



EC042: Advanced Petrophysical Interpretation & Formation Evaluation

Format and Duration
Self-Paced - 7 Hours

Summary

This course on Advanced Petrophysical Interpretation and Formation Evaluation focuses on integrating all available data into a comprehensive petrophysical model of the formation. It emphasises the use of well logs for correlation, mapping, and basin history analysis, while also introducing advanced logging tools such as dipmeter and image logs, dielectric logs, and geochemical logs to enhance formation characterisation.

Learning Outcomes

Participants will learn to:

1. Integrate diverse data sources including well logs, drilling data, and core information into a comprehensive petrophysical model of the formation.
2. Differentiate between continuous petrophysical properties and discrete categorical flags within formation evaluation.
3. Identify and appropriately handle special lithologies such as coal in petrophysical modeling.
4. Utilize well logs for correlation, mapping, and basin history analysis to improve geological interpretations.
5. Interpret log motifs and patterns related to sedimentary facies and understand the relationship between gamma ray readings and grain size.
6. Apply advanced logging tools including dipmeter and image logs, dielectric logs, and geochemical logs to enhance formation characterization.
7. Understand and apply sequence stratigraphy concepts using well log data for subsurface correlation.
8. Calculate geomechanical properties and interpret permeability directly from well log data.
9. Read and interpret density-neutron crossplots and other advanced log crossplots for shale volume and porosity evaluation.
10. Integrate and iterate estimates of shale volume, porosity, and saturation to improve accuracy and consistency in reservoir evaluation.

Training Method

This is a self-paced e-learning course, consisting of 7 modules. Within each module the learning materials are structured into short sections, each including interactive text and image content, animations, video, and audio. Each module has a scored quiz at the end to provide the learner with their learning progress. This course has a learning time of approximately 7 hours.

Who Should Attend

This course is designed for geoscientists and engineers with a foundational knowledge of petrophysics (EC013) and petrophysical tools (EC014), seeking to advance their expertise in petrophysical interpretation and formation evaluation.

Course Content



EC042: Advanced Petrophysical Interpretation & Formation Evaluation

Format and Duration
Self-Paced - 7 Hours

The Petrophysical Model: Lithology and Special Minerals

In this module, you will explore the concept of the petrophysical model, including its typical outputs and their applications in reservoir evaluation. You will learn the distinction between continuous properties like porosity and discrete flags that categorise features at specific depths. The module also covers identification and treatment of special lithologies, such as coal, within the model. Additionally, the module considers how combining density and neutron log curves provides a powerful qualitative tool for lithology interpretation.

Density Neutron Combination Advanced

This module covers how to read a typical density-neutron crossplot, enabling you to analyse the relationship between formation density and neutron porosity logs. You will learn to interpret shale volume and porosity directly from the crossplot, helping to distinguish between shale and reservoir zones. Additionally, the module introduces alternate interpretive crossplots using different log data, expanding your ability to evaluate formation properties under varying conditions and data availability.

Formation Evaluation: Integration and Averaging

This module focuses on three key learning points essential for reservoir evaluation. First, it emphasizes the importance of integrating and iterating estimates of shale volume, porosity, and saturation to improve accuracy and consistency in petrophysical analysis. Second, it introduces the concepts of NET and PAY zones as defined in this course, highlighting their relationship to interval average properties and acknowledging that definitions may vary among operators and professionals. Finally, the module provides a general understanding of how continuous permeability curves are generated and their role in modeling reservoir flow characteristics. Together, these topics lay a foundation for effective reservoir characterisation and decision-making.

Log Motifs and Patterns

This module looks at key concepts in well log interpretation for sedimentary facies analysis. It looks at log motifs and patterns characteristic of different sedimentary environments and the relationship between gamma ray (GR) readings and grain size, including their limitations. The module also covers how to integrate additional data and measurements to enhance geological interpretations from well logs. Finally, methods for correlating well logs to improve subsurface geological understanding and decision-making are reviewed.

Depositional Environments, Dipmeter/Image Logs & Sequence Stratigraphy

This module considers how to interpret geological signatures and log shapes, identify common challenges and pitfalls in correlating logs between wells, and understand the principles behind electrical imaging tools. Additionally, the module will introduce key concepts of sequence stratigraphy as applied to well log data,



EC042: Advanced Petrophysical Interpretation & Formation Evaluation

Format and Duration
Self-Paced - 7 Hours

enhancing your ability to analyse and correlate subsurface geological features effectively.

Geomechanics and Permeability

This module considers how to calculate key geomechanical parameters using well log data, enabling a better understanding of subsurface rock behaviour under stress. Also covered is the interpretation of permeability directly from downhole logs, in addition to the traditional Nuclear Magnetic Resonance (NMR) models looked at in previous modules.

Dielectric and Geochemical Logs

This module looks at the measurement principles behind dielectric logs and how they can be applied to accurately estimate water saturation in various geological environments. Fundamental concepts of geochemical logging and its diverse applications in reservoir characterisation, formation evaluation, and environmental studies are also covered.