributes maps
   - Spectral decomposition
   - Multi-attribute methods
   - Reflectivity and impedance tuning
   - Seismic net pay
   - Uncertainties & Limitations
   - Map calibration

6. Inversion
   - The objectives and limitations of seismic inversion
   - Integration and Uncertainty
   - Bayes theorem
Deterministic and probabilistic inversion
Sources of uncertainty
The inversion landscape

7. ODiSI
- Principles and application of One Dimensional Stochastic Inversion

8. Example Workflow
- Coloured inversion
- Chi angle selection
- Seismic net pay
- ODiSI