Engineering Mechanics Code: ME101 Contacts: 3L + 1T = 4 **Credits: 4**

Module I

Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector). [2L]

Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications. [4L+1T]

Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces. [4L+2T]

Module II

Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium. [3L+1T]

Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction. [3L+1T]

Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, composite areas consisting of above figures. [4L+1T]

Module III

Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone. [3L+1T]

Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety. [2L+1T]

Module IV

Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs. [3L+1T]

Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). [3L+1T]

Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy; Principle of conservation of energy; Power and efficiency. [5L+2T]

Books Recommended

- 1. Engineering Mechanics [Vol-I & II] by Meriam & Kraige, 5th ed. –Wiley India
- 2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. PHI
- 3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. –TMH

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4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. –E.W.P 5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda–Chhaya Prakashani

6. Engineering Mechanics by Basudeb Bhattacharyya–Oxford University Press.

7. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson