**CE4T3**                    **MECHANICS OF SOLIDS - II**                    **Credits: 4**

**Lecture: 4 periods/week**                    **Internal assessment: 30 marks**
**Tutorial: 1 period /week**                    **Semester end examination: 70 marks**

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**Objectives:**

- To analyze a given problem in a simple and logical manner and to apply a few fundamental and well-understand principles to get the solution.
- To make use of simplified models in all necessary formulae in a rational and logical manner.
- To get a clarity on the conditions under which they can be safely applied to the analysis and design of actual engineering structures

**Learning outcomes:**

At the end of course the student will be able to:
- Assess thin & thick cylinders, springs, columns & struts and beams curved in plan.
- Understand the unsymmetrical bending and theories of failures for complex stresses.
- Analyse the pin jointed plane frames.

**UNIT - I**
**THIN CYLINDERS:**
Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

**UNIT – II**
**THICK CYLINDERS:**
Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

**UNIT – III**
**SPRINGS:**
Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

**UNIT – IV**
**COLUMNS AND STRUTS:**
Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns-assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula - Laterally loaded struts

**UNIT - V**
**UNSYMETRICAL BENDING:**
Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams under unsymmetrical bending.

**UNIT – VI**
**BEAMS CURVED IN PLAN:**
Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semi-circular beam simply-supported on three equally spaced supports.

**UNIT – VII**
**ANALYSIS OF PIN-JOINTED PLANE FRAMES:**
Determination of Forces in members of plane, pin-jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses - by method of joints, method of sections.

**UNIT – VIII**
**THEORIES OF FAILURES:**
Introduction – Various Theories of failures like Maximum Principal Stress theory – Maximum Principal Strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

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**Learning resources**

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**Text books:**
1. A Text book of Strength of materials, (4th edition) by Bansal, R.K., Laxmi Publications (P) ltd., New Delhi, 2009.
2. Introduction to Strength of Materials by Jindal, U.C., Galgotia Publications, 2004.
3. Strength of Materials by Punmia, B.C., Standard Publishers Distributors, 1991.

**Reference books:**
1. Mechanics of Solids, (5th edition) by Ferdinandp, Beer, TataMcGraw-Hill, 2000.
2. Schaum's Outline of Strength of Materials, (2nd edition) by Nash, W. A., McGraw Hill, 1998.
3. Strength of Materials, (16th edition) by Ramamrutham, S. and Narayan, R., Dhanpat Rai Publications, 2010.
4. Strength of materials, (5th edition) by Rajput, R.K., S.Chand & Co, New Delhi, 2012.
5. Mechanics of Structures by Junnarkar, S.B., Anand Charotar Publishing House, Gujarat, 1997.