

GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL (GEOTECHNICAL ENGINEERING) (43)

THEORY OF ELASTICITY AND PLASTICITY

SUBJECT CODE: 2714303

SEMESTER: I

Type of course: Core II

Prerequisite: NA

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction : State of stress and strain at a point in two and three dimensions, stress and strain invariants, generalized Hooke's law, Plane stress and plane strain, Octahedral shear stress, conditions of compatibility	4	10
2	Two dimensional problems in Cartesian and polar coordinates (with governing differential equation), Solutions by Airy's stress function, stress concentration, problems of torsion, curved elements, member analogy method, stress function of circular plates	27	65
3	Concept of stability, static dynamic and energy criterion of stability, flexibility and stiffness criteria, buckling, post buckling stages, stability of columns& beams, inelastic building, Beams-column, stability of frames, methods applied to stability problems	09	15
4	Plasticity : Yield criteria- Introduction, The Tresca yield criterion, The Von Mises yield criterion, stress-strain relations, Introduction, Plastic potential and plastic flow, Levy-Mises equations, Prandtl-Reuss equations	5	10

Reference Books:

1. Theory of elasticity, N.Filonenko-Borodich
2. Theory of elasticity, S.P.timoshenko and J.N.Goodier
3. Bucking of bars, plates and shells, Don o. Brush and B.O. Almoth
4. Theory of elastic stability, S.P. Timoshenko and J.M.Gere
5. Principles of structural stability theory, Chajes
6. An introduction to elastic stability of structure, G.J.Sises

7. Advanced Mechanics of Solid, L.S.Srinath, Tata Mcgraw-hill
8. Computational Elasticity, M.AmmenNarosa Publishing House
9. Introduction to engineering plasticity, G.K.Lal&n.V. reddy, Narosa Publishing House

Course Outcome:

After learning the course the students should be able to:

1. Understand the stress & strain in two and three dimension
2. Know the basic differential equations in Cartesian and polar coordinate system.
3. Apply the basic differential equations for different structural condition.
4. Know the concept of stability and apply it for problems having different structural conditions.
5. Understand different yield criteria.
6. Know plastic potential and flow and its theoretical equation.

List of Experiments:

Open Ended Problems:

Major Equipments:

List of Open Source Software/learning website: