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ST5103 THEORY OF ELASTICITY AND PLASTICITY

DETAILED SYLLABUS

UNIT I ELASTICITY

Analysis of stress and strain, Equilibrium Equations - Compatibility Equations - Stress Strain Relationship. Generalized Hooke's law.

UNIT II 2D STRESS STRAIN PROBLEMS

Plane stress and plane strain - Simple two dimensional problems in Cartesian and Polar Co-ordinates.

UNIT III TORSION OF NON-CIRCULAR SECTION

St.Venant's approach - Prandtl's approach – Membrane analogy - Torsion of Thin Walled- Open and Closed sections-Design approach to open web section subjected to torsion

UNIT IV BEAMS ON ELASTIC FOUNDATIONS

Beams on Elastic foundation – Methods of analysis – Elastic line method – Idealization of soil medium – Winkler model – Infinite beams – Semi infinite and finite beams – Rigid and flexible – Uniform Cross Section – Point load and UDL – Solution by Finite Differences.

UNIT V PLASTICITY

Physical Assumptions – Yield Criteria – Failure Theories – Applications of Thick Cylinder – Plastic Stress Strain Relationship. Elasto-Plastic Problems in Bending and Torsion.

REFERENCES:

1. Ansel.C.Ugural and Saul.K.Fenster, "Advanced Strength and Applied Elasticity," Fourth Edition, Prentice Hall Professional technical Reference, New Jersey, 2003.
2. Chakrabarty.J, "Theory of Plasticity", Third Edition, Elsevier Butterworth - Heinmann – UK, 2007.
3. Jane Helena H, "Theory of Elasticity and Plasticity", PHI Learning Pvt. Ltd., 2016 .
4. Slater R.A.C, "Engineering Plasticity", John Wiley and Son, New York, 1977.

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5. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", McGraw Hill Book Co., New York, 2010.

OBJECTIVE:

To understand the concept of 3D stress, strain analysis and its applications.