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**THEORY OF ELASTICITY AND PLASTICITY**

Course Code: 13CE 2205

**L P C**  
**4 0 3****Course Educational Objectives:**

1. To impart knowledge of Principal stresses and strains
2. To develop analytical skills of solving problems using plain stress and plain strain.
3. To impart knowledge of engineering application of plasticity.

**Course Outcomes:**

1. The students shall be able to demonstrate the application of plane stress and plane strain in a given situation.
2. The student will demonstrate the ability to analyze the structure using plasticity.
3. To impart the knowledge of stress-strain relations for linearly elastic solids, and Torsion.

**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

**TEXT BOOKS**

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

**REFERENCES**

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

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