



Lesson Plan & Work-Done Diary for AY:2024-25, Odd Semester

Course with Code: Material Science and Engineering [BME303]				Faculty: Prof. Devaraj M R			Semester & Section: 3 rd Sem	
Class No.	Date Planned (DD/MM)	Topics to be covered	TLP Planned	Class No.	Date of Conduction (DD/MM)	Topics Covered	TLP Executed	Remarks if any deviation
MODULE-1: Structure of Materials								
1		Structure of Materials: Introduction: Classification of materials, crystalline and non-crystalline solids,	Chalk & Talk PPT					
2		Atomic bonding: Ionic Bonding and Metallic bonding.	Chalk & Talk PPT					
3		Crystal Structure: Crystal Lattice, Unit Cell, Planes, and directions in a lattice, Planar Atomic Density, Coordination number,	Chalk & Talk PPT					
4		atomic Packing Factor of all the Cubic structures and	Chalk & Talk PPT					
5		Hexagonal Close Packed structure. Classification and Coordination of voids, Bragg's Law.	Chalk & Talk PPT					
6		Imperfections in Solids: Types of imperfections, Point defects:	Chalk & Talk PPT					

		vacancies, interstitials, line defects,						
7		2-D and 3D-defects,	PPT					
8		Concept of free volume in amorphous solids. Slip, Twinning.	Chalk & Talk PPT					
9		Concept of Slip, Twinning. and Quiz-1	PPT & Video					
L1		Specimen preparation for macro and micro structural examinations and study the macrostructure and microstructure of a sample metal/alloys-	Lab Visit	1				
L2		To study the crystal structure of a given Cast Iron, Mild steel, Aluminium and Copper/Brass specimens and study the crystal imperfections in a given Cast Iron, Mild steel and Aluminium specimens.	Lab Visit	2				

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MODULE-2: Physical Metallurgy								
10		Physical Metallurgy: Alloy Systems: Classification of Solid solutions, Hume- Rothery Rules	Chalk & Talk PPT					
11		Diffusion: Diffusion Mechanisms: Vacancy Diffusion and Interstitial Diffusion,	PPT					
12		Fick's laws of diffusion, Factors affecting diffusion.	Chalk & Talk PPT					
13		Phase Diagrams: Gibbs Phase Rule, Solubility limit, phase equilibrium and Phase Diagrams:	PPT					
14		Isomorphous systems, Invariant Binary Reactions: Eutectic reaction, Eutectoid reaction and Peritectic reaction, Lever Rule,	PPT					
15		Iron-Carbon Diagram.	Chalk & Talk PPT					
16		Effect of common alloying elements in steel.	Chalk & Talk PPT					
17		Numerical on Lever rule.	Chalk & Talk PPT					

18		Numerical on Lever rule and Quiz-2	Chalk & Talk PPT					
L3		Study the heat treatment processes (Hardening and tempering) of steel/Aluminium specimens.- Demo	Lab Visit	3				
L4		To determine the hardness values of Mild Steel/ Aluminium by Rockwell hardness/Vickers Hardness.	Lab Visit	4				

MODULE-3: Nucleation and growth, Plastic Deformation and Heat treatment

19		Nucleation and growth: Introduction to homogeneous and heterogeneous nucleation, critical radius for nucleation.	Chalk & Talk PPT					
20		Heat treatment: Annealing,	PPT					
21		Normalizing, hardening, Tempering,	PPT					
22		Austempering and Martempering Nitriding, Cyaniding,	PPT & Video					
23		Induction Hardening and Flame Hardening, Precipitation hardening (Solid-Solution Strengthening), Grain refinement.	PPT & Video					
24		Recent advances in heat treat technology. TTT diagram,	PPT					

25		Recovery-Recrystallization-Grain Growth.	PPT					
26		Strengthening mechanisms: Strain hardening,	Chalk & Talk PPT					
L5		To determine the hardness values of Copper/ Brass by Brinell's Hardness testing machine.	Lab Visit	5				
L6		To study the creep behavior of a given Cast Iron or Aluminium specimen.	Lab Visit	6				
MODULE-4: Surface Coating Technologies, Powder Metallurgy								
27		Surface coating technologies: Introduction, coating materials, coating technologies, types of coating:	Chalk & Talk PPT					
28		Electro-plating, Chemical Vapor Deposition (CVD),	Chalk & Talk PPT					
29		Physical Vapor Deposition (PVD), High Velocity Oxy-Fuel Coating,	Chalk & Talk PPT					
30		Advantages and Disadvantages of surface coating.	PPT					
31		Powder metallurgy: Introduction, Powder Production Techniques:	PPT					

32		Different Mechanical methods: Chopping or Cutting, Abrasion methods, Machining methods,	PPT					
33		Ball Milling and Chemical method: Chemical reduction method.	PPT					
34		Characterization of powders (Particle Size & Shape Distribution), Powder Shaping: Particle Packing Modifications, Lubricants & Binders, Powder Compaction & Process, Sintering and Application of Powder Metallurgy.	PPT					
L7		To study of microstructure of welding Mild Steel components and Heat affected zone (HAZ) macro and micro examinations.	Lab Visit	7				
L8		To determine the tensile strength, modulus of elasticity, yield stress, % of elongation and % of reduction in area of Cast Iron, Mild Steel/Brass/ Aluminium and to observe the necking.	Lab Visit	8				
MODULE-5 Engineering Materials and Their Properties								
35		Engineering Materials and Their Properties: Classification, Ferrous materials: Properties, Compositions and uses of Grey cast iron and steel.	Chalk & Talk PPT					
36		Ferrous materials: Properties, Compositions and uses of Grey cast iron and steel.	PPT					

37		Non-Ferrous materials: Properties, Compositions and uses of Copper, Brass, Bronze.	PPT					
38		Composite materials - Definition, classification, types of matrix materials & reinforcements,	PPT					
39		Metal Matrix Composites (MMCs), Ceramic Matrix Composites (CMCs)	Chalk & Talk PPT					
40		Polymer Matrix Composites (PMCs), Particulate-reinforced and fiber- reinforced composites, Applications of composite materials. Mechanical and functional properties of Engineering Materials	PPT					
41		The Design Process and Materials Data: Types of design, design tools and materials data, processes of obtaining materials data, materials databases.	Chalk & Talk PPT					
42		Material Selection Charts: Selection criteria for materials, material property Charts, deriving. property limits and material indices.	PPT					

L9		<p>To conduct a wear test on Mild steel/ Cast Iron/Aluminium/ Copper to find the volumetric wear rate and coefficient of friction.</p> <p><i>Study the chemical corrosion and its protection. Demonstration</i></p>	Lab Visit	9				

	Activity	Planned	Actual	Remarks
1	Theory Classes	42		
2	Demonstrations & Lab Visit/ Experiment conduction	09		
3	Assignments/ Quizzes	2 / 3		
4	Tutorials/ Extra classes	If there is a variation in Planned and covered		
5	Internal Assessments	3		
6	ICT based Teaching. (% of usage in Curriculum)	80 to 85%		
Planning			Execution	
Faculty Signature:			Faculty Signature:	
HoD Signature:			HoD Signature:	