



**IIPM SCHOOL OF ENGINEERING AND
TECHNOLOGY**
LESSON PLAN: 2023-2024
Engineering Mechanics



Branch : Mechanical/Mining
Duration : 60
Faculty name : Prasanna Mohanty

Semester: 1st /2nd

SYLLABUS

Unit – I	<p>1. FUNDAMENTALS OF ENGINEERING MECHANICS</p> <p>1.1 Fundamentals. Definitions of Mechanics, Statics, Dynamics, Rigid Bodies, 1.2 Force, Force System. Definition, Classification of force system according to plane & line of action. Characteristics of Force & effect of Force. Principles of Transmissibility & Principles of Superposition. Action & Reaction Forces & concept of Free Body Diagram. 1.3 Resolution of a Force. Definition, Method of Resolution, Types of Component forces, Perpendicular components & non-perpendicular components. 1.4 Composition of Forces. Definition, Resultant Force, Method of composition of forces, such as 1.4.1 Analytical Method such as Law of Parallelogram of forces & method of resolution. 1.4.2. Graphical Method. Introduction, Space diagram, Vector diagram, Polygon law of forces. 1.4.3 Resultant of concurrent, non-concurrent & parallel force system by Analytical & Graphical Method. 1.5 Moment of Force. Definition, Geometrical meaning of moment of a force, measurement of moment of a force & its S.I units. Classification of moments according to direction of rotation, sign convention, Law of moments, Varignon's Theorem, Couple – Definition, S.I. units, measurement of couple, properties of couple.</p>
Unit – II	<p>2. EQUILIBRIUM</p> <p>2.1 Definition, condition of equilibrium, Analytical & Graphical conditions of equilibrium for concurrent, non-concurrent & Free Body Diagram. 2.2 Lami's Theorem – Statement, Application for solving various engineering problems.</p>
Unit – III	<p>3. FRICTION</p> <p>3.1 Definition of friction, Frictional forces, Limiting frictional force, Coefficient of Friction. Angle of Friction & Repose, Laws of Friction, Advantages & Disadvantages of Friction. 3.2 Equilibrium of bodies on level plane – Force applied on horizontal & inclined plane (up & down). 3.3 Ladder, Wedge Friction.</p>
Unit – IV	<p>4. CENTROID & MOMENT OF INERTIA</p> <p>4.1 Centroid – Definition, Moment of an area about an axis, centroid of geometrical figures such as squares, rectangles, triangles, circles, semicircles & quarter circles, centroid of composite figures. 4.2 Moment of Inertia – Definition, Parallel axis & Perpendicular axis Theorems. M.I. of plane lamina & different engineering sections.</p>

Unit – V	<p>5. SIMPLE MACHINES</p> <p>5.1 Definition of simple machine, velocity ratio of simple and compound gear train, explain simple & compound lifting machine, define M.A, V.R. & Efficiency & State the relation between them, State Law of Machine, Reversibility of Machine, Self Locking Machine.</p> <p>5.2 Study of simple machines – simple axle & wheel, single purchase crab winch & double purchase crab winch, Worm & Worm Wheel, Screw Jack.</p> <p>5.3 Types of hoisting machine like derricks etc, Their use and working principle. No problems.</p>
Unit – VI	<p>6. DYNAMICS</p> <p>6.1 Kinematics & Kinetics, Principles of Dynamics, Newton's Laws of Motion, Motion of Particle acted upon by a constant force, Equations of motion, D'Alembert's Principle.</p> <p>6.2 Work, Power, Energy & its Engineering Applications, Kinetic & Potential energy & its application.</p> <p>6.3 Momentum & impulse, conservation of energy & linear momentum, collision of elastic bodies, and Coefficient of Restitution.</p>

TEXT BOOKS & OTHER REFERENCES BOOKS

Text Books	
1.	“Engineering Mechanics”, A.R. Basu, TMH Publication Delhi.
2.	“Engineering Machines”, Basudev Bhattacharya, Oxford University Press.
Suggested / Reference Books	
1.	“Text Book of Engineering Mechanics” R.S Khurmi, S. Chand

Objective : to produce goods and services for benefit to mankind. Such productions are done utilizing various resources like Men, Materials, machines and Money. Industrial engineering and quality control is the subject which allows optimized use of such resources and hence very important for a mechanical engineer.

Learning Outcome : On completion of the subject, the student will be able to:

- Define and classify Mechanics
- Define and classify the forces and its system.
- Compute the force and apply it for solving problems on coplanar forces.
- Understand and apply resolution of forces.
- Understand composition of forces and apply it to solve problems
- Understand Moment of force, Varignon's theorem with applications, couple.

