2/4 B.Tech. FOURTH SEMESTER

CE4T3 **MECHANICS OF SOLIDS – II** **Credits: 3**

Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

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Pre-requisites: Mechanics of solids I

Learning 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.

Course outcomes:

At the end of course, the student will be able to:

1. Apply the differential equation of the elastic line, determine the slopes and deflections of determinate beams.
2. Calculate the compound and biaxial stresses, apply the Mohr's circle to determine the principal stresses and principal strains.
3. Determine the longitudinal and circumferential stresses in thin cylinders, calculate the strain energy due to different loading.
4. Calculation of crushing load, Euler's critical load, equivalent length and slenderness ration of columns.
5. Locate the principal axes of a section and shear centre, apply the theories of failure.

UNIT I

DEFLECTION OF BEAMS:
Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L and Uniformly varying load – Mohr's theorems- Moment area method, Conjugate beam method – applications to simple cases.

UNIT – II

PRINCIPAL STRESSES AND STRAINS:
Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple Shear – Mohr's circle of stresses – Principal stresses and strains

UNIT – III

THIN CYLINDERS:
Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter and volume.

THEORIES OF FAILURE:
Introduction- Theories of failure, minimum principal stress theory, maximum shear stress theory, maximum distortion energy theory – comparison of theories

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

UNIT - V

UNSYMETRICAL BENDING:
Introduction –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 - Shear centre

Learning Resources

Text Books:

1. A Text book of Strength of materials by R.K.Bansal –Laxmi Publications (P) ltd., New Delhi
2. Introduction to Strength of Materials by U.C. Jindal, Galgotia publications.
3. Strength of Materials by B.C. Punmia

References:

1. Mechanics of Solid, by Ferdinandp Beer and others – Tata Mc.Grawhill Publications 2000.
2. Strength of Materials by Schaum's out line series – Mc. Graw hill International Editions.
3. Strength of Materials by S. Ramamrutham and R. Narayan – Dhanpat Rai publications.
4. Strength of materials by R.K.Rajput, S.Chand & Co, New Delhi.
5. Mechanics of Structures, by S.B. Junnarkar, Charotar Publishing House, Anand, Gujarat.

e-learning resources:

http://nptel.ac.in/courses.php

http://jntuk-coeerd.in/