

STRENGTH OF MATERIALS-I

Course Code : 13CE1106

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Course Educational Objectives:

- ❖ To create a strong understanding about the behaviour of engineering materials under deformable bodies under the action of various types of loads.
- ❖ To understand various types and analysis of trusses, structural systems and their configurations.
- ❖ To develop an ability to draw Shear force diagram and bending moment diagrams for beams subjected to various types of loading.

Course Outcomes:

- ❖ Demonstrate the ability to draw the stress diagrams, deflections of structural system.
- ❖ To equip the importance of deflection in various beams and its application.

UNIT-I

(15 Lectures)

SIMPLE STRESSES AND STRAINS:

Elasticity and plasticity – Types of stresses and strains – Hooke’s law – stress – strain diagram for mild steel and HYSD – Working stress – Factor of safety – Lateral strain, Poisson’s ratio and volumetric strain – Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT-II

(12 Lectures)

SHEAR FORCE AND BENDING MOMENT:

Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly

varying loads and combination of these loads – Point of contra flexure
– Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III

(14 Lectures)

FLEXURAL STRESSES:

Theory of simple bending – Assumptions – Derivation of bending equations, Neutral axis – Determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections.

SHEAR STRESSES:

Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT-IV

(10 Lectures)

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, - UDL, UVL - Moment area method – application to simple cases.

UNIT-V

(12 Lectures)

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.

TEXT BOOKS:

1. R.K.Bansal, “*Introduction to text book of Strength of materials*”, 4th Edition, Laxmi publications Pvt. Ltd., New Delhi, 2008.
2. Sadhu Singh, “*Strength of Materials*”, 2nd Edition, Khanna Publications, 2001.
3. S.Ramamrutham and R.Narayanan “*Strength of Materials*” 11th Edition, Dhanpat Rai publications, 2009.

4. Timoshenko & Gere “*Mechanics of Materials*”, 4th Edition, Mc Graw hill, 2003.

REFERENCES:

1. Ferdinand Beer and Johnston, “*Mechanics of Solids*”, 6th Edition, Tata Mc Graw hill Publications, 2000.
2. Schaum’s out line series, “*Strength of Materials*” 10th Edition, Mc Graw hill International Editions, 2007.
3. R. Subramanian, “*Strength of materials*”, 1st Edition, Oxford university press, New Delhi, 2011.
4. Bhavi Katti, “*Strength of Materials*”, 7th Edition, 2010.
5. Timoshenko & Young, “*Strength of Materials*”, 4th Edition, Tata Mc Graw hill, 2003.

