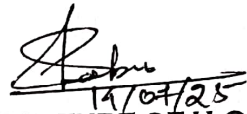


Discipline: Mechanical Engineering	Semester : 3 rd Semester 2025-2026 Dt-15/07/2025 To 15/11/2025	Name of the Teaching Faculty: Tapas Kumar Satpathy, Lecturer , Department of Mechanical Engineering
Subject: Materials Science & Engineering (Th 3)	No. of Days/week Class Allotted: 45	No of weeks: 18
week	Class Day	Theory Topics
1 st	1 st	Crystal structures and Bonds: Unit cell and space lattice, Crystal system
	2 nd	The seven basic crystal systems, Crystal structure for metallic elements, BCC, FCC and HCP.
	3 rd	Coordination number for Simple Cubic, BCC and FCC; Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC
2 nd	1 st	Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP
	2 nd	Simple problems on finding number of atoms for a unit cell
	3 rd	Bonds in solids: Classification - primary or chemical bond
3 rd	1 st	secondary or molecular bond; Types of primary bonds: Ionic, Covalent and Metallic Bonds
	2 nd	Types of secondary bonds: Dispersion bond, Dipole bond and Hydrogen bond
	3 rd	Phase diagrams, Ferrous metals and its Alloys: Isomorphs, eutectic and eutectoid systems
4 th	1 st	Iron-Carbon binary diagram; Iron and Carbon Steels
	2 nd	flow sheet for production of iron and steel
	3 rd	Iron ores – Pig iron: classification, composition and effects of impurities on iron, Cast Iron: classification, composition, properties and uses
5 th	1 st	Wrought Iron: properties, uses/applications of wrought Iron; comparison of cast iron, wrought iron and mild steel and high carbon steel
	2 nd	Standard commercial grades of steel as per BIS and AISI; Alloy Steels – purpose of alloying; effects of alloying elements
	3 rd	Important alloy steels: Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel
6 th	1 st	Stainless Steel (SS): types of SS, applications of SS – magnet steel – composition, properties and uses
	2 nd	Non-ferrous metals and its Alloys: Properties and uses of aluminum, copper, tin, lead, zinc, magnesium and nickel
	3 rd	Copper alloys: Brasses, bronzes – composition, properties and uses;
7 th	1 st	Aluminum alloys: Duralumin, hinalium, magnelium – composition, properties and uses
	2 nd	Nickel alloys: Inconel, monel, nicPerome – composition, properties and uses
	3 rd	Anti-friction/Bearing alloys: Various types of bearing bronzes

8 th	1 st	Standard commercial grades as per BIS/ASME
	2 nd	Failure analysis & Testing of Materials: Introduction to failure analysis
	3 rd	Fracture: ductile fracture, brittle fracture
9 th	1 st	Cleavage, notch sensitivity, fatigue, endurance limit
	2 nd	Characteristics of fatigue fracture
	3 rd	Variables affecting fatigue life, creep, creep curve, creep fracture
	4 th	Destructive testing: Tensile testing, compression testing
10 th	1 st	Hardness testing: Brinell test
	2 nd	Rockwell, bend test
	3 rd	Torsion test, fatigue test
11 th	1 st	Creep test
	2 nd	Non destructive testing, Visual Inspection
	3 rd	Magnetic particle inspection, liquid penetrant test
12 th	1 st	Ultrasonic inspection, radiography
	2 nd	Corrosion & Surface Engineering: Nature of corrosion and its causes
	3 rd	Electro chemical re-actions, Electrolytes, Factors affecting corrosion: Environment, Material properties and physical conditions
13 th	1 st	Types of corrosion, Corrosion control: Material selection, environment control and design
	2 nd	Corrosion control: Material selection, environment control and design, Surface engineering processes: Coatings and surface treatments; Cleaning and mechanical finishing of surfaces
	3 rd	Organic coatings; Electroplating and Special metallic plating, Electro polishing and photo etching
14 th	1 st	Conversion coatings: Oxide, phosphate and chromate coatings, Thin film coatings PVD and CVD
	2 nd	Surface analysis; Hard-facing, thermal spraying and high energy processes, Process/material selection
	3 rd	Pollution norms for treating effluents as per standards
15 th	1 st	Revision
	2 nd	Revision
	3 rd	Revision
16 th	1 st	Revision
	2 nd	Revision
	3 rd	Revision

17 th	1 st	Revision
	2 nd	Revision
	3 rd	Discussion of Probable Questions and Answers (1)
18 th	1 st	Discussion of Probable Questions and Answers (2)
	2 nd	Discussion of Probable Questions and Answers(3)
	3 rd	Discussion of Probable Questions and Answers (4)

Tapas Kumar Sanyal 14/07/2023
SIGNATURE OF THE FACULTY


14/07/23
SIGNATURE OF H.O.D.