

LESSON PLAN 2025-26

NAME OF THE TEACHER : LOKESH PATTNAIK, (SR. LECT, AUTOMOBILE)

Subject: Engineering Materials (AEPC205)

Program: Diploma in Automobile Engineering

Semester: 3rd

Total Contact Hours: 45

Total Marks: 100

Assessment: Progressive – 30, End Term – 70

Credits: 3

COURSE OBJECTIVES:

At the end of the course, the students will be able to:

CO1 Identify different engineering materials and their properties along with ferrous, non-ferrous and alloys

CO2 Describe the iron-carbon phase transformation process and crystal imperfections

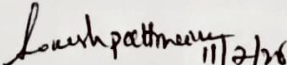
CO3 Explain the effect of heat treatment and its impact on material properties.

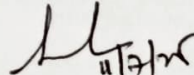
CO4 Classify non-ferrous alloys, bearing and spring materials

CO5 Identify the properties of polymers, composites and ceramics

Class No.	Topic	Subtopics	Teaching Aids/Activities	Course Objective
Unit I – Engineering Materials & Ferrous Alloys (10 classes)				
1	Introduction to Engineering Materials	Definition, importance, classification	PPT, material samples	CO1
2	Material Classification	Ferrous vs Non-Ferrous, Alloys	Chart, material table	CO1
3	Material Properties – Physical	Density, thermal conductivity, melting point	Video, chart	CO1
4	Material Properties – Mechanical	Strength, hardness, ductility, toughness	Comparative table	CO1
5	Material Properties – Chemical	Corrosion resistance, chemical stability	Real-life case examples	CO1
6	Performance & Reliability	Failure mechanisms, safety requirements	Case study	CO1
7	Ferrous Materials – Overview	Introduction and characteristics	Real samples, images	CO1
8	Low, Medium, High Carbon Steels	Composition, properties, applications	Steel grade charts	CO1
9	Alloy Steels	Tool steel, stainless steel, high alloy steel	Alloying element chart	CO1
10	Effect of Alloying Elements	Cr, Mn, Ni, V, Mo and their impact	Alloy wheel examples, video	CO1
Unit II – Iron-Carbon Diagram & Crystal Imperfections (12 classes)				
11	Phase Diagrams – Basics	Concept, cooling curves	Iron-carbon chart	CO2
12	Iron-Carbon Diagram – Overview	Critical points, eutectoid, eutectic	Diagram plotting	CO2
13	Microconstituents in Steel	Ferrite, austenite, cementite, pearlite	Microstructure images	CO2
14	Crystal Structures	Unit cells – BCC, FCC, HCP	3D models, visual demo	CO2
15	Crystal Imperfections – Intro	Ideal vs Real crystals	Crystal lattice visuals	CO2
16	Point Defects	Vacancies, interstitials, substitution	Animation, atomic models	CO2
17	Line Defects	Dislocations – edge & screw	Chalk demo, simulation	CO2
18	Surface & Volume Defects	Grain boundaries, voids	Image comparison	CO2
19	Deformation Mechanisms	Slip and twinning	Diagrams, video	CO2
20	Effect on Material Properties	Strength, brittleness, ductility	Comparative testing data	CO2

21	Revision & Practice – Diagrams	Iron-carbon questions, diagrams	Worksheet, MCQs	CO2
22	Crystal Imperfection Problems	Numerical/conceptual application	Class activity	CO2
Unit III – Heat Treatment (7 classes)				
23	Purpose & Need for Heat Treatment	Introduction, objectives	Real-life tools, animation	CO3
24	Annealing & Normalizing	Process, effects, applications	Heat cycle graph	CO3
25	Hardening & Tempering	Tempering colors, quenching media	Workshop demo/video	CO3
26	Stress Relieving	Causes of stress, method	Sample case study	CO3
27	Surface Hardening	Carburizing, nitriding	Furnace images, video	CO3
28	Effect on Properties	Case depth, hardness profile	Property graphs	CO3
29	Hardenability of Steel	Jominy test, practical meaning	Video, Jominy end-quench test chart	CO3
Unit IV – Non-Ferrous Alloys & Bearings (9 classes)				
30	Aluminium Alloys	Duralumin, Y-alloy – composition and use	Specimen chart	CO4
31	Copper Alloys	Brass, bronze, cupronickel	Alloy samples	CO4
32	Tin, Lead, Babbit Alloys	Applications in bearings	Real bearing samples	CO4
33	Phosphor Bronze, Copper-Tin	Composition, uses	Diagram, sample photos	CO4
34	Low-Alloy Materials	P91, P22 – power plants, high-temp applications	Industrial case studies	CO4
35	High-Alloy Materials	Stainless, duplex, super duplex	Grade comparison chart	CO4
36	Bearing Materials	Copper, tin, lead, cadmium bases	Demo kits, comparison table	CO4
37	Spring Materials	Iron-based, copper-based materials	Springs demo, material chart	CO4
38	Revision on Alloys	Summary + worksheet	Group discussion	CO4
Unit V – Polymers, Composites, Ceramics (7 classes)				
39	Thermoplastics vs Thermosets	Properties, examples	Plastic samples, flow chart	CO5
40	Elastomers	Rubber, silicone, neoprene – properties	Stretch test demo	CO5
41	Particulate Composites	Cement, concrete, alloys	Sample display	CO5
42	Fibre-Reinforced Composites	Carbon, glass fibres	Real samples, structure image	CO5
43	Ceramic Materials	Types, uses, characteristics	Crack test, insulation demo	CO5
44	Properties & Applications Recap	Overview of polymers, ceramics, composites	Flashcards, Q&A	CO5
45	Final Review & Assessment	Model Test, Oral Q&A	Practice paper, final quiz	All COs


Signature of Teacher


Signature of HOD