FRESH COURSES PROPOSED FOR NEW REGIME OF NEP

INTRODUCTION TO METALLURGICAL ENGINEERING

Course Type	Course Code	Name of Course	L	T	P	Credit
DSC	NFMC101	Introduction to Metallurgical Engineering	3	0	0	3

Course Objective
The objective of the course is to introduce undergraduate students to the common processes/concepts in the metallurgical engineering paradigm.
Learning Outcomes
Upon successful completion of this course, students will be able identify the production, property, microstructure of different commercial metals and alloys

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction- Historical perspective; why study metallurgical engineering; classification of metals; modern alloys	2	Understanding about the specific properties and development of metals and alloys.
2	Extraction I- ores and metals; classes of ores; objectives and chemistry of roasting; sulphide smelting for any one metal; structure, properties and role of metallurgical slag; production of Fe and any other metal/s from oxide ores; metal production from halide ores (any one);	6	Knowledge about common pyrometallurgical routes of metal extraction.
3	Extraction II- Hyrdometallurgy; electormetallurgy, principle and methods of refining (introduction only)	3	Knowledge about common alternative routes of metal extraction.
4	Structure of atoms and crystalline solids- bonding force and energies, primary and secondary bonds; unit cell; crystal structure; crystallographic planes and directions; closed packed crystals	6	Knowledge about atomic configuration in metals and alloys.
5	Crystals- Crystallization; crystal imperfections: point, line, surface and volume defects; single and poly crystals; grin size; elastic modulus, hardness, tensile strength	6	Understanding about the microstructural defects.
6	Principle of alloy theory- concept of phase; phase rule; stability of phases; solid solution; intermediate phases; phase diagram; iron-carbon alloy system and two other alloy system; metastable versus equilibrium phase diagram; heat treatment and furnaces	9	Using phase diagram for predicting the microstructure of alloys.
7	Characterization of metals- light microscopy; metallography; x-ray diffraction; metallurgical microscopes; introduction to destructive testing (hardness); non-destructive testing (radiography, ultrasonic, magnetic particle inspection etc.)	6	Obtaining and recording micrograph of common alloys and non-destructive evaluation of components.
8	Metals and Alloys- microstructure and applications of some steels; cast iron; aluminium alloys; super-alloys	4	Knowledge about structure-property co-relation in common commercial alloys
	Total	42	

Text Books:

S. No.	Resource/Book Name	Author(s)/Editor(s)	Publisher
1	Callister's Materials Science and Engineering	R. Balasubramaniam	Wiley
2	Introduction to Physical Metallurgy	Sidney Avner	McGraw Hill
3	Physical Chemistry of Metallurgical Processes	M. Shamsuddin	Wiley
4	Heat treatment: Principles and Techniques	T.V. Rajan, C.P. Sharma	PHI Learning

Reference Books:

S. No.	Resource/Book Name	Author(s)/Editor(s)	Publisher
1	Fundamentals of Materials Science and Engineering	W.D. Callister	John Wiley & Sons
2	Modern Physical Metallurgy and Materials Engineering	R.E. Smallman and R.J. Bishop	Butterworth-Heinmann