Discipline: Mechanical Engg.	3RD SEMESTR	Name of the Teaching Faculty: PRABIR KUMAR SWAI Designation: Lecturer S-II(MECHANICAL)
Subject: Material science and engineering (TH-3)	CLASS DAY	Semester From date: 01.07.2026 To date: 05.11.2026 No. of weeks: 19 Total class:
Week		Theory Topics
1ST	1ST	introduction to material science and syllabus discussion
	2ND	**Crystal structures and Bonds:** Unit cell and space lattice
	3RD	Crystal system: The seven basic crystal systems;
2ND	1ST	Crystal system: The seven basic crystal systems;
	2ND	Crystal structure for metallic elements: BCC, FCC and HCP; Coordination number for Simple Cubic, BCC and FCC; Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC; Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP;
	3RD	Crystal structure for metallic elements: BCC, FCC and HCP; Coordination number for Simple Cubic, BCC and FCC; Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC; Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP;
3RD	1ST	Crystal structure for metallic elements: BCC, FCC and HCP; Coordination number for Simple Cubic, BCC and FCC; Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC; Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP;
	2ND	Simple problems on finding number of atoms for a unit cell.

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	3RD	**Bonds in solids:** Classification - primary or chemical bond, secondary or molecular bond;
4TH	1ST	Typesof primary bonds: Ionic, Covalent and Metallic Bonds
	2ND	Types of secondary bonds: Dispersion bond, Dipole bond and Hydrogen bond
	3RD	**Phase diagrams, Ferrous metals and its Alloys:** Isomorphs, eutectic and eutectoid systems;
5TH	1ST	Iron-Carbon binary diagram
	2ND	Iron-Carbon binary diagram
	3RD	Iron and Carbon Steels; flow sheet for production of iron and steel; Iron ores – Pig iron:
6TH	1ST	classification, composition and effects of impurities on iron;
	2ND	Cast Iron: classification, composition, properties and uses; Wrought Iron: properties, uses/applications of wrought Iron
	3RD	comparison of cast iron, wrought iron and mild steel and high carbon steel;
7TH	1ST	standard commercial grades of steel as per BIS and AISI; Alloy Steels – purpose of alloying; effects of alloying elements – Important alloysteels:
	2ND	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

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	3RD	**Non-ferrous metals and its Alloys:** Properties and uses of aluminum
8TH	1ST	Properties and uses of copper, tin, lead, zinc
	2ND	Properties and uses of , magnesium and nickel;
	3RD	Copper alloys: Brasses, bronzes – composition, properties and uses;
9th	1ST	Aluminum alloys: Duralumin, hindalium, magnelium – composition, properties and uses
	2ND	Nickel alloys: Inconel, monel, nicPerome – composition, properties and uses
	3RD	Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard commercial grades as per BIS/ASME
10TH	1ST	**Failure analysis & Testing of Materials:** Introduction to failure analysis
	2ND	Fracture: ductile fracture, brittle fracture;
	3RD	cleavage; notch sensitivity; fatigue; endurance limit
11TH	1ST	characteristics of fatigue fracture; variables affecting fatigue life;
	2ND	creep; creep curve; creep fracture;
	3RD	Destructive testing:Tensile testing; compression testing
12th	1ST	Hardness testing: Brinell, Rockwell; bend test;
	2ND	torsion test; fatigue test; creep test
	3RD	Non- destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography.

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13TH	1ST	Non- destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography.
	2ND	Non- destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography.
	3RD	**Corrosion & Surface Engineering:** Nature of corrosion and its causes
14th	1ST	Electro chemical re-actions; Electrolytes;
	2ND	Factors affecting corrosion: Environment, Material properties and physical conditions;
	3RD	Types of corrosion; Corrosion control: Material selection, environment control and design
15th	1ST	Surface engineering processes: Coatings and surface treatments;
	2ND	Cleaning and mechanical finishing of surfaces
	3RD	Organic coatings; Electroplating
16th	1ST	Special metallic plating; Electro polishing and photo-etching ;
	2ND	Conversion coatings: Oxide, phosphate and chromate coatings
	3RD	Thin film coatings: PVD and CVD
	1ST	Surface analysis; Hard-facing, thermal spraying
	2ND	high- energy processes; Process/mate-rial selection

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17th		
	3RD	Pollution norms for treating effluents as per standards.
18th	1ST	revision
	2ND	revision
	3RD	revision
revision	1ST	revision
	2ND	revision
	3RD	revision

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