Applied Mechanics

Course Objective :

This course has been designed to provide basic knowledge of engineering mechanics to the students of all branches of engineering so that it would be helpful for them to understand structural engineering stress analysis principles in later courses or to use basics of mechanics in their branch of engineering. This course shall be considered as an introduction: common for all engineering faculties of Tribhuvan University in the first year of undergraduate. Emphasis has been given to Statics.

1. Introduction(2 hours)
    a. Definitions and scope of Applied Mechanics
    b. Concept of Rigid and Deformed Bodies
    c. Fundamental concepts and principles of mechanics: Newtonian Mechanics

2. Basic Concept in Statics and Static Equilibrium(4 hours)
    a. Concept of Particles and Free Body Diagram
    b. Physical meaning of Equilibrium and its essence in structural application
    c. Equation of Equilibrium in Two Dimension

3. Forces acting on particle and rigid body(6 hours)
    a. Different types of Forces: Point, Surface Traction and Body Forces -Translational Force and Rotational Force: Relevant Examples
    b. Resolution and Composition of Forces: Relevant Examples
    c. Principle of Transmissibility and Equivalent Forces: Relevant Examples
    d. Moments and couples: Relevant Examples
    e. Resolution of a Force into Forces and a Couple: Relevant Examples
    f. Resultant of Force and Moment for a System of Force: Examples

4. Center of Gravity, Centroid and Moment of Inertia(6 hours)
    a. Concepts and Calculation of Centre of Gravity and Centroid: Examples
    b. Calculation of Second Moment of Area / Moment of Inertia and Radius of Gyration and Relevant usages
    c. Use of Parallel axis Theorem: Relevant Examples

5. Friction(2 hours)
    a. Laws of Friction, Static and Dynamic Coefficient of Friction, Angle of Friction: Engineering Examples of usage of friction
    b. Calculations involving friction in structures: Example as High Tension Friction Grip bolts and its free body diagram

6. Analysis of Beams and Frames(9 hours)
    a. Introduction to Structures: Discrete and Continuum
    b. Concept of Load Estimating and Support Idealizations: Examples and Standard symbols
    c. Use of beams/frames in engineering: Concept of rigid joints/distribute loads in beams/frames.
    d. Concept of Statically/Kinematically Determinate and Indeterminate Beams and Frames: Relevant Examples

e. Calculation of Axial Force, Shear Force and Bending Moment for Determinate Beams and Frames

f. Axial Force, Shear Force and Bending Moment Diagrams and Examples for drawing it.

7. Analysis of Plane Trusses(4 hours)
   a. Use of trusses in engineering: Concept of pin joints/joint loads in trusses.
   b. Calculation of Member Forces of Truss by method of joints: Simple Examples
   c. Calculation of Member Forces of Truss by method of sections: Simple Examples

8. Kinematics of Particles and Rigid Body(7 hours)
   a. Rectilinear Kinematics: Continuous Motion
   b. Position, Velocity and Acceleration of a Particle and Rigid Body
   c. Determination of Motion of Particle and Rigid Body
   d. Uniform Rectilinear Motion of Particles
   e. Uniformly Accelerated Rectilinear Motion of Particles
   f. Curvilinear Motion: Rectangular Components with Examples of Particles

9. Kinetics of Particles and Rigid Body: Force and Acceleration(5 hours)
   a. Newton's Second Law of Motion and momentum
   b. Equation of Motion and Dynamic Equilibrium: Relevant Examples
   c. Angular Momentum and Rate of Change
   d. Equation of Motion-Rectilinear and Curvilinear
   e. Rectangular: Tangential and Normal Components and Polar Coordinates: Radial and Transverse Components