GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRENGTH OF MATERIALS-II

Course Code: GR15A2012   L:3 T:1 P:0 C:4
II Year II Semester

Prerequisites
- Basic concepts of Mechanics of Solids
- Basic Knowledge on Structural Stability

Course Objectives
- Awareness about the internal and external pressure acting in pressure vessels.
- Idea about the springs and its various types of combination connections.
- Knowledge about columns and struts with different end conditions and laterally loaded struts.
- Direct and bending stresses in concrete structures like retaining wall, chimney and dams.

Course Outcomes
- Ability to exchange ideas and information about bending and direct stresses.
- Good imagination to solve problems based on effect of torsion on shafts.
- Knowledge and awareness of pressure existing in vessels at different conditions.
- Utilize appropriate materials in design considering engineering properties and sustainability.

Unit-I
Thin and Thick Cylinders: Derivation of formula for longitudinal and circumferential stresses (hoop), longitudinal and volumetric strains, changes in diameter, volume of thin cylinders and thin spherical shells.
Introduction-Lame's theory for thick cylinders-Derivation of Lame's formulae, distribution of hoop radial stresses across thickness due to internal pressure, design of thick cylinders and thick spherical shells

Unit-II
Torision Of Circular Shafts: Theory of pure torsion-derivation equations: $T/J=q/r=N/L$. Assumptions made in the theory of pure torsion, torsional moment of resistance, polar section modulus, power transmitted by shafts. Combined bending, torsion and end thrust. Design of shafts according to theories of failure.
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-III

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. Effective length of a column, slenderness ratio, euler's critical stress. Limitations of Euler's theory. Rankine's formula, Gordon formula. Long columns subjected to eccentric loading. Secant formula, Empirical formulae. Straight line formula.

BEAM COLUMNS Laterally loaded struts subjected to uniformly distributed concentrated loads, Maximum B.M and stress due to transverse and laterally loading.

Unit-IV

Direct And Bending Stresses: Stresses under the action of direct loading and bending moment, core of a section**.** Determination of stresses in the case of chimneys, retaining walls and dams. Conditions for stability of dame. Stresses due to direct loading and bending moment about both axis.

Unit-V

Unsymmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes –Moment 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 .

Beams Curved in Plan: Introduction – Circular beams loaded uniformly and supported on symmetrically placed columns and Semi circular beams simply supported on three equally spaced supports.

Text Books

1. R.K Bansal, A text book of Strength of materials, Laxmi Publications(P) Ltd., New Delhi, 5th Edition, 2012.
2. Basavrajaiah and Mahadevappa, Strength of materials, University Press, Hyderabad, 3rd Edition, 2010.
3. Bhavikatti, Strength of materials, Vikas Publications, 3rd Edition, 2008.

Reference Books

1. Ferdinand Beer and others, Mechanics of solid, Tata Mc. Graw Hill Publications, 6th Edition.
2. S. Ramakrishna and R. Narayan, Strength of materials, Dhanpat Rai Publications.
3. R. K. Rajput, Strength of materials, S. Chand & Co, New Delhi, 5th   Edition, 2010.
4. A. R. Basu, Strength of materials, Dhanpat Rai & Co, Nai Sarah, New Delhi, first revised on 2005, Re-print 2009.
5. L. S. Srinath et al., Strength of materials, Mac millian India Ltd.
6. R.S.Khurmi, Strength of materials, S. Chand & Co. Ltd., 23rd Edition