

Content Product
Detailed syllabus
STRENGTH OF MATERIALS

UNIT I - STRESS, STRAIN AND DEFORMATION OF SOLIDS

Deformable bodies - Rigid body Vs deformable body, Mechanics of deformable bodies, Material properties, Types of loading, Types of stresses, Forces and moments. **Stress** - Stress, Normal stress, Biaxial and Triaxial stress, Units of measurement, Shear stress, Complementary shear stress, Examples, Exercises. **Deformation: Strain, Elastic Constants and Volumetric strain** - Strain, Elastic limit, Hooke's law, Equation for extension, Lateral strain and poisson's ratio, Volumetric strain, Stress-strain relationship, Stress-strain relation for different materials, Factor of safety, Relation between elastic constants, Examples, Exercises. **Deformation of Simple and Compound bars** - Simple Bar, Compound bar, Compound bar subjected to external load, Compound bar Equivalent or Combined Modulus, Compound bar with different changes in lengths, Examples, Exercises. **Thermal stress** - Thermal stress and strain, Compound bar subjected to change in temperature, Compound bar subjected to external load and temperature, Examples, Exercises. **Strain energy** - Strain energy, Strain energy - gradual load, Strain energy stored in a body when the load is applied suddenly, Strain energy stored in a body when the load is applied with impact, Example, Exercise. **Analysis of Stress & Strain** - Trigonometry Recapitulation, Stress in Inclined Cross Section, Material Subjected to Pure Shear, Material Subjected to Two Mutually Perpendicular Normal Stresses, Maximum Shear stress, Principal Plane inclination in terms of associated Principal Stresses, Plane Strain, Principal Strain, Principal Strain in terms of Stress, Examples, Exercises. **Mohr's Circle** - Mohr's Circle, Construction of Mohr's Circle, Examples, Exercises.

UNIT II-TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS

Introduction to beam - Beam definition, Examples of beam, Classification of beams, Geometric forms of beams, Classification of beams based on support, Types of loads on beams. **Shear force and bending moment for cantilever beams** - Shear force and bending moment in beams, Shear force sign convention, Bending moment sign convention, Shear force and bending moment diagram, Cantilever beam subjected to concentrated load, Cantilever subjected to UDL, Cantilever subjected to UDL and concentrated load, Cantilever subjected to UDL for part of beam, Cantilever subjected to UVL o to w, Cantilever subjected to UDL w to o, Examples, Exercises. **Simply supported beams** - Concentrated load at mid span, Concentrated load placed unsymmetrical, UDL over whole span, UVL o to w at other end, UVL o to w at mid end, Relation between Load, Shear force and Bending moment, Point of contra flexure, Examples, Exercises. **Overhanging beam** - Examples, Exercises. **Simple bending Theory**- Theory of simple bending, Assumption in theory of simple bending, Bending stresses and neutral axis, Derivation of bending equation or bending formula, Section modulus for straight beams, Section modulus calculation for symmetrical and Unsymmetrical sections, Section modulus of rectangular section, Section modulus of circular section, Section modulus for other sections, Examples, Exercises. **Bending of curved beams** - Bending of curved beams, Bending stress calculation in curved beams, Example for curved beams. **Composite or Flitched Beam** - Composite or Flitched Beam, Bending of Flitched Beam, Examples, Exercises. **Shearing stress in beam** - Shearing stress in beam, Shearing stress variation on beam, Shear stress in rectangular section, Shear stress in circular section, Shear stress in symmetrical I-section, Shear stress in triangular section, Examples, Exercises. **Shear flow** - Shear flow.

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UNIT III – TORSION

Torsion - Introduction to torsion, Definition of shaft, Torsion in shafts, Assumptions for torsion equations, Angle of twist, Stresses in shafts, Torsion equation for solid shafts, Torsion equation for hollow circular shaft, Torsion rigidity, Modulus of rupture, Power transmission, Composite shafts - serial connection, Composite shafts - parallel connection, Comparison of solid and hollow shafts, Examples, Exercises. **Close-coiled helical springs** - Introduction to springs, Types of springs, Material characteristics of springs, Helical springs, Classification of helical springs, Advantages of helical springs, Application of helical springs, Terms used in close-coiled helical springs, Close-coiled helical springs with axial load, Rectangular and square section wire springs, Close-coiled helical springs with axial twist, Springs in series, Springs in parallel, Leaf springs, Types of leaf spring, Stresses and deflection of leaf springs, Examples, Exercises.

UNIT IV - DEFLECTION OF BEAMS

Deflection of Beam - Beam deflection, Elastic curve of neutral axis of the beam under normal load, Relationship between loading S.F, B.M, slope and deflection, Finding slope and deflection, Double integration method, Cantilever with concentrated load at the end, Cantilever with uniformly distributed load at the end, Simply supported beam with uniformly distributed load at the end, Simply supported beam with concentrated load at mid - span, Macaulay's method, Macaulay's method for UDL, Macaulay's method for beam with UDL applied over part of the beam, Mohr moment-area method, Cantilever with concentrated load at the tip, Cantilever with UDL, Simply supported beam with UDL, Simply supported beam with central concentrated load, Conjugate beam method, Conjugate beam theorem I, Conjugate theorem II, Maxwell's reciprocal theorem, Examples, Exercises.

UNIT V - ANALYSIS OF STRESSES IN TWO DIMENSIONS

Thin Cylindrical and spherical shells - Thin shells-Introduction, Thin cylindrical shells, Circumferential or hoop stresses, Longitudinal stresses, Maximum shear stress, Design of thin cylindrical shells, Spherical shells, Cylindrical shell with hemispherical ends, Built-up cylindrical shells, Spherical shells-change in dimension, Examples, Exercises. **Thick Cylinders** - Introduction to thick cylinders, Lamé's theory, Thick cylinders subjected to inside and outside pressures, Shear stress, Introduction to compound cylinders, Examples, Exercises.