COURSE TYPE	COURSE CODE	NAME OF THE COURSE	L	T	P	CREDIT
DC	NFMC502	Coal and Mineral Beneficiation	3	1	0	4

COURSE OBJECTIVE
• To equip the students with the knowledge of the theory and practices related to the operation of the cleaning and dewatering technologies used in the industry for coal and ores
LEARNING OUTCOMES
At the end of this course, the students will learn about the ● Theories of coal preparation and mineral processing technologies ● Construction and operation of density separators, magnetic separators, electrical separators and surface-property-based separators ● Construction and operation of dewatering equipment ● Coal preparation and mineral processing flowsheets

NO.	TOPICS TO BE COVERED	LECTURE HOURS	TUTORIAL HOURS	LEARNING OUTCOME
1	**Introduction:** Definition, unit operations, necessity, scope, merits and limitations of coal preparation and mineral processing. Important terms: coal, mineral, gangue, ore, concentrate, clean coal, middling, reject, tailing, yield, recovery, ratio of concentration, etc. Properties of coal and minerals relevant to their cleaning and dewatering: density, magnetic behavior, permeability, conductivity, hydrophobicity, etc.	3	1	Introduction to the subject and understanding of the properties related to the processing of coal and minerals
2	**Density separation fundamentals:** Definition, scope, types, merits and limitations of density separation. Washability analysis for coal and minerals. Washability indices. M-curve. Ease of cleaning. Concentration criterion.	3	5	Knowledge of the pre-requisites and planning for density separation
3	**Density separation equipment I:** Jig: Theory of jigging. Construction, operation, application and product	9	1	Knowledge of the theories and practices related to

	discharge in different industrial jigs. Factors affecting jig performance. Dense medium separation: Medium characteristics and preparation. Types of dense medium separators – their construction, operation and application. Medium recovery circuits and equipment. Auxiliary equipment in dense medium separation circuits.			jigging and dense medium separation
4	**Density separation equipment II:** Flowing film separation: Principles, scope and types. Flowing film separation equipment – their construction, operation and application. Beneficiation of intermediate-sized particles by density separation: reflux classifier, teetered bed separators, water-only cyclones, etc. Enhanced gravity separation: Need, scope and equipment.	6	1	Understanding of the theory and practices for the density separation of intermediate-sized particles
5	**Magnetic and Electrical separation:** Magnetic separation fundamentals: Review of relevant physical quantities. Types of magnetic materials. Behavior of different materials in a magnetic field. Magnetic separators: Types, construction, operation, application, merits and limitations. Electrical separation fundamentals: Review of relevant physical quantities and electrical properties. Electrical separators: Types, construction, operation, application, merits and limitations. Fundamentals: Review of relevant physical quantities and electrical properties. Electrical separators: Types, construction, operation, application, merits and limitations.	6	2	Familiarization with the magnetic separation theory and practices

6	**Interfacial science, selective flocculation and oil agglomeration:** Interfacial properties. Electrical double layer. Electrokinetic and Hydrodynamic properties of interfaces. Young-Laplace equation. Kelvin equation. Principles of selective flocculation and oil agglomeration, reagents, scope, application, limitations, and construction and operation of equipment related to selective flocculation and oil agglomeration.	7	3	Understanding of the underlying phenomena of surface-property-based separation. Knowledge of the recent advances in surface-property-based separation
7	**Froth flotation:** Fundamentals: Principles, types, scope, application and limitations of froth flotation. Application of interfacial science in froth flotation. Froth flotation reagents: Types, application and chemistry. Froth flotation equipment: Construction, operation, application and limitations of different types of flotation machines – mechanical, column, Jameson, pneumatic, etc. Froth flotation circuits and practices for coal and ores (copper, lead-zinc, iron, gold, etc.)	8	1	Knowledge of the theory and practice of industrial froth flotation
	Total	**42**	**14**	**56**

TEXT BOOKS:

1. Wills Mineral Processing Technology by B. A. Wills and J. E. Finch, Elsevier
2. SME Mineral Processing and Extractive Metallurgy Handbook by Robert C. Dunne, SME

REFERENCE BOOKS:

1. Introduction to mineral processing by E. G. Kelly and D. J. Spottiswood, John Wiley & Sons
2. Physics and Chemistry of Interfaces by H. Butt, K. Graf, and M. Kappl, Wiley
3. Surface Chemistry of Froth Flotation by S.R. Rao, Springer
4. Flotation Science and Engineering by K.A. Matis, CRC Press