

GUJARAT TECHNOLOGICAL UNIVERSITY

METALLURGY ENGINEERING (21) ADVANCED NON FERROUS EXTRACTIVE METALLURGY SUBJECT CODE: 2182108 B.E. 8TH SEMESTER

Type of course: Engineering Science

Prerequisite: Knowledge of Principle of Extractive metallurgy

Rationale: Advanced Non Ferrous Extractive Metallurgy subject will prepare students for careers in Engineering where they have to manage the processes of mineral dressing, metal extraction and refining of different nonferrous metals. This education at the undergraduate level will enable students to seek employment in Metal Industries upon graduation while at the same time, provide a firm foundation for the pursuit of graduate studies in Metallurgy Engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
				ESE	PA	ALA	ESE	OEP		
4	2	0	6	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Brief out line of essential requirement of Non-ferrous materials, Minerals, their occurrence in India. Brief Review of Pyro-, Hydro and Electrometallurgy principles and processes. Rare metals – Minerals and their occurrence in India. Indian atomic power plants. Nuclear power programme in India and future trends.	12	20
2	Production Metallurgy of Vanadium, Manganese, Molybdenum, Cobalt, Tantalum, Tungsten, Titanium and their properties and applications.	15	25
3	Occurrence, extraction, mechanical and physical properties and use of uranium, thorium and zirconium.	15	25
4	Occurrence, extraction, mechanical and physical properties and uses of beryllium, hafnium and plutonium. Methods of production of ultrahigh purity metals and their importance in metallurgy.	15	25
5	Recent developments in production of Non-ferrous Metals.	03	05
Total		60	100

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	20	10	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Extraction of Non-ferrous Metals, H. S. Ray, R. Sridhar and K. P. Abraham, Affiliated East-West Press.
2. Principles of Extractive Metallurgy -A. Ghosh and H. S. Ray, John Wiley & Sons.
3. Extractive Metallurgy by Joseph Newton, John Wiley & Sons.
4. Principles of Extractive Metallurgy., T. Rosenquist, McGraw Hill
5. Metallurgy of the Non ferrous metals, by W.H. Dennis, Pitman, London 1963.
6. Nuclear Reactor Fuel Elements – Metallurgy and Fabrications – Kaufmann
7. C.G. Krishnadas Nair, Non-ferrous Metals strategy cum source book, IIM publication.
8. R.Bhimarao, K. Srinivasrao and Vibhuti N. Mishra, Non-ferrous Metals in the New Millennium, 2001.

Course Outcome:

After learning the course the students should be able to:

- Understand different nonferrous metals extraction processes.
- Know flow sheets of extraction of different non ferrous metals.

List of Tutorials:

- Charts of different Non ferrous metal extraction processes.
- Charts of Newer methods of extraction of non ferrous metals developed by Industries.
- Any other problem decided by faculty based on syllabus.

List of Open Source Software/learning website:

- I. <http://nptel.iitm.ac.in/>
- II. www.ocw.mit.edu

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be submitted to GTU.