
THEORY OF ELASTICITY AND PLASTICITY

Course Code: 13CE 2205

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Course Outcomes:

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

CO1 : Discuss plane stress and plane strain in a given situation.

CO2 : Analyse the two dimensional problems using Airy's stress function.

CO3 : Solve linearly elastic bodies using Hooke's law.

CO4 : Calculate torsional stresses developed in thin walled sections.

CO5 : Apply the concepts of elasticity and plasticity to analyse the engineering problems.

UNIT-I

Elasticity: Analysis of stress and strain, Definition of stress and strain at a point, Equilibrium and compatibility equations, Transformation of stress and strain at a point

Principal stresses and strains: Stress and strain invariants, hydrostatic and deviator stress strains.

UNIT-II

Plane stress and plane strain: - Simple two dimensional problems in Cartesian and polar co-ordinates, Airy's stress function in rectangular and polar coordinates.

UNIT-III

Stress-strain relations for linearly elastic solids: Generalized Hooke's law. Solution of axi-symmetric problems, stress concentration due to presence of a circular hole, Elementary problems of elasticity in three dimensions.

UNIT-IV

Torsion: St.Venant's approach-Prandtl's approach – Membrane analogy - Torsion of thin walled open and closed sections.

UNIT-V

Plasticity: Physical Assumptions – Yield criteria - Tresca and VonMises criterion of yielding, plastic stress strain relationship, Elastic plastic problems in bending. Some engineering applications of elasticity and plasticity

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GVPCE(A)

M.Tech. Structural Engineering

2014

TEXT BOOKS

1. Timoshenko, S. and Goodier J.N. "*Theory of Elasticity*", 2nd Edition, McGraw Hill Book Co, 2001.
2. Sadhu Singh, "*Theory of Elasticity*", 3rd Edition, Khanna Publishers, 2003.

REFERENCES

1. Chen W.F. and Han D.J. "*Plasticity for structural Engineers*", 1st Edition,. Springer-Verlag, 2000.
2. Irving H.Shames and James,M.Pitarresi. "*Introduction to Solid Mechanics*", 4th Edition, Prentice Hall of India Pvt. Ltd., 2000.
