

Discipline: MECHANICAL	Semester: 3 RD		Name of the Teaching Faculty: Er. MONALISHA SWAIN
Subject: (TH-3) MATERIAL SCIENCE ENGI NEERING	No. of days/per week class allotted: 03 Periods		Semester From date: 14/07/2025
			To date:
			No of weeks: 15
MONTH	NO. OF PERIODS	PERIODS	Theory Topics to be covered
JULY	2	1	Introduction
		1	Basics of Material Science
JULY	4	1	1. Crystal structures and Bonds: Unit cell and space lattice
		2	Crystal system: The seven basic crystal systems
		3	Crystal structure for metallic elements: BCC, FCC and HCP
		4	Coordination number for Simple Cubic, BCC and FCC
AUGUST	6	1	Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC
		2	Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP
		3	Simple problems on finding number of atoms for a unit cell
		4	Bonds in solids: Classification - primary or chemical bond, secondary or molecular bond;;
		5	Types of primary bonds: Ionic, Covalent and Metallic Bonds
		6	Types of secondary bonds: Dispersion bond, Dipole bond and Hydrogen bond
			Class test 1
AUGUST	6	1	Unit-II: Phase diagrams, Ferrous metals and its Alloys: Isomorphs, eutectic and eutectoid systems;
		2	Iron-Carbon binary diagram;;;
		3	Iron-Carbon binary diagram
		4	Iron and Carbon Steels; flow sheet for production of iron and steel;
		5	Iron ores – Pig iron: classification, composition and effects of impurities on iron;
		6	Cast Iron: classification, composition, properties and uses;
		7	Wrought Iron: properties, uses/applications of wrought Iron
SEPTEMBER	3	1	comparison of cast iron, wrought iron and mild steel and high carbon steel; standard

			commercial grades of steel as per BIS and AISI
		2	Alloy Steels – purpose of alloying; effects of alloying elements –
		3	Important alloysteels: Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel,Stainless Steel (SS): types of SS, applications of SS – magnet steel – composition, properties and uses
			Class test
SEPTEMBER	6	1	Non-ferrous metals and its Alloys: Properties and uses of aluminum, copper, tin, lead, zinc, magnesium and nickel
		2	Copper alloys
		3	Brasses, bronzes – composition, properties and uses
		4	Aluminum alloys: Duralumin, hindalium, magnelium – composition, properties and uses
		5	Nickel alloys: Inconel, monel, nicPerome – composition, properties and uses.
		6	Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard commercial grades as per BIS/ASME
			Class Test
OCTOBER	10	1	Failure analysis & Testing of Materials: Introduction to failure analysis;;;
	3	2	Fracture: ductile fracture, brittle fracture; cleavage
		3	notch sensitivity; fatigue; endurance limit;
		4	characteristics of fatigue fracture; variables affecting fatigue life
		5	Creep; creep curve; creep fracture
OCTOBER	6	6	Destructive testing:Tensile testing; compression testing
		7	Hardness testing: Brinell, Rockwell; bend test;
		8	Torsion test; fatigue test; creep test.
		9	Nondestructive testing: Visual Inspection; magnetic particle inspection
		10	. liquid penetrant test; ultrasonic inspection; radiography
			Class test
OCTOBER	3	1	Corrosion & Surface Engineering: Nature of corrosion and its causes;; s; Types of corrosion;;;
		2	Electro chemical re-actions; Electrolytes

		3	Factors affecting corrosion: Environment, Material properties and physical condition
NOVEMBER	6	1	Corrosion control: Material selection, environment control and design
		2	Surface engineering processes: Coatings and surface treatments; Cleaning and mechanical finishing of surfaces
		3	Organic coatings; Electroplating and Special metallic plating
		4	Electro polishing and photoetching ;– Conversion coatings: Oxide, phosphate and chromate coatings; Thin film coatings: PVD and CVD
		5	Surface analysis; Hard-facing, thermal spraying and highenergy processes
		6	Process/material selection. Pollution norms for treating effluents as per standards
			Class test

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