Sl. No	Chapter	Proposed Week for Teaching	Period No.	Subject Name	Important Teaching Points	Content Source
1	I	1 st	1	FUNDAMENTALS OF ENGINEERING MECHANICS	❖ Fundamentals. Definitions of Mechanics, Statics, Dynamics, Rigid Bodies	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
2			2		❖ Force, Force System. ❖ Definition, Classification of force system according to plane & line of action. Characteristics of ❖ Force & effect of Force..	
3			3		❖ Principles of Transmissibility & Principles of Superposition. Action & Reaction Forces & concept of Free Body Diagram.	
4			4		❖ Resolution of a Force. ❖ Definition, Method of Resolution, Types of Component forces, Perpendicular components & ❖ non-perpendicular components.	
5		2 nd	1		❖ Composition of Forces. Definition, Resultant Force, Method of composition of forces, such as Analytical Method such as Law of Parallelogram of forces & method of resolution.	
6			2		❖ Graphical Method. Introduction, Space diagram, Vector diagram, Polygon law of forces.	
7			3		❖ Resultant of concurrent, non-concurrent & parallel force system by Analytical & Graphical ❖ Method.	
8			4		❖ Moment of Force. Definition, Geometrical meaning of moment of a force, measurement of moment of a force & its S.I units. Classification of moments according to direction of rotation, sign convention, Law of ❖ moments, Varignon’s Theorem,	
9		3 rd	1		❖ Couple – Definition, S.I. units, measurement of couple, properties of couple.	

10	II		2	EQUILIBRIUM	❖ Definition, condition of equilibrium, Analytical & Graphical conditions of equilibrium for concurrent, non-concurrent & Free Body Diagram.	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
11			3		❖ Lami’s Theorem – Statement, Application for solving various engineering problems	
12	III	4 th	4	FRICITION	❖ Definition of friction, Frictional forces, Limiting frictional force, Coefficient of Friction. Angle of	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
			1		❖ Friction & Repose, Laws of Friction, Advantages & Disadvantages of Friction.	
13	IV		2	FRICITION	❖ Equilibrium of bodies on level plane – Force applied on horizontal & inclined plane(up&down).	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
14			3		❖ Ladder, Wedge Friction.	
15			4		❖ ASSIGNMENT	
16			1		❖ CLASS TEST	
17			2		❖ Simple problems	
			3		❖ Centroid – Definition, Moment of an area about an axis, centroid of geometrical figures such as squares, rectangles, triangles,	
18	V	5 th	4	CENTROID & MOMENT OF INERTIA	❖ Centroid of geometrical of circles, semicircles & quarter circles, centroid of composite figures.	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
19			1		❖ Moment of Inertia – Definition, Parallel axis & Perpendicular axis Theorems. M.I. of plane	
					❖ lamina & different engineering sections.	
20			2		❖ ASSIGNMENT	
21			3		❖ CLASS TEST	
22			4		❖ (Simple problems)	
23	VI	6 th	1	SIMPLE MACHINES	❖ Definition of simple machine, velocity ratio of simple and compound gear train, explain simple lifting machine, define	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
24			2		❖ M.A, V.R. & Efficiency& State the relation between them, State Law of Machine, Reversibility of Machine, Self Locking Machine.	
25			3		❖ compound lifting machine, define M.A, V.R. & Efficiency	

					❖ State the relation between them, State Law of Machine, Reversibility of Machine, Self Locking Machine	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
26			4		❖ Study of simple machines – simple axle & wheel, single purchase crab winch	
			1		❖ Double purchase crab winch, Worm & Worm Wheel, Screw Jack.	
27			2		❖ Types of hoisting machine like derricks etc, Their use and working principle. No problems.	
28		7 th	3		❖ ASSIGNMENT	
29			4		❖ CLASS TEST	
30			1		❖ (Simple problems)	
31			2	DYNAMICS	❖ Kinematics & Kinetics, Principles of Dynamics	Text Book of Engineering Mechanics” R.S Khurmi, S. Chand
32			3		❖ Newton’s Laws of Motion, Motion of Particle ❖ acted upon by a constant force,	
33		8 th	4		❖ Equations of motion, DeAlembert’s Principle.	
34			1		❖ Work, Power, Energy & its Engineering Applications, Kinetic & Potential energy& its application.	
35			2		❖ Momentum & impulse, conservation of energy &	
36			3		❖ Linear momentum, collision of elastic bodies, and Coefficient of Restitution.	
37	IV	9 th	4		❖ ASSIGNMENT	
38			1		❖ CLASS TEST	
39			2		❖ (Simple problems)	

Faculty Member

HOD

Principal/ Director