

TITLE OF THE COURSE: STRENGTH OF MATERIALS			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – III			
Course Code	18CV32	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	60
Total Number of Lecture Hours	50 (10 Hours per Module)	Exam Hours	03
Credits – 04			
Course Objectives: This course will enable students:			
1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements. 2. To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements. 3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements. 4. To analyse and understand principal stresses due to the combination of two dimensional stresses on an element and failure mechanisms in materials. 5. To evaluate the behavior of torsion members, columns and struts.			
Module-1			
Simple Stresses and Strain:			
Introduction, Definition and concept and of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.			
L1, L2			
Module-2			
Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses			
Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lamé's equation, radial and hoop stress distribution.			

Module-3
Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.
Module-4
Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft, combined bending and torsion. Theories of Failure: Introduction, maximum principal stress theory (Rankine's theory), Maximum shearing stress theory (Tresca's theory), Strain energy theory (Beltrami and Haigh), and maximum strain theory (St. Venant's theory).
Module-5
Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre(only concept) Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.
Course outcomes: After studying this course, students will be able;
1. To evaluate the strength of various structural elements internal forces such as compression, tension, shear, bending and torsion. 2. To suggest suitable material from among the available in the field of construction and manufacturing. 3. To evaluate the behavior and strength of structural elements under the action of compound stresses and thus understand failure concepts 4. To understand the basic concept of analysis and design of members subjected to torsion. 5. To understand the basic concept of analysis and design of structural elements such as columns and struts.
Text Books:
1. B.S. Basavarajaiah, P.Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010 2. Ferdinand P. Beer, E. Russell Johnston and Jr. John T. DeWolf "Mechanics of Materials", Tata McGraw-Hill, Third Edition, SI Units

Reference Books:

1. D.H. Young, S.P. Timoshenko “ Elements of Strength of Materials” East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
2. R K Bansal, “A Textbook of Strength of Materials”, 4th Edition, Laxmi Publications, 2010
3. S.S. Rattan “ Strength of Materials” McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013)
4. Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.