UTKALMANI GOPABANDHU INSTITUTE OF ENGINEERING, ROURKELA

LESSON PLAN

SESSION-2023-24

SUBJECT: ENGINEERING MECHANICS (THEORY-4)

DEPARTMENT OF

MECHANICAL ENGINEERING

Semester: **1ST**		Name of the Teaching Faculty: **ER SISIR KUMAR DALAI,** **WORKSHOP SUPERINTENDENT**
Discipline: **MECHANICAL ENGINEERING**		
Subject: **ENGINEERING MECHANICS (Th-04)**	No. of days/per week class allotted: **04**	Semester From date:**16.08.2023** To Date:**12.12.2023** No. of Weeks: **15**
Week	**Class/Day**	**Theory / Practical Topics**
1ST	1ST	Definitions of Mechanics, Statics, Dynamics, Rigid Bodies
	2ND	Force System. Definition, Classification of force system according to plane & line of action.
	3RD	Characteristics of Force & effect of Force. Principles of Transmissibility & Principles of Superposition. Action & Reaction Forces & concept of Free Body Diagram.
	4TH	Resolution of a Force. Definition, Method of Resolution, Types of Component forces, Perpendicular components & non-perpendicular components.
2ND	1ST	Composition of Forces. Definition, Resultant Force, Method of composition of forces.
	2ND	Analytical Method such as Law of Parallelogram of forces & method of resolution.
	3RD	Graphical Method. Introduction, Space diagram, Vector diagram, Polygon law of forces.
	4TH	Resultant of concurrent, non-concurrent & parallel force system by Analytical & Graphical Method.
3RD	1ST	Moment of Force. Definition, Geometrical meaning of moment of a force, measurement of moment of a force & its S.I units.
	2ND	Classification of moments according to direction of rotation, sign convention.
	3RD	Law of moments, Varignon's Theorem
	4TH	Couple – Definition, S.I. units, measurement of couple.
4TH	1ST	Properties of couple, simple problems on Force systems

	2ND	Introduction to Equilibrium, Definition, condition of equilibrium.
	3RD	Analytical & Graphical conditions of equilibrium for concurrent, non-concurrent & Free Body Diagram.
	4TH	Lami's Theorem – Statement, Application for solving various engineering problems.
5TH	1ST	Definition of friction & Frictional forces
	2ND	Define Limiting frictional force & Coefficient of Friction.
	3RD	Define Angle of Friction & Repose & Laws of Friction
	4TH	Advantages & Disadvantages of Friction.
6TH	1ST	Discussion General friction problem
	2ND	Solving problem
	3RD	Solving Problem
	4TH	Equilibrium of bodies on level plane – Force applied on horizontal plane
7TH	1ST	Problem solved of Force applied on horizontal plane
	2ND	Equilibrium of bodies on level plane – Force applied on inclined plane
	3RD	Solving Problems of Force applied on inclined plane
	4TH	Ladder, Wedge Friction
8TH	1ST	Solving Problems of Ladder friction
	2ND	Solving Problems of Ladder friction
	3RD	Solving Problems of Wedge friction
	4TH	Introduction to centroid and M.I, Lami's Theorem – Statement, Application for solving various engineering problems.
9TH	1ST	Centroid of geometrical figures such as squares, rectangles, triangles, circles, semicircles & quarter circles.
	2ND	Centroid of composite figures, problems on centroid
	3RD	Moment of Inertia – Definition, Parallel axis & Perpendicular axis Theorems.
	4TH	M.I. of plane lamina & different engineering sections.
10TH	1ST	Problems on M.I and revision.
	2ND	Definition of simple machine, velocity ratio of simple and compound gear train.
	3RD	Explain simple & compound lifting machine
	4TH	Define M.A, V.R.& Efficiency and State the relation between them.
	5TH	State Law of Machine, Reversibility of Machine, Self-Locking Machine.

11TH	1ST	Study of simple machines – simple axle & wheel.
	2ND	Solving problems of simple axle & wheel.
	3RD	Discuss Single purchase crab winch.
	4TH	Solving problems of Single purchase crab winch.
12TH	1ST	Discuss double purchase crab winch.
	2ND	Solving problems of double purchase crab winch
	3RD	Discuss Worm & Worm Wheel
	4TH	Solving problems of Worm& Worm Wheel
13TH	1ST	Discuss Screw Jack
	2ND	Solving problems of screw jack
	3RD	Types of hoisting machine-like derricks etc. Their use and working principle
	4TH	Kinematics & Kinetics, Principles of Dynamics, Newton's Laws of Motion
14TH	1ST	Motion of Particle acted upon by a constant force, Equations of motion
	2ND	De-Alembert's Principle, Work, Power, Energy & its Engineering Applications
	3RD	Kinetic & Potential energy & its application.
	4TH	Momentum & impulse, conservation of energy & linear momentum
15TH	1ST	Collision of elastic bodies, and Coefficient of Restitution.
	2ND	Revision
	3RD	Revision
	4TH	Revision

Learning Resources:

1. Text Book of Engineering Mechanics – R.S Khurmi (S. Chand).

2. Engineering Mechanics – A.R. Basu (TMH Publication Delhi)

3. Engineering Machines – Basudev Bhattacharya (Oxford University Press).