20ME202T					Strength of Materials					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To impart the knowledge of fundamental concepts of stresses and strains
- To obtain the analytical and graphical solutions of principle stress and strain
- To get acquainted with the theories on flexural stresses and bean deflections
- To get accustomed to the torsional forces in solid and hollow shafts

UNIT I UNIT 1 SIMPLE STRESSES AND STRAINS 8 Hrs.

Elasticity - Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength - torsional stress and deformations - twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II PRINCIPAL STRESSES AND STRAINS, SHEAR FORCE AND BENDING MOMENT 10 Hrs.

Principal stresses and strains: Stresses on an inclined section of a bar under axial loading, compound stresses: normal and tangential stresses on an inclined plane for biaxial stresses. Two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle stresses- Principle stresses and strains- analytical and graphical solutions Shear force and bending moment: Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads, Point of contra flexure, Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT III FLEXURAL STRESSES, DEFLECTION OF BEAMS 10 Hrs.

Flexural stresses: Theory of simple bending, Assumptions, Derivation of bending equation, Neutral axis, Determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), T, I, Angle, Channel sections, Design of simple beam sections. Deflection of beams: Bending into a circular arc, slope, deflection and radius of curvature, Differential equation for the elastic line of a beam, Double integration and Macaulay's methods, Determination of slope and deflection for cantilever, overhanging and simply supported beams subjected to point loads, U.D.L. Uniformly varying load.

UNIT IV TORSION, COLUMNS & STRUTS 8 Hrs.

Torsion: Torque, Derivation and use of torque equation, Shear stress diagram for solid and hollow circular shafts, Comparison between solid and hollow shaft with regard to their strength and weight, Power transmitted by shaft, Concept of mean and maximum torque. Columns & struts: Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula

Max. 36 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Define the fundamental concepts of stresses and strains in one dimensional and two dimensional states
CO2: Sketch shear force and bending moment diagram for different types of beams with various loading conditions
CO3: Estimate the slope and deflection of beam subjected to various loading conditions
CO4: Interpret the bending and shear stresses in beams of different shapes
CO5: Estimate the power required for the shaft
CO6: Estimate the effective length of columns with different support conditions

TEXT/REFERENCE BOOKS

1. James M Gere, Mechanics of Materials, Cengage publication (2014)
2. Beer and Johnston, Mechanics of Materials, Tata Mc Graw hill (2015)
3. R. C. Hibbeler, Mechanics of Materials, Prentice Hall, Pearson, India (2013)
4. S. S. Ratan, Strength of Materials, Tata Mc Graw hill (2011)
5. R.K.Rajput, Strength of materials, S.Chand & Co, New Delhi (2013)

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs.**
Part A: 8 questions of 2 marks each	16 Marks
Part B: 6 questions of 14 marks each	84 Marks