SEMESTER – II

THEORY SUBJECTS

Sl. No.	Sub. Code	Theory	Contact Hours			Credit
			L	T	P/S	
1.	22AS213	Strength of Materials	3	0	0	3

Course Objective	To introduce the basic concepts of the stresses and strains for different materials and strength of structural elements; development of internal forces and resistance mechanisms for one dimensional and two-dimensional structural elements; and evaluate the behaviour of torsional members.
Anticipated Learning Outcomes:	Ability to evaluate the strength of various structural elements along with their behaviour and suggest suitable material; understand the basic concept of analysis and design of members subjected to torsion.
Module 1 Simple Stresses and Strains	Load, Stress, Principle of St. Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Shear stress, Complementary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Safe stress values for materials, Relationship between elastic constants. Simple numerical on stress and strain and elastic constants. Composite bars in tension and compression - temperature stresses in composite rods.
Module 2 Strain Energy & Impact Loading	Strain energy-elastic, plastic and rigid members, stresses due to different types of axial loading-Gradually applied loads, suddenly applied loads, impact loads, Simple numerical on strain energy calculation.
Module 3 Biaxial State of Stress	Analysis of Biaxial Stress. Plane stress, Principal plane, Principal stress and Principal axes, Mohr's Circle for Biaxial Stress, Calculation of principal stresses from principal strains. Stresses in thin cylinders and thin spherical shells under internal pressure, wire winding of thin cylinders.
Module 4 Bending of Beams	Theory of simple bending of initially straight beams, Neutral layer, Neutral axis, Bending stresses, Distribution of bending stresses in sections, moment of resistance, section modulus, Section moduli for

different shapes of sections, shear stresses in bending, Distribution of normal and shear stress, Composite beams. Simple numerical on bending stress and shear stress calculation.

Module 5 Torsion of Circular Shafts	Pure torsion, theory of pure torsion, assumptions in the theory of pure torsion, torsional moment of resistance, polar modulus, power transmitted by a shaft, twisting moment, strength of solid and hollow circular shafts and strength of shafts in combined bending and twisting. Simple numerical on torsional moment calculation.

Text Books

1. *Gere, J. M and Timoshenko, S. P., Mechanics of Materials, CBS Publishers and Distributors.*
2. *Kurmi, R. S. Strength of Materials. New Delhi: S. Chand and Company.*

References

1. *Elements of Strength of Materials by S. P. Timoshenko and D. H. Young, Affiliated East West Press*
2. *Strength of Materials by G. H. Ryder, Macmillan Press*
3. *Strength of Materials by R. Subramaniam, Oxford University Press*