

Course Type	Course Code	Name of Course	L	T	P	Credit
DC (Hons)	NGLH303	<b>PETROLEUM GEOLOGY</b>	3	1	0	4

(Theory)

Course Objective			
To teach basic principles and applications of petroleum geology as per industry and scientific needs			
Learning Outcomes			
The primary objective of the course is			
<ul style="list-style-type: none"> <li>To give the students a proper inputs of a basic petroleum system from generation, migration and accumulation of conventional hydrocarbons.</li> <li>Various geochemical methods of hydrocarbon exploration with basics of formation evaluation</li> </ul>			
Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
<b>PETROLEUM GEOLOGY</b>			
1	Petroleum: its different states of natural occurrence and composition. Origin of petroleum, Geochemistry and maturation of kerogen; Biogenic and Thermal effect. Distribution of Petroleum in space and time. Along with some tutorial exercises.	10	To know about the Chemical and physical properties of hydrocarbons
2	Petrographic and geochemical methods of Oil Exploration: Petrographic: Microscopic organic analysis, Thermal Alteration Index, Vitrinite Reflectance, Geochemical: Combustion methods (Carbon ratio and Total Organic Carbon), Stable isotope method, Time Temperature Index (TTI), Arrhenius equation, Lopatin's method, Concept of cooking time, Level of Organic Metamorphism (LOM) and Rock Eval Pyrolysis method. Along with some tutorial exercises.	10	To Understand the occurrence, origin and generation of petroleum. Formation of Kerogen and how hydrocarbon generates through kerogen maturation. To track various levels of kerogen/organic matter maturation and to use this in hydrocarbon exploration by different petrographic and geochemical methods
3	Introduction to migration of oil and gas: geologic framework of migration; short and long distance migration, primary and secondary migration; geologic factors controlling hydrocarbon migration; forces responsible for migration.	6	Understand various aspects of hydrocarbon migration from source rock to reservoir rocks.
4	Oil field water- characters and classifications	5	Understand composition and characteristic of oil field/formation water and its use in hydrocarbon exploration.
5	Basics and sedimentary rocks related to reservoirs rocks. Reservoir rocks: general attributes and petrophysical properties. Classification of reservoir rocks - Clastic and Carbonate reservoirs. A brief account on Reservoir Characterization.	10	Understand various aspects of reservoir rocks
6	Hydrocarbon traps: definition; classification of hydrocarbon traps - structural, *stratigraphic and combination; time of trap formation and time of hydrocarbon accumulation. Cap rocks - definition and general properties. (*Brief outline of sequence stratigraphy with special emphasis to development of stratigraphic traps)	6	Understand principle of hydrocarbon traps and its various types
7	Introduction to oil and gas exploration with reserve estimation with exercises. Brief outline of formation evaluation and its related exercises.	7	Understand various methods of hydrocarbon exploration and reserve estimation.
8	Petroleum Geology of important Indian basins (offshore and onshore).	2	Understand the Proliferous basins of India
	Total	56	

#### Recommended Books:

1. Tissot, B. P., and Welte, D. H., 1984, Petroleum Formation and Occurrence. Springer-Verlag, Germany, Edition : 2<sup>nd</sup> Revised enlarged.
2. North F. K., 1985. Petroleum Geology. Allen & Unwin Inc., London. 1<sup>st</sup> Edition

#### Other References:

1. Bastia Rabi, 2024. Atlas, A ready reckoner for decoding the hydrocarbon traps. Technology Publications, India. 1<sup>st</sup> edition.
2. Selley, R. C., 1998. Elements of Petroleum Geology. Academic Press, USA. 2<sup>nd</sup> edition.

3. Slatt, R. M., 2006. Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists, and Engineers. Elsevier, Hungary. 1<sup>st</sup> Edition.
4. Mishra S, Banerjee, S. Petroleum Systems, 2026. Analysis of Indian Sedimentary Basins; Understanding Hydrocarbon Prospectivity. Springer Geology. 414p