

Name of the subject: Structural Mechanics		
Department: Architecture and Regional Planning		
Curriculum: UG (1st Year)	Type of Course: Compulsory	Semester: 2nd (SPRING),
LTP: 3-1-0,	Credits: 4	Prerequisite(s): Nil

Course Overview:

The course of Structural Mechanics is subdivided into two parts. In the first part, course intends to familiarize architecture students with basic concept of statics portion of engineering mechanics. In the second part the students will be exposed with the initial principles of Strength of Materials. The course is designed such that, after successful completion of the course, the student will understand the Structural Analysis in the next semester. The lecture will demonstrated the principles of statics and solid mechanics in coordination with the properties and behaviour of building structural elements.

Learning Objectives:

After the completion of this course, students will be able to:

1. Relate the basic principle of statics and to apply the concept in structural problems.
2. Synthesize the structural loading into the two dimensional force system
3. Analyse elastic behaviour of materials
4. Evaluate shear force and bending moment of the beams subjected to different types of loads
5. Calculate the deflection for simple beam with load system.

Course Contents:

Introduction to Statics: load, geometry and system, Fundamentals of Mechanics, Force Systems: coplanar and concurrent system and Equation of general equilibrium, Centroid and Moment of Inertia, Theory of Elasticity: stress and strain, Hook's Law, elastic constraints and modular ratio, Shear Force and Bending Moment, Analysis of Truss

Course Contents & Hourly break-up

Module and Chapter Name	Course Content	Number of Hours	Number of Tutorials
Module 1: Introduction	Basics of structural elements, grid, materials, load and geometry.	2	Nil
	Vector active, Surface active and Form active structures	1	
Module 2: Fundamentals Force Systems and Equilibrium	Introduction to mechanics and basic principles. Vector and scalar quantities, Laws of mechanics,	2	2
	Two-dimensional force systems, Coplanar and concurrent system, Equivalent force system	2	
	Concept of force, couple and moment, Free body diagrams, General equations of equilibrium.	3	
Module 3: Centre of Gravity and Moment of Inertia	Centre of gravity of solid objects, determination of centroid of plane and curve areas,	2	1
	Moment of Inertia of plane figures, parallel axis theorem, Polar moment of inertia, and radius of gyration.	2	
Module 4: Theory of Elasticity	Concept of stress and strain – normal and shear, Poisson's ratio, stress-strain diagrams for ductile and brittle materials,	2	3
	Elasticity and plasticity, linear elasticity and Hooke's Law, Young's modulus,	2	
	Modulus of rigidity, volumetric strain and bulk modulus,	2	
	Allowable loads and factor of safety for ductile and brittle materials. Concept of modular ratio.	3	
Module 5: Shear Force and Bending Moment	Types of supports, beams, and loads, statically determinate and indeterminate beams, Degree of statically indeterminacy,	3	3
	Equilibrium of a beam, Shear force and bending moment diagrams for statically determinate beams subjected to different types of loads.	7	
Module 6: Analysis of Truss	Types of Truss. Structural behaviour of simple truss,	2	1
	Analysis of simple plane truss using method of sections and method of joints	4	

Total Number of Lecturers: 39

Total Number of Tutorials: 10

Text Book

1. J.L. Meriam, and L. G. Kraige, *Engineering Mechanics: Statics*, John Wiley & Sons, Inc.
2. S. P. Timoshenko, and D.H. Young, *Elementa of Strength of Materials*, Affiliated East-West Press.
3. R. K. Bansal, *A Text Book of Strength of Material*, Laxmi Publication
4. R. K. Kaushik, *Strength of Materials*, Willy Publication

Reference books:

1. I. H. Shames, *Engineering Mechanics: Statics and Dynamics*, Prentice Hall, New Jersey
2. I.B. Prasad, *A text book of Applied Mechanics: Dynamics and Statics*, Khanna Publishers
3. S. Ramamurtham, *Strength of Materials*, Dhanpat Rai Publications
4. S. S. Rattan, *Strength of Materials*, Tata McGraw-Hill Publishers.
5. S.S. Bhavikatti, *Engineering Mechanics*, New Age International Publication.