Course Code	Course Title	L	T	P	C
20SE001	THEORY OF ELASTICITY AND PLASTICITY	3	1	2	5

PRE-REQUISTE COURSES: STRENGTH OF MATERIALS, STRUCTURAL ANALYSIS

COURSE OBJECTIVES:

To make students understand the principles of elasticity. To familiarize students with basic equations of elasticity. To expose students to two dimensional problems in Cartesian and polar coordinates. To make students understand the principle of torsion of prismatic bars.

COURSE OUTCOMES:

At the end of the course student will be able to

CO's	Course Outcomes	PO's
1	Analyse the concept of elasticity and relationship between stress strain characteristics	1,2
2	The concept of plane stress and plane strain problems and two dimensional.	1,3
3	Familiar in the concept of torsion on non-circular section,	3
4	The concept beams on elastic foundation	3
5	Analyse in various theories of failure and plasticity.	3

SKILLS:

- ✓ Ability to analyze the elasticity problems using Mat Lab coding.
- ✓ Developing the capability to use Mat Lab coding in elasticity problems

UNIT-I:

ELASTICITY: Analysis of Stress and Strain- Equilibrium equations - Compatibility equations - Stress strain relationship. Generalized Hooke's law - Boundary Conditions.

UNIT –II:

ELASTICITY SOLUTION: 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.

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.

TEXT BOOKS:

1. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, New Delhi 1988
2. Chakrabarty. J., 'Theory of Plasticity", Elsevier Butterworth-Heinmann-UK, Third Edition, 2006
3. Sadhu Singh, "Theory of Plasticity", Khanna Publishers, New Delhi 1988
4. Martin H. Sadd, "Elasticity: Theory, Applications and Numeric", Academic Press, 2010.

REFERENCES:

1. Ansel.C.Ugural and Saul.K.Fenster. "Advanced Strength and Applied Elasticity", Fourth Edition, Prentice Hall Professional technical Reference, New Jersy, 2003.
2. Slater R.A.C. "Engineering Plasticity", John Wiley and Son, New York,1977.
3. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", McGraw Hill Book Co., New York, 1988.
4. Mohammed Amin., "Computation Elasticity", Narosa Publications, 2005.
5. Chen and Ha., "Plasticity for Structural Engineers", Springer Verlag, 1998.
6. K. Baskar, T.K. Varadan. "Theory of Isotropic/Orthotropic Elasticity", An Introductory Primer, Anne books Pvt. Ltd., 2009.
7. Wang. W.T. "Applied Elasticity" McGraw-Hill Inc., US (1 December 1963)
8. Hoffman and Sacks. "Theory of Elasticity and Plasticity".