

Engineering Mechanics

L T P
3 2

Total Theory Hrs 42
F M: 100Th + 50Pr

Subject Code- MEC305

1. Introduction to Engineering Mechanics 2

Definitions of mechanics, Engineering Mechanics, statics, dynamics, kinematics, kinetics, particles, body, rigid body, mass, weight, length, time, scalar and vector, S.I. units.

2. Force 10

2.1 Force & Force system: - Definition of a force, S.I. unit of a force, representation of a force by vector and by Bow's notation method, classification of force system
According to line and line of action, Characteristic of force, effects of a force, principle of transmissibility.

2.2 Resolution of a force: Definition, Method of resolution, Types of Component of a force – Perpendicular component and Non-perpendicular component.

2.3 Moment of a force:- Definition, measurement of moment of a force, SI Unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments, Varignon's theorem of moment and its use.

2.4 Couple–Definition, S.I. unit, measurement of a couple, properties of couple.

2.5 Composition of Forces: - Definition, Resultant force, methods of composition of forces, Analytical methods: Trigonometric method (law of parallelogram of forces) and Algebraic method (method of resolution) for calculation of result and for all force systems.

3. Equilibrium: 8

3.1 Conditions of equilibrium–analytical and graphical conditions of equilibrium for concurrent, parallel force system, non-concurrent nonparallel force system, free body and free body diagram.

3.2 Lami's Theorem–Statement and explanation, Application of Lami's theorem for solving various engineering problem having two unknown only.

3.3 Equilibrant–Definition, relation between result and equilibrant, equilibrant of concurrent and non-concurrent force system.

3.4 Collision– Collision of elastic and inelastic bodies, coefficient of restitution, loss of kinetic energy during impact. (simple problem related with collision)

3.5 Truss - Introduction, Reaction at supports, Forces in a member by method of joints and method of section, Simple problems on methods of joints only).

4. Centroid and Centre of Gravity: 6

4.1 Centroid: Definition of centroid & moment of an area about an axis, centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite Geometrical figures.

4.2 Centre of gravity: Definition, centre of gravity of simple solids such as cylinder, sphere, Hemisphere, Cone, cube, and rectangular block, centre of gravity of composite solids
(Any types of hollow solids shall not be considered).

5. Friction:

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- 5.1 Definition and basic concept of-** friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation among angle of friction, angle of repose and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction.
- 5.2 Equilibrium of bodies on level plane**—external force applied horizontal and inclined (Pull & Push)
- 5.3 Equilibrium of bodies on inclined plane**— external forces is applied parallel to the plane.
- 5.4 Ladder Friction & Wedge Friction (simple numerical only).**

6 . Simple Machines:

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- 6.1** Basic concept and definition of load, effort, mechanical advantage, velocity ratio and efficiency of a simple lifting machine, relation among mechanical advantage, velocity ratio and efficiency of a machine, Ideal machine, ideal effort and ideal load, friction in machines.
- 6.2** Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine (no derivation) and self-locking machine.
- 6.3** Basic concept of Lever& their types, Pulleys (fixed & movable), simple wheel and axle, winch crab, worm & worm wheel and screw jack (simple problems on lever only).

Recommended Books:

- 1. Engineering Mechanics**
- 2. Engineering Mechanics**
- 3. Engineering Mechanics**

R K Bansal
D S Kumar
R S Khurmi

Reference Books

- 1. Vector Mechanics for Engineers: Statics & Dynamics**
- 2. Engineering Mechanics : Statics & Dynamics**

Beer & Jhonson
I H Shames

Subject : Engineering Mechanics Lab

Subject Code : MEC308

List of Practical's:-

- 1) To verify law of polygon of forces.
- 2) To verify law of moments.
- 3) To verify Lami's theorem.
- 4) To determine the forces in members of a Jib crane.
- 5) Comparison of coefficient of friction of various pair of surfaces and Determination of angle of repose.
- 6) To verify force transmitted by members of truss.
- 7) Experimental location of center of gravity of plane plate of uniform thickness.
- 8) Find MA,VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish law of machine and calculate maximum efficiency of Worm and worm wheel
- 9) Find MA,VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish law of machine and calculate maximum efficiency of Differential axle and wheel
- 10) Find MA,VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish law of machine and calculate maximum efficiency of Simple screw jack.
- 11) Study of Single purchase winch crab and Double purchase winch crab
- 12) Study of reversibility of the simple screw jack.