STRENGTH OF MATERIALS

COURSE OBJECTIVE

To familiarize the student with the various stresses that may act on a material such as compressive stress, tensile stress, tangential stress, etc and the response of a material to each of these types. The course will define basic concepts and calculations that will come handy in long-term to civil engineering students.

COURSE CONTENT UNIT I

Simple Stress and Strains: Concept of Elastic body stress and Strain, Hooke's law, Various types of stress and strains, Elastic constants, Stresses in compound bars, composite and tapering bars, Temperature stresses. Complex Stress and Strains- Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and Strains, Mohr's circle of stresses.

UNIT II

Bending and Shearing Stresses: Theory of simple bending, Concept of pure bending and bending stress, Equation of bending, Neutral axis, Section-Modulus, Differential equation of the elastic curve, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading, Bending stress distribution across a section of beam, Shearing Stress and shear stress distribution across a section in Beams.

UNIT III

Determination of Slope and Deflection of beams by Double Integration Method, Macaulay's Method, Area Moment Method, Conjugate Beam Method, and Strain Energy Method, Castiglione's Method, and Unit Load Method.

UNIT IV

Columns and Struts: Theory of columns, Slenderness ratio**,** Direct and bending stresses in short columns, Kern of a section. Buckling and stability, Euler's buckling/crippling load for columns with different end conditions, Rankin's formula, Eccentric loads and the Secant formula-Imperfections in columns. Thin Pressure Vessels: cylinders and spheres. Stress due to internal pressure, Change in diameter and volume. Theories of failure.

UNIT V

Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Torsion of solid and hollow circular shafts, Analyses of problems based on combined Bending and Torsion. Unsymmetrical Bending: Principal moment of Inertia, Product of Inertia, Bending of a beam in a plane which is not a plane of, symmetry. Shear center; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis.

COURSE OUTCOME

An ability to identify and compute various mechanical stresses in material and the material's response to each. An ability to apply this knowledge in science and engineering models.

REFERENCE

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7. Mubeen A , Mechanics of solids , Pearsons
8. D.S Prakash Rao, Strength of Material , University Press , Hyderabad
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LIST OF PRACTICALS

1. Study of Universal testing Machine
2. To determine the Compressive and Tensile Strength of Materials.
3. To determine the Brinell Hardness of Materials.
4. To determine the Rockwell Hardness of Materials
5. To determine the Toughness of the materials.
6. To determine the stiffness of the spring.
7. To determine the deflection of Beam by the use of deflection-beam apparatus.