

## **AE8017 THEORY OF ELASTICITY**

### DETAILED SYLLABUS

#### **OBJECTIVE:**

- To make the student understand the elastic behavior of different structural components under various loadings and boundary conditions.

#### **UNIT I BASIC EQUATIONS OF ELASTICITY**

Definition of Stress and Strain: Stress - Strain relationships - Equations of Equilibrium, Compatibility equations, Boundary Conditions, Saint Venant's principle - Principal Stresses, Stress Ellipsoid - Stress invariants

#### **UNIT II PLANE STRESS AND PLANE STRAIN PROBLEMS**

Airy's stress function, Bi-harmonic equations, Polynomial solutions, Simple two-dimensional problems in Cartesian coordinates like bending of cantilever and simply supported beams.

#### **UNIT III POLAR COORDINATES**

Equations of equilibrium, Strain - displacement relations, Stress – strain relations, Airy's stress function, Axi – symmetric problems, Introduction to Dunder's table, Curved beam analysis, Lamé's, Kirsch, Michell's and Boussinesque problems – Rotating discs.

#### **UNIT IV TORSION**

Navier's theory, St. Venant's theory, Prandtl's theory on torsion, semi- inverse method and applications to shafts of circular, elliptical, equilateral triangular and rectangular sections. Membrane Analogy.

#### **UNIT V INTRODUCTION TO THEORY OF PLATES AND SHELLS**

Classical plate theory – Assumptions – Governing equations – Boundary conditions – Navier's method of solution for simply supported rectangular plates – Levy's method of solution for rectangular plates under different boundary conditions.

#### **TEXT BOOKS:**

1. Ansel C Ugural and Saul K Fenster, "Advanced Strength and Applied Elasticity", 4th Edition, Prentice Hall, New Jersey, 2003.
2. Bhaskar, K., and Varadan, T. K., "Theory of Isotropic/Orthotropic Elasticity", CRC Press USA, 2009.
3. Timoshenko, S., and Goodier, T.N., "Theory of Elasticity", McGraw – Hill Ltd., Tokyo, 1990.

#### **REFERENCES:**

1. Barber, J. R., "Elasticity", Kluwer Academic Publishers, 2004
2. Sokolnikoff, I. S., "Mathematical Theory of Elasticity", McGraw – Hill, New York, 1978.
3. Volterra & J.H. Caines, "Advanced Strength of Materials", Prentice Hall, New Jersey, 1991

Diploma, Anna Univ UG & PG Courses

*Notes*

*Syllabus*

*Question Papers*

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[www.AllAbtEngg.com](http://www.AllAbtEngg.com)

4. Wang, C. T., "Applied Elasticity", McGraw – Hill Co., New York, 1993.