

B.Tech 3rd Semester (Robotics and Artificial Intelligence)**Lesson Plan: Engineering Mechanics (ESC-303-RAI/21)**

S.N.	Content to be Covered	Lect. No.
UNIT – 1: Force Systems (8 Lectures)		
1	Basic concepts of Engineering Mechanics – Force, Moment, Couple	L1
2	Particle equilibrium in 2-D and 3-D	L2
3	Rigid Body Equilibrium and System of Forces	L3
4	Coplanar Concurrent Forces – Components in Space and Resultant	L4
5	Moment of Forces and its Applications	L5
6	Couples and Resultant of Force System	L6
7	Equilibrium of System of Forces, Free Body Diagrams	L7
8	Equations of Equilibrium of Coplanar Systems	L8
UNIT – 2: Vectors and Tensors (5 Lectures)		
9	Introduction to Vectors, Tensors, and Coordinate Systems	L9
10	Vector and Tensor Algebra; Indicical Notation	L10
11	Symmetric and Anti-symmetric Tensors; Eigenvalues and Principal Axes	L11
12	3-D Rotations – Euler’s Theorem, Axis-Angle Formulation	L12
13	Euler Angles and Coordinate Transformation of Vectors and Tensors	L13
UNIT – 3: Structural Analysis (7 Lectures)		
14	Equilibrium in Three Dimensions	L14
15	Trusses – Method of Joints	L15
16	Trusses – Method of Sections	L16
17	Zero Force Members and Applications	L17
18	Beams – Types and Reactions	L18
19	Frames and Machines – Analysis	L19
20	Numerical Problems on Trusses and Beams	L20

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UNIT – 4: Centroid and Centre of Gravity (7 Lectures)		
21	Centroid of Simple Figures – First Principles	L21
22	Centroid of Composite Sections	L22
23	Centre of Gravity – Concept and Applications	L23
24	Area Moment of Inertia – Definition and First Principles	L24
25	Theorems of Moment of Inertia	L25
26	Moment of Inertia of Standard and Composite Sections	L26
27	Mass Moment of Inertia – Circular Plate, Cylinder, Cone, Sphere, Hook	L27
UNIT – 5: Particle Dynamics (8 Lectures)		
28	Rectilinear and Plane Curvilinear Motion (Rectangular, Path, Polar Coordinates)	L28
29	3-D Curvilinear Motion, Relative and Constrained Motion	L29
30	Newton’s 2nd Law in Rectangular, Path, and Polar Coordinates	L30
31	Work-Kinetic Energy, Power, and Potential Energy	L31
32	Impulse-Momentum Principle (Linear and Angular)	L32
33	Impact – Direct and Oblique	L33
34	Numerical Problems and Applications	L34
35	Tutorial / Revision of Unit 5	L35
UNIT – 6: Kinematics and Kinetics of Rigid Bodies (8 Lectures)		
36	Basic Terms and General Principles in Dynamics	L36
37	Types of Motion – Translational, Rotational, Plane Motion	L37
38	Instantaneous Centre of Rotation in Plane Motion	L38
39	Simple Problems on Instantaneous Centre of Rotation	L39
40	D’Alembert’s Principle and its Applications in Plane Motion	L40
41	Work-Energy Principle for Connected Bodies	L41
42	Kinetics of Rigid Body Rotation	L42
43	Numerical Problems and Revision	L43