**ME3351 ENGINEERING MECHANICS** L T P C

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**COURSE OBJECTIVES:**

1 To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures

2 To introduce the equilibrium of rigid bodies, vector methods and free body diagram

3 To study and understand the distributed forces, surface, loading on beam and intensity.

4 To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.

5 To develop basic dynamics concepts – force, momentum, work and energy;

**UNIT I STATICS OF PARTICLES** 9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton’s First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

**UNIT II EQUILIBRIUM OF RIGID BODIES** 9

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon’s Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

**UNIT III DISTRIBUTED FORCES** 9

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a ThreeDimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

**UNIT IV FRICTION**  9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

**UNIT V DYNAMICS OF PARTICLES**  9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton’s Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

**TOTAL: 45 PERIODS**