CE8402 STRENGTH OF MATERIALS II

DETAILED SYLLABUS

UNIT I ENERGY PRINCIPLES

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings), shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams, plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram.

UNIT II INDETERMINATE BEAMS

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDERS

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems.

UNIT V ADVANCED TOPICS

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – stresses in hooks.

TEXTBOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S. Chand & company Ltd., New Delhi, 2015.

2. Rattan. S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.

3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.

4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016

OBJECTIVES:

- To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.