STRENGTH OF MATERIALS

Course Code	20ME3402	Year	II	Semester	II
Course Category	Program Core	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Applied Mechanics
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course outcomes: At the end of the course, the student will be able to:

CO	Statement	BTL	Units
CO1	Understand the basic concepts of the stresses and strains for different materials and strength of structural elements.	L2	1,2,3,4,5
CO2	Apply the principles to determine the resistance and deformation in machine members subjected to axial, flexural and torsional loads.	L3	1,2
CO3	Analyze the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading.	L4	3,4
CO4	Analyze principal stresses, strains and buckling stresses for design.	L4	5

Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High:3, Medium: 2, Low:1)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2				2			1		2	3	2
CO2	3	3	2				2			1		2	3	2
CO3	3	3	2				2			1		2	3	2
CO4	3	3	2				2			1		2	3	2

Syllabus		
Unit	Contents	COS
I	**Simple Stresses and Strains**: Types of stresses and strains - Hooke's law, stress- strain diagrams - Axially loaded bars of uniform and varying cross section, Compound bars, Relation between elastic moduli, Thermal stresses. **Torsion:** Torsion, Torsion Equation – Solid and Hollow circular shaft, Torsional rigidity, Power transmitted by shaft.	CO1, CO2,
II	**Shear Force and Bending Moment Diagrams:** Types of beams and loads, Shear force and bending moment diagram for cantilever, simply supported and overhanging beams subjected to Point load, Moments and UDL, Point of contraflexure, Relation between load, shearing force and bending moment.	CO1, CO2

III	**Bending stresses in beams:** Introduction, pure or simple bending, distribution of bending stresses in symmetrical sections, section modulus, Strength of a section. **Shear stresses in beams:** Shear Stress at a section, Shear Stresses distribution in symmetrical sections.	**CO1, CO3**
IV	**Deflection of Beams**: Differential equations of the deflection curve, Slope and deflection of Cantilever beam, simply supported beam and overhanging beam using double integration method, Macaulay's method and Moment area method. **Thin Cylinders:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders.	**CO1, CO3**
V	**Complex stresses:** Stresses on inclined Sections, Plane Stress, Principal Stresses and Maximum Shear Stress. Mohr's Circle for Plane Stress. **Columns and Struts:** Buckling and stability of column, crippling load of columns with pinned ends, fixed-free, fixed –fixed and fixed-pinned, effective length of column ,limitations of Euler's formula.	**CO1, CO4**

Learning Resources

Text Book(s):

1. Stephen P. Timoshenko, James M. Gere "Mechanics of Materials", 2nd edition, C B S Publishers, 2011.
2. S.S. Rattan, "Strength of Materials", 2nd edition, Tata Mc-Graw Hill Private Limited, New Delhi, 2012.

References:

1. James M. Gere, "Mechanics of Materials", 7th edition, Cengage learning India, 2010.
2. AdarshSwaroop, "Mechanics of Materials" 1st edition, New Age International Pvt. Ltd, 2012.
3. Popov, Mechanics of Solids, 2/e, New Pearson Education,2015.
4. B. Raghu Kumar, Strength of Materials, B S Publications.