D. Syllabus Detailing and Learning Objectives

Module	Chapter	Detailed Content	Syllabus Detailing	Learning Objectives
Module 1	**System of Coplanar Forces, Centroid**	Resultant of concurrent forces, parallel forces, non-concurrent non-parallel system of forces, Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane Centroid for plane Laminas.	**Purpose**: To make students understand the definition of resultant, types of force system, definition of moment, couple and application of Varignon's theorem, definition of centroid and procedure to locate centroid. **Scope –** **1. Academic Aspects-** Find the resultant of coplanar force system and locate the centroid of any plane lamina **2. Technology Aspect**- By knowing the centroid of a structure, engineers can find out whether it is stable or not. **3. Application Aspect**- Beams. Girders. Buildings etc. **Students Evaluation** – 1. Theory Questions to be asked to find resultant and to locate centroid. 2. Practicals to be taken based on finding of resultant, i.e., law of polygon of forces	1. Locate and place forces such that the body remains balanced. **(E)** 2. Calculate the position of centroid of the complete composite body, given a lamina of several standard shapes or any composite object. **(A)** 3. Calculate and find the effect forces exerted on them. **(A)** 4. Understand various systems of forces 5. Determine resultant of two forces by Parallelogram law of forces & resultant of three of more forces by method of resolution**(E)** 6. Determine resultant by Varignon's Theorem**(E)**
Module 2	**Equilibrium of System of Coplanar Forces, Types of support, Analysis of plane trusses**	Condition of equilibrium for concurrent forces, parallel forces and non-concurrent non-parallel general forces and Couples. Loads, Beams, Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)	**Purpose**: To make students understand the Concept of Equilibrium, support & beams, Trusses **Scope –** **1. Academic Aspects-**Find the support reactions of beams, forces in members of trusses **2. Technology Aspect-** by knowing the support reactions & forces will able to design the members, structures in equilibrium **3. Application Aspect-** Trusses, beams, static structures	1. Explain free body diagram**(U)** 2. Apply Lami's theorem to different equilibrium problems**(A)** 3. Apply conditions of equilibrium to different equilibrium problems**(A)** 4. Find reactions of simply supported beam**. (A)** 5. Identify perfect truss. **(U)** 6. Determine the forces in different member using method of section as well as method of joint in same problem **(E)**

		By using Method of joints and Method of sections. (Excluding pin jointed frames)	**Students Evaluation** – 1. Theory Questions to be asked to find Support reactions of structure & forces in members of truss. 2. Practicals to be taken based on finding of Support reactions	
Module 3	**Forces in space**, **Friction, Principle of virtual work**	Resultant of concurrent force system, parallel force system and non-concurrent non-parallel force system. Equilibrium of Concurrent force system, parallel force system and non-concurrent non-parallel force system. Introduction to Laws of friction, Cone of friction, Equilibrium of bodies on inclined plane, Application to problems involving wedges, ladders. Applications on equilibrium mechanisms, pin jointed frames.	**Purpose**: **Scope –** **1. Academic Aspects-** **2. Technology Aspect-** **3. Application Aspect-** **Students Evaluation** –	1. Define the moment of force about a point and about a line (U) 2. Evaluate resultant of concurrent, parallel and general force system (E) 3. Identify, problems based on equilibrium of concurrent & parallel force system (U) 4. Define the term Angle of friction, coefficient of friction, Angle of repose and cone of friction (U) 5. Explain the application of friction on ladder and ladder having external weight acting on it (U) 6. Explain virtual work equation and solve it for unknown force, couple, etc. (E)
Module 4	**Kinematics of a Particle**	Rectilinear motion, Velocity & acceleration in terms of rectangular co-ordinate system, Motion along plane curved path, Tangential Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	**Purpose**: To make students understand Newton law of Motion and use them for typical problems efficiently. **Scope –** **1. Academic Aspects-** Relation between linear motion and angular motion, and determining the linear motion values of a particle on curved surface and vice versa. **2. Technology Aspect-** Describing position, velocity and geometrical aspects of the motion. **3. Application Aspect-** Use for the designing of rotating parts for various machines.	1. State Newton's Laws of Motion to solve problems on motions with uniform velocity-acceleration as well as variable acceleration using (R) 2. Derive the equations for velocities and accelerations of the body moving along the curved path (U) 3. Illustrate the graphical solution to find the displacement, velocity, acceleration and time of the particle' motion through motion curves (A) 4. Determine the Range, Maximum Height, Time of Flight and velocities of the parabolic motion of the particle i.e. projectile motion. (E) 5. Apply the concept of dependent motion in motion under Gravity (A)

			Students Evaluation – Theory Questions to calculate the linear and angular velocities using Nwton's Law of motion.	6. Derive the equations of distance, speed and acceleration for the given equation of time(U)
Module 5	**Kinematics of a Rigid Body**	Introduction to general plane motion, Instantaneous center of rotation for the velocity, velocity diagrams for bodies in plane motion.	**Purpose**: To make students understand the definition of General Plane motion & ICR **Scope –** **1. Academic Aspects-** Locate the ICR and find the angular and linear velocities of body performing GPM **2. Technology Aspect-** Design of I.C engines, kinematics pairs of machines etc. **3. Application Aspect**- Manufacturing of machines, vehicles etc. **Students Evaluation** – 1. Theory Questions to be asked to locate the ICR and find the angular and linear velocities	1. know the different types of motion. (R) 2. learn the concept of General Plane Motion. (U) 3. define ICR (Instantaneous Centre of Rotation) (R) 4. Analyze the location of ICR to solve for system containing two & three links(AN) 5. Analyze the location of ICR to solve for system containing rollers. (AN) 6. Calculate the velocities at different location of the mechanism (A).
Module 6	**Kinetics of a Particle: Force and Acceleration, Kinetics of a Particle: Work and Energy, Kinetics of a Particle: Impulse and Momentum**	Introduction to basic concepts, D'Alembert's Principle, Equations of dynamic equilibrium, Newton's second law of motion, Principle of work and energy, Law of conservation of energy, Principle of linear impulse and momentum. Law of conservation of momentum. Impact and collision.	**Purpose**: **Scope –** **1. Academic Aspects-** **2. Technology Aspect-** **3. Application Aspect-** **Students Evaluation** –	1. State the concept of Kinetics of Particles and its difference from Kinematics of Particles(R) 2. Use Newton's second law of motion and hence D'Alembert's Principle in various problems based on kinetics of particle(A) 3. Understand Impact, types of impact, coefficient of restitution(U) 4. Classify the problems based on Impulse, Linear Momentum and Impulse-Momentum Theorem(A) 5. Differentiate work done by different types of forces like external force, gravity force, friction force, spring force etc., under Work-Energy Principle by using Principle of Conservation of Energy (A) 6. Derive the conditions of dynamic equilibrium for solving problems on the same(A)