



GANAPATI INSTITUTE OF ENGINEERING & TECHNOLOGY(Polytechnic),JAGATPUR,CUTTACK
DEPARTMENT OF MECHANICAL ENGINEERING.

LESSON PLAN-2026 WINTER

Discipline : Mechanical Engineering	Semester:3rd	Name of the Teaching Faculty:- Er.ANANDITA NANDA
Subject: Material Science & Engineering [MEPC-205 TH:3]	No. of Days/per week class allotted:03	Semester From Date : 01.07.2026 To Dates: 05.11.2026
		No. of Weeks:15
Week	Class Day	Theory Topics
1ST	1st	Unit-1: Crystal Structures and Bonds: Unit cell and space lattice: Crystal system: The seven basic crystal systems;
	2nd	Crystal structure for metallic elements: BCC, FCC and HCP;
	3rd	Coordination number for Simple Cubic, BCC and FCC;
2ND	1st	Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC;
	2nd	Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP;
	3rd	Simple problems on finding number of atoms for a unit cell.
3RD	1st	Bonds in solids: Classification - primary or chemical bond,
	2nd	Bonds in solids: Classification - secondary or molecular bond;
	3rd	Types of primary bonds: Ionic, Covalent and Metallic Bonds;
4TH	1st	Types of secondary bonds Dispersion bond, Dipole bond and Hydrogen bond
	2nd	Unit-2: Phase diagrams, Ferrous metals and its Alloys: Isomorphs, eutectic and eutectoid systems
	3rd	Iron-Carbon binary diagram; Iron and Carbon Steels; flow sheet for production of iron and steel
5TH	1st	Iron ores – Pig iron: classification, composition and effects of impurities on iron;
	2nd	Cast Iron: classification, composition, properties and uses;
	3rd	comparison of cast iron, wrought iron and mild steel and high carbon steel; standard commercial grades of steel as per BIS and AISI

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6 TH	1 st	Wrought Iron: properties, uses/applications of wrought Iron;
	2 nd	Alloy Steels – purpose of alloying; effects of alloying elements – Important alloy steels:
	3 rd	Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel, Stainless Steel (SS)
7 TH	1 st	types of SS, applications of SS – magnet steel – composition, properties and uses
	2 nd	Unit-3:Non-ferrous metals and its Alloys: Properties and uses of aluminium , copper, tin
	3 rd	Aluminum alloys: Duralumin, hinalium, magnelium – composition, properties and uses;
8 TH	1 st	Properties and uses of lead, zinc, magnesium and nickel;
	2 nd	Copper alloys: Brasses, composition, properties and uses;
	3 rd	Bronzes – composition, properties and uses;
9 TH	1 st	Aluminum alloys: Duralumin, hinalium, magnelium – composition, properties and uses;
	2 nd	Nickel alloys: Inconel, monel – composition, properties and uses.
	3 rd	Nickel alloys: nicPerome – composition, properties and uses.
10 TH	1 st	Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard commercial grades as per BIS/ASME
	2 nd	Unit-4: Failure analysis & Testing of Materials: Introduction to failure analysis;
	3 rd	Fracture: ductile fracture, brittle fracture; cleavage; notch sensitivity; fatigue; endurance limit;
11 TH	1 st	Characteristics of fatigue fracture;
	2 nd	variables affecting fatigue life; creep; creep curve; creep fracture;
	3 rd	Destructive testing: Tensile testing; compression testing;
12 TH	1 st	Hardness testing: Brinell , Rockwell; bend test;
	2 nd	Torsion test; fatigue test; creep test.
	3 rd	Non- destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test;

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13 TH	1 st	Ultrasonic inspection; radiography.
	2 nd	Unit-5:Corrosion & Surface Engineering: Nature of corrosion and its causes;
	3 rd	Electro chemical re-actions; Electrolytes;
14 TH	1 st	Factors affecting corrosion: Environment, Material properties and physical conditions;
	2 nd	Types of corrosion; Corrosion control: Material selection, environment control and design;
	3 rd	Surface engineering processes: Coatings and surface treatments;
15 TH	1 st	Cleaning and mechanical finishing of surfaces; Organic coatings; Electroplating and Special metallic plating;
	2 nd	Electro polishing and photo-etching ;– Conversion coatings: Oxide, phosphate and chromate coatings;
	3 rd	PVD and CVD; Surface analysis; Hard-facing, thermal spraying and high-energy processes; Process/material selection. Pollution norms for treating effluents as per standards

Learning Resources:

1. Material Science – GBS Narang –Khanna Publishers, New Delhi
2. Material Science – R.K.Rajput – Lakshmi Publication ,New Delhi
3. Material Science – R.S.Khurmi ,R.S.Sedha – S.Chand, Publication

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