

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V METALLURGY ENGINEERING

Subject Name: **Non-Ferrous Extractive Metallurgy**

Subject Code: **152102**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
4	0	0	4	70	30	50

Sr. No.	Course Content
1.	General: a. World resources of Non-ferrous metals and their occurrence. Present and future position of non-ferrous metallurgical industry in India- resources, production and consumption. b. Indian scenario of non-ferrous ores and mineral deposits. Production plants for non-ferrous metals such as copper, zinc, lead, tin, aluminium, nickel, magnesium, titanium, etc.
2.	Aluminium: Occurance of Bauxite. Bayer's process for production of alumina. Alternatives to Bayer's process. Hall-Heroult process-conventional and new materials for construction of aluminium reduction cell, nature of electrolyte. Electrolysis of alumina with emphasis on physico-chemical principles and secondary-reactions, factors affecting current efficiency. Alternatives to Hall-Heroult process. Refining of aluminium.
3.	Copper: a. Occurance of copper ores. Roasting. Matte-smelting, Converting and Refining process as applied to copper production and their physico-chemical aspects. b. Single step and multistep continuous processes. Hydrometallurgical process for production of primary copper. Recovery of copper from copper slag.
4.	Nickel: Occurrence of nickel ores, Pyrometallurgical and Hydrometallurgical processes for nickel production and refining.
5.	Lead and Zinc: Occurrence of lead and zinc ores, Pyrometallurgical and Hydrometallurgical processes for lead and zinc production and their physico-chemical aspects, Refining of lead and zinc, Recovery of byproducts.

6.	<p>Gold and Silver:</p> <p>a. Occurrence of gold and silver. Various methods for production of gold and silver from their ores and other sources.</p> <p>b. Recovery of gold, silver and platinum from secondary sources such as Copper Anode Mud, Red Mud, Zinc dross and electrolytic solutions.</p>
7.	<p>Tin:</p> <p>Occurrence of tin, various methods of extraction of tin from its ores and other sources. Uses of tin.</p>
8.	<p>Magnesium:</p> <p>Occurrence of magnesium, Methods of production of magnesium oxide and magnesium chloride, Pyrometallurgical extraction of magnesium, Electrolytic extraction and refining of magnesium.</p>

Reference Books:

1. Extraction of Non-ferrous Metals, H. S. Ray, R. Sridhar and K. P. Abraham, (Affiliated East-West Press)
2. Metallurgy of Non-ferrous Metals, W. H. Dennis,(Ditman)
3. General Metallurgy, B. Kuznetsov, (Peace Publ., Moscow)
4. Non-ferrous Extractive Metallurgy, J. L. Bray
5. Principles of Extractive Metallurgy., T. Rosenquist(McGraw Hill)