Advance Formation Evaluation

1.1. Course Number: GE 523

1.2. Contact Hours: 3-0-0 Credits: 9

1.3. Semester Offered: 5th Year -Odd

1.4. Prerequisite: Formation Evaluation, Petroleum Geology, Petroleum Geophysics

1.5. Syllabus Committee Members: Dr. Satish Sinha and Dr. Piyush Sarkar

2. **Objective:** The primary objective of the course is to introduce advanced well logging tools and interpretation techniques for Hydrocarbons, mineral, and groundwater exploration.

3. **Course Content:** Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topics	Lectures
1	Ratio Methods and cross-plotting	Archie's law for Clean sand interpretation, Apparent water resistivity, Tixier ratio methods, Resistivity vs. porosity log Cross plotting for identification of matrix and porosity of the sedimentary formation.	8
2	Rock Mineral Evaluation	Multi-mineral evaluation for complex lithology	6
3	Log interpretation for shaly formation	Shaly sand interpretation using SP, Gamma, neutron, density, resistivity and sonic log responses, water saturation and porosity estimation in shaly formation.	6
4.	Evaluation of Gas bearing formation	Effect of gas on Neutron, density and sonic log response. Porosity and water saturation in gas bearing formation, gas effect on lithology aand porosity crossplots, shaly gas bearing formation.	6
5	Advanced Logging Tools	Nuclear Magnetic Resonance, Litho-density Induced Gamma Ray Spectrometry, Chlorine log, High Resolution four arm Dipmeter (HDT) log	8
6	Case study	Applications of well logs in mineral and ground water investigations, Application of well logs in characterization of coals, Determination of quality of coal and rock strength Log characteristics for identification of electrofacies and depositional environment, Detection of Fracture from Acoustic and Resistivity Image Tools, Overpressure zone detection from sonic, density and Resistivity log responses	6
		Total	**40**

4. Readings:

4.1. Textbook:

- Bateman, R, M., Open Hole Log Analysis and Formation Evaluation
- Helander, D. P., Fundamentals of Formation Evaluation.

4.2. Reference books:

- Brock, J., Applied Open Hole Log Analysis
- Ellis, D. V., Well Logging for Earth Scientists
- Bateman, R, M., Cased Hole Log Analysis and Reservoir Performance Monitoring.
- Serra, O., Fundamentals of Well Log Interpretation
- Vaish, J. P., Geophysical Well Logging: Principles and Practices

5. Outcome of the course:

Knowledge on Interpretation of well log data; Fundamental petrophysical concepts and equations; Petrophysical parameters like porosity, permeability and water saturation; Log measured properties can be used to determine the porosity, permeability, water/hydrocarbon saturation, shale content and rock type; Well log Characteristics for electrofacies and depositional environmental studies.