

4 th Semester	RCH4D004	MINERAL PROCESSING	L-T-P 3-0-0	3 CREDITS
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Module I: (10 hrs)

Thermal methods in processing of ores: Roasting, sintering, calcination, pelletisation, and briquetting. Chemical and electrochemical methods in mineral processing: Leaching – acid and bacterial leaching, amalgamation and cyanidation.

Module II: (07 hrs)

Introduction and scope of mineral processing in extractive metallurgy: Ores and Mineral resources in India and worldwide for basic metals like iron, copper, aluminium, lead and zinc. Physical and chemical characteristic of industrial minerals. Beneficiation flow sheets of coal and simple ores of copper, lead, zinc, and iron with reference to Indian deposits.

Module III: (10 hrs)

Minerals, ores & method of beneficiation: Introduction, Reactivity of metals, exploration of mineral deposits, definition of mineral & ore, Methods in mineral exploration: magnetic, electrical, electro-magnetic & other methods. Methods of beneficiation: Introduction, comminution, crushing & grinding, efficiency in comminution, size of a particle, classification and concentration, sizing and sorting equipment. General methods of extraction: Pyrometallurgy, calcinations, roasting & roasting units, smelting, chloridizing, refining metals by chlorination, direct & indirect chlorination, hydrometallurgy.

Module IV: (10 hrs)

Refining: Theory of leaching, electrochemical mechanism in leaching, cyanidation of gold and silver, contact reduction of metal in aqueous solution (cementation), Recovery of metal values from leach liquor by ion exchange, solvent extraction & electrolysis. General methods of refining – chemical methods, purification of crude metal produced in bulk: precipitation methods, electrolytic refining of Cu, Pb, Sn, and Ni.

Reference Books:

1. Principles of Mineral Dressing by AM Gaudin, McGraw-Hill.
2. Unit Operations of Chemical Engineering, 7th Ed. By W L McCabe, J C Smith and P Harriott, McGraw-Hill.
3. Handbook of Mineral Dressing: Ores and Industrial Minerals by A F Taggart, John Wiley.

Web learning resources:

1. Introduction to Mineral Processing by Prof. Arun Kumar Majumder, Department of Metallurgy and Material Science, IIT Kharagpur (Link: <https://nptel.ac.in/courses/105/105/105105171/>)