

Course Type	Course Code	Name of Course	L	T	P	Credit
DC (Hons)	NGLH401	Fundamentals of Coal Geology	3	1	0	4

Course Objective
To develop a comprehensive understanding of coal as a sedimentary, geochemical and energy resource system by integrating coal genesis, multi-scale characterization, basin controls, organic matter maturation, industrial utilization and emerging carbon-engineering perspectives within a unified geological framework.
Learning Outcomes
Upon completion of the course, students will be able to: <ul style="list-style-type: none"> • Explain the origin, classification and coalification pathways of coal and their controls on rank and type • Interpret coal seams across scales—from field architecture and depositional systems to petrographic constituents and maturity indicators • Analyse organic matter evolution and compare coalification and petroleum maturation processes using thermal maturity parameters • Evaluate coal quality and predict industrial performance using petrographic and analytical data • Assess the distribution and resource framework of coal in Indian and global basins • Discuss emerging applications of coal science, including coalbed methane, carbon sequestration, critical elements and the coal–biomass carbon continuum

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Origin of coal: Peat-forming environments; organic matter input and preservation; humic vs sapropelic coals; biochemical and geochemical coalification; coal rank, type and grade; introduction to coal classification systems	7L + 2T	Understanding the origin, classification and maturity evolution of coal
2	Multi-Scale Characterization of Coal: Coal lithotypes, Macerals, Microlithotypes, Mineral matter in coal, Field scale seam architecture and cyclicity, vitrinite reflectance and rank determination	7L + 2T	Ability to interpret coal seams across scales—from field observations to petrographic analysis—and relate microfabric to depositional and hydrological controls
3	Depositional Systems and Structural Controls on Coal Seams: Fluvial, deltaic and paralic coal-bearing systems, Mire types and hydrological controls, Seam stacking patterns and cyclicity, Cleat development and stress regimes	4L + 2T	Ability to interpret coal seam geometry and facies distribution within sedimentary basin frameworks
4	Organic Matter Evolution and Hydrocarbon Generation: Kerogen types and organic matter classification; coal–petroleum system continuum; kinetics of hydrocarbon generation; thermal maturity; introduction to Rock-Eval pyrolysis	7L + 3T	Ability to compare coalification and petroleum maturation processes and interpret hydrocarbon generation stages using thermal maturity parameters
5	Industrial and Engineering Utilization and Evaluation of Coal: Coal Combustion, Coal Carbonization, Coal Gasification and Coal Liquefaction, Application of coal petrography in predicting industrial behaviour; interpretation of proximate and ultimate analyses	7L + 2T	Evaluation of coal quality for industrial use
6	Indian and Global coal resources	3L + 1T	Knowledge on the coal distribution in India and globally
7	New Emerging aspects: Coal Bed Methane; CO ₂ Sequestration in Coal, Coal-associated Critical Elements, Coal-derived Carbon Materials, Coal–Biomass Continuum and Carbon Cycle Engineering	7L + 2T	Awareness of modern applications and extensions of coal sciences
	Total classes	42L + 14 T	

Text books:

1. Taylor, G.H., Teichmuller, M., Davis, A, Diesel, C.F.K., Littke, R.,P., 1998. Organic Petrology GerbrüderBorntraeger, Berlin. 16,704.
2. Applied Coal Petrology- The Role of Coal Petrology in Coal Utilization by Isabel Suarez-Ruiz and John C. Crelling (Eds), Academic Press (2008)
3. Van Krevelen, D.W., 1993., Coal Typology-chemistry-physics-constitution. Elsevier Science, Amsterdam 963

Reference Books:

1. Introduction to Geology of coal and Indian Coalfields by N.L.Sharma & K.S.V. Ram, 1979
2. Coal resources of India. Mem.GSI, vol.88,1971
3. Coal Geology and Coal Technology by C.R.Ward,1984
4. Coal bearing depositional system by CFK Diessel, 1992 Edition
5. The Chemistry and technology of coal- James G. Speight, 1994
6. Coal and coal bearing strata Ed. A,C.Scott, 1987
7. Coalbed Methane and Coal Geology-Eds. R.Gayer and I. Harris, 1996.
8. Coalbed Methane: scientific, environmental and economic evaluation-Masatalerz and others, 1999.
9. Progress of Coal Petrology in India by H.S.Pareek, 2004.