

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Civil Engineering
(Applicable from the academic session 2018-2019)

Semester IV [Second year]

CE(ES)402	Introduction to Solid Mechanics	2L + 0T	2 Credits
Course Outcome	After going through this course, the students will be able to: <ol style="list-style-type: none"> 1. To identify the equilibrium conditions and elastic properties of axially loaded bars through stress-strain and force-displacement curves. 2. To identify the principal plane and principal stresses through Mohr circle. 3. To calculate the hoop and meridional stresses in thin cylinders and spherical shells. 4. To identify different degrees of freedoms for support conditions like hinge, roller and fixed 		

	constraints. 5. To calculate the bending moment, shear force and deflection of beams for uniformly distributed, concentrated, linearly varying and external concentrated moment. 6. To calculate the member forces in a plane truss using Method of Joint and Method of Section. 7. To identify torsional moment and twist on a circular shaft and calculate the shear stress. 8. To know the concepts of strain energy due to axial load, bending and shear. 9. To calculate the buckling load of columns using Euler's theory for different support constraints			
Prerequisite	Engineering Mechanics (CE(ES)301), Basic Calculus			
Module 1	Review of Basic Concepts of Stress and Strain: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety, Beam Statics: Support reactions, concepts of redundancy, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams		6L	
Module 2	Symmetric Beam Bending: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, Bending and shear stress for regular sections, shear centre		3L	
Module 3:	Deflection of statically determinate beams: Fundamental concepts: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions: Direct integration solution		4L	
Module 4:	Analysis of determinate plane trusses: Concepts of redundancy, Analysis by method of joints, method of sections		4L	
Module 5:	Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle		3L	
Module 6	Introduction to thin cylindrical & spherical shells: Hoop stress and meridional - stress and volumetric changes		3L	
Module 7	Torsion: Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical; springs		4L	
Module 8	Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae.		3L	
Reference	Sl.	Book Name	Author	Publishing House
	1	Strength of Materials	D.S. Bedi	Khanna Publishing House
	2	Elements of Strength of Material	S. P. Timoshenko and D. H. Young	EWP Pvt. Ltd
	3	Mechanics of Material	R.C. Hibbeler	Pearson
	4	Mechanics of Material	Beer, Jhonston, DeWolf, Mazurek	McGrawHill Education
	5	Strength of Materials	R. Subramanian	OXFORD University Press
	6	Strength of Materials	S S Bhavikatti	Vikas Publishing House Ltd
	7	Strength of Materials	R.K. Bansal	Laxmi Publication
	8	Fundamentals of Strength of Material	Nag & Chandra	WIE