Course Code	18ME32	Course Title	Strength of Materials	Semester	III
Credits	4	L – T – P –TL*	4 – 1 – 0 – 5	Teaching Hrs	56
Total Marks	100	CIE*	40	SEE*	60

***NOTE: L – Lecture; T – Tutorial; P – Practical; TL – Total;**
CIE – Continuous Internal Evaluation; SEE – Semester End Examination

Course Learning Objectives: This course will enable students to; • To teach the student's knowledge of simple stress, strain and deformations of components due to external loads and study on the behavior of ductile and brittle materials. • To enable to assess stresses and deformations of Compound stresses and Torsion • To teach the student's knowledge of Shear Force, Bending Moment Diagram and Bending stress • To teach the student's knowledge of beams and columns • To provide the basic knowledge for use in the design courses.	Teaching Hrs
Module-1 **Simple Stress and Strain:** Introduction. Properties of material, Concept of Stress and Strain, Hook's Law, Stress Strain Diagram for structural steel and Non-ferrous materials. Poisson's Ratio & principles of superposition, Total elongation of tapering bars of circular and rectangular cross-sections. Elongation due to self-weight, Problems on deformations of member **Simple Stress & Strain – (Continued)** Composite section, Volumetric strain. Expression for Volumetric strain, Elastic constants, relationship among elastic constants, Thermal stresses including compound bars	12
Module-2 **Compound Stresses:** Introduction. Stress components on inclined planes. General two-dimensional stress system, Principal planes and stresses, Problems on principle plane stresses. Mohr's circle for biaxial stresses. **Thin and Thick Cylinders:** Introduction. Thin and thick cylinders subjected to pressure. Hoop stresses and longitudinal stresses. Problems on change in length, diameter and volume. Lame's equations. Problems on thick cylinder**.**	**12**
Module-3 **Bending Moment and Shear Force in Beams:** Introduction, Types of beams loadings and supports. Shearing force in beam. Bending moment, Sign convention. Relationship between loading shear force and bending moment. Expression for shear and bending moment equations, SFD and BMD with salient values for cantilever beams considering point load, UDL, UVL and Couple. SFD and BMD with salient values for simply supported and over hanging beams considering point load, UDL, UVL and Couple.	**12**
Module-4 **Bending Stress and Shear Stress in Beams:** Introduction, Bending stress in beam. Assumptions in simple	**10**

bending theory. Pure bending derivation of Flexure equation. Modulus of rupture, Section modulus, Flexural rigidity. Assumptions in theory of shear stresses in beams, Expression for horizontal shear stress in beam, Shear stress diagram for solid rectangular section and circular section **Deflection of Beams:** Introduction, Definitions of slope, deflection. Elastic curve-derivation of differential equation of deflection curve. Sign convention, slope and deflection standard loading using Macaulay's method, Problems on simply supported and overhanging beams to point load, UDL & Couple.	
Module-5 **Torsion of Circular Shafts:** Introduction. Pure torsion- General torsion equation. Strength and stiffness, Torsional rigidity, Torsional flexibility and polar modulus. Power transmitted by solid shaft. Power transmitted by hollow shaft. **Elastic stability of columns:** Introduction. Euler's theory on columns. Effective length, slenderness ratio. Short and long columns, Radius of gyration, Buckling load. Assumptions, derivations of Euler's Buckling load for different end conditions. Limitations of Euler's theory, Rankine's formula, related problems.	**10**
Course outcomes: By the end of the course, the student shall be able to CO1: Describe the basic meaning of stress, strain diagrams for engineering materials. CO2: Compute stress distribution in Compound bars, identify the stresses in torsional members and determine principal stresses in two dimensional systems. CO3: Construct the shear force and bending moment diagrams for the beam. CO4: Determine the deflections in beams and columns.	
Question paper pattern: • The question paper will have ten full questions carrying equal marks. • Each full question will be for 20 marks. • There will be two full questions (with a maximum of four sub- questions) from each module. • Each full question will have sub- question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module.	
Textbooks: 1. James G.Gere, "Mechanics of Materials", 5th Edition, 2004.Thomson Publishers. ISBN-0534417930 **2.** S.Ramamrutham, R. Narayanan, "Strength of Materials", Dhanphatrai publishing Co.Ltd.2003.ISBN-818743354X, 978818743354. **Reference Books:** 1. Egor. P. Popov, "Engineering Mechanics of solids", Pearson education India, 2nd edition, 1998. ISBN-8120321073, 9788120321076 2. S. S. Bhavikatti, "Strength of Materials",Third edition, Vikas publications House – Pvt. Ltd. **3.** Ferdinand Beer & Russell Jhonstan, "Mechanics of Materials", TMH 3rd Edition, 2003. ISBN – 0070535108, 9780070535107	