

PMT6J004 NON FERROUS EXTRACTIVE METALLURGY

Module-I

Fundamentals of Unit processes involved in Metal Extraction. Thermodynamic considerations and process selection in Pyro-metallurgical extraction of metals.

Kinetics of leaching of ores; effect of various operating variables on leaching process; bio leaching. Principles involved in Electro-metallurgical extraction of metals.

Module-II

Extraction of metals from oxide ores (Sn, Mg), Extraction of metals from Sul phide ores (Cu, Ni, Pb and Zn), Extraction of metals through halide route (Ti and Zr)

Refining involving oxidation, chemical transport reactions, zone refining, distillation, etc. Ion exchange and solvent extraction processes and their application in extraction processes (Zr, V, Th, Nb, etc)

Module-III

Electro winning and Electro refining of metals:

a) From aqueous salts (Cu, Ni, Au, Ag)

b) From fused salts (Al and Mg)

Environmental pollution and its address related to various metal extraction processes in general.

Books for reference :

1. *Extraction of Non Ferrous Metals* by H. S.Ray, R.Sridhar & K.P.Abraham, Affiliated East -West Press, New Delhi
2. *Extraction and Refining of Metals*, by C. Bodsworth, CRC Press.
3. *Metallurgy of Non Ferrous Metals* by W.H.Dennis, Pitman.
4. *Principles of Extractive Metallurgy*, by T. Rosenquist, McGraw hill, 1974
5. *Non Ferrous Production Metallurgy* by J.I.Bray, John Wiley, N.Y.
6. *General Metallurgy* by N.Severykov et al, Mir Publishers, Moscow.
7. *Rare Metal Extraction by Chemical Engineering*. Tech. by W.D.Jamrack, Pergamon Press, Oxford.