Summary
This course focuses on the role of log-based rock physics within seismic interpretation, with the objective of getting the attendees to be comfortable with using log data in seismic modelling. It builds on the material in the Essentials course (N004), developing the concepts to include probabilistic prediction methods and time-lapse studies.

Learning Outcomes
Participants will learn to:

1. Construct offset vs angle relationships.
2. Construct single-interface models of AVO scenarios as well as synthetic gather displays.
3. Formulate synthetic models in the interpretation of stack data and AVO products.
4. Generate modelled fluid factor traces from log data to evaluate the magnitude of fluid related AVO effects.
5. Construct AVO projections to enhance fluid or lithology effects in seismic.
6. Construct rock property crossplots and angle synthetics.
7. Perform well ties to evaluate wavelet polarity and phase.
8. Evaluate well ties in terms of the accuracy of wavelet estimation and phase ambiguity.
9. Evaluate offset scaling with the use of quantitative well tie techniques.
10. Assess the fluid substitution effect in sandstones and carbonates with intergranular porosity as well as shaley sands by applying (and QCing) Gassmann’s equation.
11. Construct missing shear sonic data by log transformation.
12. Estimate net pay using seismic techniques and appreciate the uncertainties involved.

Duration and Training Method
A three-day classroom-based course comprising a mixture of case studies, lectures, PC based exercises and discussion groups.

Who Should Attend
Geoscientists who have previous experience in the practical application of:

- Seismic Modelling and well ties
- AVO
- Trace Inversion

and want to know more.

Prerequisites and Linking Courses
The course builds on the themes introduced in N004 and is a key member of the Reservoir Characterisation set of courses within the Geophysical Competency suite.
Participants should have attended Nautilus Training Alliance course N004 (Essentials of Rock Physics and Seismic Amplitude Interpretation) or equivalent course prior to attending this course.

Course Content

The course is largely practical in nature (using commercially available PC based software) with linking review talks, building on material and practicals presented in the ‘Essentials’ course (N004). Material from the Essentials course is included in the manual as well as additional more advanced material.

The 3 day course content is to some extent flexible (depending on the attendees’ interests) but will draw on the following topics:

1. Conventional AVO vs Elastic Inversion
   - Role of AVO modelling in seismic interpretation
   - AVO techniques and AVO styles
   - AVO analysis: techniques and practical issues
     - Scoping workflow using log data to evaluate litho-facies discrimination and resolution (1D and 2D synthetic models, projections, EEI, bandlimited impedance)
     - Issues in AVO gradient estimation
   - QC issues in seismic inversion

2. Well ties
   - Practical application of quantitative well-seismic matching techniques
     - Phase estimation, amplitude (offset) scaling
     - White’s method vs Adaptive technique

3. Practical well log conditioning
   - Dipole log QC
   - Vs prediction schemes
   - Estimation (and correction) of invasion effects on sonic and density logs
   - Use of forward modelling schemes (e.g. Xu-White model)

4. Probability, Uncertainty and the Nature of Calibration

5. Time-Lapse (4D) modelling
   - Gassmann forward modelling and practical use of laboratory data

6. Anisotropy
   - Types of anisotropy and modelling approximations
Uncertainties in parameterisation
Practical applications