

MECHANICS OF SOLIDS

III Semester: AE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAEB04	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 60		Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 60	
COURSE OBJECTIVES:								
The course should enable the students to:								
<ul style="list-style-type: none"> I. Understand the behavior of structure basic structural components under loading conditions II. Apply the shear force, bending moment and deflection methods to the beam in different load conditions III. Relate the bending and flexural stress solving methods to real time problems IV. Pertain the concept of buckling behavior of the columns along with eigen modes V. Discuss the equilibrium and compatibility conditions for two-dimensional and three-dimensional elastic bodies 								
COURSE OUTCOMES(COs):								
<ul style="list-style-type: none"> I. To understand the basics of material properties, stress and strain. II. To apply knowledge of various kinds of beams for engineering applications. III. Ability to identify, formulate, and solve engineering & real life problems. IV. Ability to design and conduct experiments, as well as to analyze and interpret data V. Ability to design a component to meet desired needs within realistic constraints of safety. 								
COURSE LEARNING OUTCOMES (CLOs):								
<ul style="list-style-type: none"> 1. Calculate the stress strain relations in conjunction with elasticity and material properties 2. Describe the resistance and deformation in members which are subjected to axial, flexural and torsion loads. 3. Discuss thermal explanations in solid bars and induced thermal stresses 4. Solve for bending and shear parameters of beams under loading conditions 5. Explain for deflections of beams under loading with various approaches. 6. Determine the deflections of different beams under different loading conditions. 7. Compute the bending stresses developed in various sections of beams of real field problems. 8. Apply the bending equation on various sections 9. Determine the shear stresses developed in various sections of beams 10. Calculate the stability of structural elements and determine buckling loads. 11. Discuss critical buckling load for column with various loading and end conditions 12. Apply theories and to predict the performance of bars under axial loading including buckling. 13. Understand the theory of beam column & determine buckling loads on it. 14. Solve the principal stress problems by graphical methods. 15. Explain the stress transformation and concept of principle plane and principle stresses 16. Evaluate principal stresses, strains and apply the concept of failure theories for design 17. Acquire knowledge to solve real time problems in Aircraft structure subjected loading conditions 								
MODULE-I	INTRODUCTION						Classes: 12	
Properties of Engineering materials, Stresses and strains, Hooke's law, elastic constant, relation between module, working stress, factor of safety, poissons ratio, bars of varying cross section; Thermal stresses. Torsion in shafts, concept of Strain energy								

MODULE-II	FORCES, DEFECTIONS IN BEAMS	Classes: 14
<p>Shear force and bending moment diagrams for different types of beams with point load, uniform distributed load and uniform varying load.</p> <p>Deflection of beams by Double integration method, Macaulay's method, moment area method, Principle of superposition.</p>		
MODULE-III	STRESSES IN BEAMS	Classes: 16
<p>Bending stresses and Shear stress variation in beams of symmetric and un-symmetric sections, Beams of uniform strength.</p> <p>Flexural stresses: Bending equations, calculation of bending stresses for different sections of beams like I, L, T, C, angle section</p>		
MODULE-IV	COLUMNS	Classes: 08
<p>Columns, types of columns, Euler's formula instability of columns, Rankine's and Johnson's formula, Eigen values and Eigen modes, concept of beam-column.</p>		
MODULE-V	THEORY OF ELASTICITY	Classes: 10
<p>Equilibrium and compatibility conditions and constitute relations for elastic solid and plane: generalized plane strain cases Airy's stress function</p> <p>Stress on inclined planes, stress transformations determination of principal stresses and strains by analytical method and graphical method - Mohr's circles and its constructions</p>		
Text Books:		
<ol style="list-style-type: none"> 1. R. K Bansal, "Strength of Materials", Laxmi publications, 5th Edition, 2012. 2. B C Punmia, "Mechanics of Materials", Laxmi publications (P) Ltd, 2006. 3. T. H. G. Megson, "Aircraft Structures for Engineering Students", Butterworth-Heinemann Ltd, 5th Edition, 2012 		
Reference Books:		
<ol style="list-style-type: none"> 1. Dym, C. L, Shames, I. H, "Solid Mechanics", McGraw Hill, Kogakusha, Tokyo, 7th Edition, 2007. 2. Stephen Timoshenko, "Strength of Materials", Vol I & II, CBS Publishers and Distributors, 3rd Edition, 2004. 3. R. K. Rajput, "Strength of Materials", S. Chand and Co., 1st Edition, 1999. 4. Timoshenko, S, Young, D. H. "Elements of Strength of Materials", T. Van Nostrand Co. Inc., Princeton N.J, 4th Edition, 1977. 5. Gere, Timoshenko, "Mechanics of Materials", McGraw Hill, 3rd Edition, 1993. 		
Web References:		
<ol style="list-style-type: none"> 1. www.nptel.ac.in/courses/112107147/ 2. www.vssut.ac.in/lecture_notes/lecture1423904647.pdf 3. www.web.mit.edu/emech/dontindex-build/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. www.e-booksdirectory.com/listing.php?category=456 2. www.esag.harvard.edu/rice/e0_Solid_Mechanics_94_10.pdf 3. www.itiomar.it/pubblica/dispense/MECHANICAL%20ENGINEERING%20HANDBOOK/ 		