STRENGTH OF MATERIALS

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACEB07	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components;

II. Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods;

III. Analyze various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress; locate the shear center of thin wall beams; and

IV. Calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading; apply various failure criteria for general stress states at points; solve torsion problems in bars and thin walled members;

MODULE –I	STRESSES AND STRAINS	Classes: 12

Concept of stress and strain, St. Venant"s principle, stress and strain diagram, Elasticity and plasticity, types of stresses and strains, Hooke's law stress – strain diagram for mild steel working stress, factor of safety, Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them; Bars of varying section, composite bars, temperature stresses. Strain Energy – Resilience, Gradual, sudden, impact and shock loadings, simple applications, two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

MODULE –II	BENDING MOMENT AND SHEAR FORCE DIAGRAMS	Classes: 08

Bending Moment (BM) and Shear Force (SF) diagrams. BM and SF diagrams for cantilevers simply supported with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments. Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

MODULE –III	DEFLECTIONS IN BEAMS , TORSION	Classes: 08

Derivation of bending equation, Neutral axis, determination of bending stresses, section modulus ofrectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.

Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

MODULE –IV	TORSION	Classes: 08
Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.		
MODULE –V	**THIN CYLINDERS AND SPHERES**	**Classes: 09**
Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.		

Text Books:

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004.
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979.

Reference Books:

1. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf– TMH2002.
2. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

Web References:

1. http://www.nptelvideos.in/2012/11/strength-of-materials- prof.html
2. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-2004/lecture-notes/
3. https://www.youtube.com/watch?v=coRgpxG2pyY&list=PLLbvVfERDon3oDfCYxkwRct1Q6YeOzi9g

E-Text Books:

1. http://www.freeengineeringbooks.com/Civil/Strength-of-Material-Books.php
2. http://royalmechanicalbuzz.blogspot.in/2015/04/strength-of-materials-book-by-r-k-bansal.html
3. https://books.google.co.in/books?id=I8gg0Q4OQ4C&printsec=frontcover&dq=STRENGTH+OF+MATERIALS&hl=en&sa=X&ved=0ahUKEwjpveCD44HgAhWBad4KHacUAgYQ6AEIMDAB#v=onepage&q=STRENGTH%20OF%20MATERIALS&f=false