

## **BTech Preparatory Unit (BPU) in Civil Engineering (Mechanics: Statics)**

### **Objectives**

After completing this module, each student should be able to:

- establish equilibrium equations for particles and rigid bodies via free body diagrams,
- identify constraints and the statical determinacy of structures,
- analyse statically determinate trusses, frames and machines,
- draw shear force and bending moment diagrams of beams under lateral loads,
- investigate effect of friction on statics of structure,

### **Description**

- General concepts: Newton's Laws in Mechanics; SI System of Units; Forces and Moments.
- Equilibrium Conditions; Free Body Diagrams of Particles and Rigid Bodies.
- Constraints and Statical Determinacy of Structures; Centre of Gravity and Centroid of a Body
- Analysis of Statically Determinate Pin Jointed Structures (Trusses);
- Analysis of Statically Determinate Frames and Machines.
- Analysis of Statically Determinate Taut Cables.
- Beams under Lateral Loads; Shear Force Diagrams; Bending Moment Diagrams.
- Dry Friction; Coefficients of Friction; Effects of Friction on Equilibrium Conditions of Structures.

### **Syllabus**

1. General concepts: Newton's Laws in Mechanics; SI System of Units; Forces and Moments; General Procedure and Considerations.
2. Equilibrium of Particles: Systems of Forces; Conditions for Equilibrium; Free Body Diagrams of Particles.
3. Equilibrium of Rigid Bodies: Systems of Forces and Moments; Conditions for Equilibrium; Free Body Diagrams of Rigid Bodies.
4. Constraints and the Statical Determinacy of Structures; Centre of Gravity and Centroid of a Body.
5. Analysis of Statically Determinate Pin Jointed Structures (Trusses): Analysis of Trusses by Method of Joints; Analysis of Truss by Method of Sections.
6. Analysis of Statically Determinate Frames and Machines: Basic Considerations; Free Body Diagrams; Equilibrium Conditions.

7. Analysis of Taut Cables; Conditions for Equilibrium; Free Body Diagrams.
8. Beams under Lateral Loads: Free Body Diagrams; Equilibrium Equations; Shear Force Diagrams; Bending Moment Diagrams.
9. Dry Friction; Coefficients of Friction; Effects of Friction Forces on Equilibrium Conditions of Structures.