## PRPE3004 WELL LOGGING (3-0-0)

**Course Objectives:**

- To enable the students to understand the concept of formation evaluation, well logging and techniques involved in it.
- Understand fundamental principles: Grasping the physical principles behind various logging tools (electrical, nuclear, acoustic)
- Identify lithology and stratigraphy: Learning to use logs
- Address complex scenarios: Understanding how to interpret logs in challenging environments

**MODULE I (8 Hours)**

Aims and objectives of well logging. Reservoir formations. Borehole conditions. Fundamental concepts in borehole geophysics physical properties of reservoir rocks. Formation parameters and their relationships: formation factor, porosity, permeability, resistivity, water and hydrocarbon saturations, and movable oil. Archie's and Humbles equations.

**MODULE II (8 Hours)**

Principles, instrumentation, operational procedures and applications of different geophysical logs: S.P., electrical, induction, nuclear, sonic, caliper, temperature, dip and direction. Natural gamma ray spectrometry log, nuclear magnetic log, litho density log, neutron activation technique, thermal neutron decay time log, chlorine and oxygen logs.

**MODULE III (8 hours)**

Recording, transmission and processing of log data. Formation evaluation for hydrocarbons. Qualitative and quantitative interpretations of well log data. Overlays and cross-plots. Determination of reservoir parameters – porosity, resistivity, permeability, water and hydrocarbon saturation, movable oil. Lithology determination by neutron, density and sonic cross-plots, dual mineral method, triporosity method, litho porosity cross-plot (M-N plot), clean sand and shaly sand interpretations.

**MODULE IV (8 hours)**

Sub-surface correlation and mapping from log data. Delineation of fractures from logs. Production logging. Well logging for metallic and non-metallic minerals: radioactive and nonradioactive evaporates, coal, sulphur. Borehole geophysics for groundwater exploration. Effective pay thickness of an aquifer. Saline water-fresh water interface from log data. Determination of groundwater flow direction by logs.

**MODULE V (8 hours)**

Theoretical computations of normal and lateral log responses. Identification and delineation of sub-surface formations from well log data. Calculation of reservoir parameters: formation factor, porosity, permeability, resistivity, water and hydrocarbon saturations, and movable oil. Subsurface correlation of formations and interpretation of field data.

**Course Outcomes :**

**Upon successful completion of a well logging course, Students should be able to:**

- Ascertain the hydrocarbon potential of a well.
- Calculate key petrophysical parameters such as porosity, permeability (via proxies), shale volume, and water/hydrocarbon saturation.

- Delineate productive zones by identifying fluid contacts (oil/water, gas/oil) and determining the depth and thickness of potential reservoirs.
- Make informed decisions related to well completion design, production planning, and reservoir management (e.g., where to set casing, which zones to test/perforate).

**TEXT BOOKS:**


- Standard Handbook of pertroleum and Natural Gas Engineering. 2nd Edition. William C
- Lyons, Gary C Plisga. Gulf Professional Publishing.
- D.P Helander 'Fundamentals Of Formation Evaluation'
- Dewan.J.T 'Essentials of Modern Open-Hole Log Interpretation' Pen Well Books, 1983, ISBN 0878142339.


**REFERENCE:**


Serra.O 'Fundamentals of Well log Interpretation' Volume1. Elsevier Science Publisher, New York, 1984,ISBN 04441327.