

CH 256 CHEMICAL ENGINEERING MATERIALS

CREDITS= 6 (L = 4, T=0, P = 2)

1	Engineering Materials: Classification of materials-metallic materials; ceramic materials; composite materials; electrical and electronic materials. Structure- property-performance relationship.	2 Hours
2	Testing and properties of materials: Need for testing; Classification of testing; Specimen specifications for testing; Mechanical testing of materials-tension, compression, torsion, hardness, fatigue and impact testing. Electrical, thermal, optical and magnetic properties of materials.	4 Hours
3	Structures of crystalline solids: Crystal structures, unit cells, polymorphism and allotropy, anisotropy, crystallographic directions and planes and their significance.	4 Hours
4	Structure, properties and control in multiphase solids: Phase diagrams, phase rule, Hume-Rothery's rule, Solidification and cooling curves, Lever rule, Iron- Iron carbide phase diagram, Steels and cast iron, Effect of alloying elements on steels.	4 Hours
5	Thermal processing of metals and alloys: Heat treatment-definition and aims of heat treatment, Types of heat treatments- annealing, normalizing, hardening, tempering. Effect of cooling rates on the properties, Surface hardening methods.	4 Hours
6	Non-ferrous metals and alloys: Copper, aluminium and their alloys bearing metals, super alloys, noble metals.	3 Hours
7	Corrosion: Corrosion types, corrosion mechanisms and methods corrosion control.	4 Hours
8	Ceramic materials: Simple ceramic structures, properties and applications of ceramic materials.	3 Hours
9	Polymers: Mechanisms of polymerization, types of polymers, properties and applications of plastics, rubber and resins.	4 Hours
10	Composite materials: Material combinations, fibre-reinforced plastic composite materials, concrete, wood, sandwich structures, metal-matrix and ceramic-matrix composites.	3 Hours
11	Conducting materials: Properties and applications of optical fibers and conducting and super-conducting materials.	2 Hours
12	Selection of materials: Principles and practical aspects of materials of construction for chemical plant like heat exchangers, evaporators, storage vessels, distillation columns and reactors.	3 Hours

Reference books:		
Title:	Material Science and Engineering	
Author:	William D. Callister, Jr.	
Publisher:	John Wiley	
Title:	The Science and Engineering of Materials	
Author:	Askeland Donald R.	
Publisher:	Chapman and Hall	
Title:	Principles of Materials Science and Engineering	
Author:	Smith W. F.	
Publisher:	McGraw-Hill	
Title:	Elements of Materials Science	
Author:	Van Vlack L. H.	
Publisher:	Addison Wiley	
Title:	Physical Metallurgy for Engineers	
Author:	Clark D. S., Wilber R. V.	
Publisher:	CBS publications.	

List of experiments		
1	Identification of materials	
2.	Bravais lattice and crystal geometry.	
3.	Crystal planes and directions.	
4.	To study the behaviour of material under tensile load	
5.	To determine the compressive strength of brittle material.	
6.	Brinell and Rockwell hardness tests.	
7.	To determine the impact value of various materials.	
8.	To study the fatigue behaviour of material.	
9.	To study the effect of torsion load on materials.	
10.	To prepare the specimen for micro-examination.	
11.	To study the concept of NDT and liquid penetration test.	