

MTPC3003 NON-FERROUS EXTRACTION OF METALS (3-0-0)

Course Objectives:

- To explore the fundamentals and various methods used for extraction of non-ferrous metals.
- To describe the procedure and equipment used for production of non-ferrous metals from their ores.

Module-I: (06 Hrs)

Metal extraction: Fundamentals, unit processes involved in pyrometallurgy, electrometallurgy and hydrometallurgy.

Sustainable Chemical Metallurgy, Recycling and Recovery from waste. Environmental pollution and its address related to various metal extraction processes in general.

Module-II: (06 Hrs)

Aluminum: properties and ores, Extraction using Bayer's process and Hall-Heroult process. Refining of metal: Hoopes process. Indian plant practice. Alternative processes: Alcoa process.

Magnesium: properties and ores. Pidgeon's process. Dows process.

Module-III: (06 Hrs)

Copper: properties and ores. Pyro-metallurgical processes. New processes: Flash smelting. WORCRA and Noranda processes. Hydrometallurgical extraction of copper. Copper production in India.

Nickel: properties and ores, pyrometallurgical extraction and refining

Lead: properties and ores. Pyrometallurgical extraction

Zinc: properties and ores. pyrometallurgical and hydrometallurgical extraction methods. Imperial smelting process.

Module-IV: (06 Hrs)

Production flow sheets for extraction of Gold and Silver.

Titanium: properties and ores. Extraction and production of Ti sponge.

Tin: properties and ores. smelting and refining.

Chromium: properties and ores, method of extraction from ore and slag.

Module-V: (06 Hrs)

Radioactive material extraction: Uranium: Extraction of Uranium. Production flow sheet of Jaduguda ore.

Production flow sheets of extraction of Thorium and Plutonium. Zirconium production in India.

Course Outcome:

CO1: To understand the fundamentals of non-ferrous metal extraction

CO2: To explore the extraction principles of light metals

CO3: To explore the principle of extraction for base metals

CO4: Demonstrate proficiency of the basic concepts in precious metal extraction

CO5: To acquire knowledge of radioactive material extraction

Text Books

1. Ray H.S., Sridhar R. and Abraham K.P., Extraction of Non-Ferrous Metals, Affiliated East – West Press, New Delhi, 2008
2. Dennis W.H., Metallurgy of Non-Ferrous Metals, Sir Isaac Pitman & Sons, 1963

Reference Books:

1. Bodsworth C., Extraction and Refining of Metals, CRC Press, 1994
2. Rumbu R., Non-ferrous Extractive Metallurgy - Industrial Practices: 1 (Non-ferrous Metallurgy), Createspace Independent Pub, 2014
3. Rosenquist T., Principles of Extractive Metallurgy, McGraw hill, 1974