

NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR
(Metallurgical and Materials Engineering)
SUBJECT: MT 1403 Principle of Extractive Metallurgy

SYLLABUS IN DETAIL

MM1403: Principles of Extractive Metallurgy (3-1-0)

UNIT-I: Importance of mineral dressing, Equipments and steps involved-liberation, comminution, Principles of Crushing, Grinding and Grindability. Evaluation of Particle size, size distribution curves and their significance.

UNIT-II: Mechanism of breakage of materials, industrial screening, classification. Dry and wet classifiers. Free and hindered settling. Thickener, hydrocyclones, filtration, agitation and mixing, tabling, jigging, magnetic and electrostatic separation. Surface behaviour and flotation principles. Flotation Machines.

UNIT-III: Fuels for metallurgical processes, Refractories and their uses, Reactor design considerations, sizing of fluidized and fixed bed metallurgical reactors. Unit Processes in pyrometallurgy: Drying, calcination, roasting, pelletising and sintering. Thermodynamics of metal extraction, Slags-classification and properties. Reduction, smelting in shaft furnace, alternative reductants, hydrogen as reductant, metallothermic reduction. Thermodynamic principles and applications of matte smelting and converting. Flash smelting and submerged bath smelting.

UNIT-IV: Principles of metal refining with examples for metals like Cu, Ni, Pb, Sn and Zn; design of metal separation using high temperature distillation. Unit processes in hydrometallurgy: leaching, purification of leach liquor, solvent extraction and ion exchange systems and flow sheet design.

UNIT-V: Unit processes in electrometallurgy: Faradays laws of electrolysis, concept of overvoltage, limiting current density, overall cell voltage, series and parallel electrical circuits in refining. Electrowinning and electrorefining with reference to metals like Cu, Ni, Co, Cd, Fe, Zn, Al and Mg. Text Books: 1. Will's Mineral Processing Technology by B. Will and T. Napier-Munn 2. Principles of Extractive Metallurgy by Terkel Rosenqvist 3. Unit Processes of Extractive Metallurgy, R. D. Pehlke, Elsevier publishing Company, 1973.

Economic Criteria of Mining processing Operations.[9]

Environmental management in mineral processing industries [].

References:

1. Principal of Extractive Metallurgy by Terkel Rogenavist,
2. Extractive Metallurgy by Joshep Newton
3. Extraction of Non-ferrous metals by H.S.Ray
4. Process Selection in extractive Metallurgy by Peter Hayes
5. Economic Geology by Umeshwar Prasad
6. Economic Geology by N.L.Ram and Sharma