ADVANCED FORMATION EVALUATION

1. GENERAL

1.1 COURSE TITLE: Advanced Formation Evaluation

1.2 COURSE NUMBER: PE-521

1.3 CONTACT HRS: 3-0-0 Credits: 9

1.4 SEMESTER -OFFERED: odd

1.5 PREREQUISITE: Formation Evaluation / Reservoir Engineering / Petroleum Geology / Well Log Analysis

1.6 SYLLABUS COMMITTEE MEMBER:

Dr. Satish Kumar Sinha

2. OBJECTIVE: The objective of this course is to give Engineers, Geologists, Geophysicists and Petrophysicists necessary skills to evaluate drilling wells, estimate reserves and evaluate assets. This course is designed for masters and PhD level students and is very demanding for the students. The students will learn to estimate petrophysical and transport properties of rocks from the well logs and other formation data through many practical examples.

3. COURSE CONTENT (Unit wise distribution of content and number of lectures)

Unit I: (10 Lectures)	Introduction: Drilling of a well, well logs and its uses, acquisition of well logs, historical development. Rock forming minerals, types of rocks, reservoirs, source rocks, migration Archie's formulation, Capillary pressure and Leverett J-function, elastic rock properties, fluid measurements, effect of clay minerals on physical properties measurements.
Unit II: (10 Lectures)	Borehole environment, resistivity measurements, SP Logging
Unit III: (10 Lectures)	Radioactive logging: Natural Gamma Ray Logging, Spectral GR, Density Logs, Neutron logs; Acoustic logs

Unit IV: (10 Lectures)	Log Analysis: Gross Pay vs. Net Pay; Saturation estimation, STOOIP, Movable oil saturation, Multiple log interpretation, Shaly Sand interpretation, Gas sand interpretation; NMR logs, Image logs,

4. READINGS

4.1 TEXT BOOKS:

1. Tiab, D. and Donaldson, E.C., 2015, "Petrophysics, Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties", Gulf Pub.
2. Darling, T., 2005, "Well Logging and Formation Evaluation", Gulf Pub.

4.2 REFERENCE BOOKS:

1. Bassiouni, Z., 1994, "Theory, Measurement, and Interpretation of Well Logs", SPE Textbook Series Vol. 4.
2. Rider, M., 2004, "The Geological Interpretation of Well Logs", Rider-French Consulting, Ltd.
3. Ellis, D. V., 1987, "Well Logging for Earth Scientists", Elsevier Science Publishing Company.
4. Luthi, S. M., 2001, "Geological Well Logs: Their use in reservoir modeling", Springer-Verlag.
5. Hearst, J. R., and Nelson, P. H., and Paillet, F. L., 2000, "Well Logging for Physical Properties: A handbook for geophysicists, geologists and engineers", John Wiley and Sons, Ltd.
6. Ransom, R. C., 1995, "Practical Formation Evaluation", John Wiley and Sons, Ltd.
7. Formation Pressure Evaluation, Reference Guide from Baker Huges
8. Log Interpretation Principles/Applications, Reference book from Schlumberger
9. Cased Hole Log Interpretation, Reference book from Schlumberger
10. Fundamentals of Formation Testing, Schlumberger

5. OUTCOME OF THE COURSE

- Know the logging operations and data acquisition for logging while drilling and open hole logging.
- Interpret individual and combination of wire-line log data for lithology and fluids
- Interpret different wire-line log data by cross-plotting
- Estimate hydrocarbon volume in the reservoir based on reservoir properties
- Integrate core test data to derive capillary pressure and relative permeability curves.

- Apply standard methods to analyze well-test data.
- Know the main applications and limitations of the different measurements
- Perform a quick qualitative interpretation to determine possible interest zones