Lesson Plan

B.Tech. (Robotics and Artificial Intelligence) 3rd Semester

Subject Name: Materials Engineering (PCC-RAI-301/21)

Name of Teacher: Prof. Hari Om

S.N.	Content to be Covered	Lect. No.
	UNIT-1	
1	Introduction to Materials Science and Engineering,	1
2	Basic concepts of Crystals, Unit Cells, Crystal Systems	2
3	Point Coordinates, Crystallographic Directions and Planes	3
4	Linear and Planar Density Computations, Single and Polycrystalline Materials, Polymorphism and Allotropy, Anisotropy, Non-crystalline solids	4
5	Imperfections in Solids, Point Defects, Dislocations,	5
6	Interfacial Defects, Bulk or Volume Defects.	6
	UNIT-2	
7	Basic Concepts, Characteristics of Dislocations	7
8	Slip Systems, Slip in Single Crystals and CRSS	8
9	Plastic Deformation of Polycrystalline Materials	9
10	Deformation by Slip and Twinning	10
11	Strengthening of alloys by grain size reduction	11
12	Solid solution strengthening and strain hardening.	12
	UNIT-3	
13	Rigid bodies and deformable solids, Tension, Compression and Shear Stresses,	13
14	Hooke's law, Elastic constants and their relations,	14
15	Plastic behaviour of materials, Deformation of simple and compound bars,	15
16	Thermal stresses, Volumetric strains,	16
17	Stresses on inclined planes,	17
18	Principal stresses and principal planes,	18
19	Mohr's circle of stress. Numerical Problems	19

	UNIT-4	
20	Fundamentals of Fracture, Failure vs. Fracture,	20
21	Ductile Fracture, Brittle Fracture	21
22	Principles of Fracture Mechanics, Stress concentration, Fracture toughness	22
23	Fatigue, Cyclic Stresses, The S–N Curve, Crack Initiation and Propagation	23
24	Factors that affect Fatigue Life, Environmental Effects	24
25	Creep in alloys, Generalized Creep Behaviour, Stress and Temperature Effects on creep	25
	UNIT-5	
26	Various theories of elastic failures with derivations and graphical representations,	26
27	Various theories of elastic failures with derivations and graphical representations,	27
28	Applications to problems of 2-D &3-D stress system with direct loading	28
29	Applications to problems of 2-D &3-D stress system with bending	29
30	Applications to problems of 2-D &3-D stress system with combined direct loading and bending	30
31	Applications to problems of 2-D &3-D stress system with combined torsional and direct loading. Numerical Problems	31
	UNIT-6	
32	Types and applications of Ceramics	32
33	Particle Reinforced Composites, Fiber-Reinforced Composites	33
34	Introduction to Nano-materials, Shape-Memory Alloys, Bio-materials	34
35	Recyclable polymers and Biodegradable Polymers	35
36	Economic, Environmental, and Societal Issues in Materials Engineering,	36
37	Introduction to RoHS directives	37