THEORY OF STRUCTURES

III Semester: AE										
Course Code	Category	Hours / Week			Credits	Maximum Marks				
AAE002	Core	L	Т	Р	C	CIA	SEE	TOTAL		
		3	1	3	4	30	70	100		
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45				

OBJECTIVES:

- 1. Understand the several of Concepts of stress and strain in mechanical components by stressing the fundamentals.
- 2. Calculate bending stresses and shear stresses for in a beam of symmetric and un-symmetric sections.
- 3. Explain the deflections of beams with various load conditions by different approaches.
- 4. Discuss the buckling behavior of columns with different load and boundary conditions.

COURSE LEARNING OUTCOMES (CLOs):

- 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 stresses of symmetric and un-symmetric beams under loading conditions.
- 5. Calculate the shear stresses developed in various sections of beams.
- 6. Calculate the flexural developed in various sections of beams of real field problems.
- 7. Differentiate between redundant structures and determinate structures.
- 8. Analyze the redundant complex structural components subjected to different loading and boundary conditions.
- 9. Solve for deflections of beams under loading with various approaches.
- 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 a theories and to predict the performance of bars under axial loading including buckling.
- 13. Describe the behavior of structural components subjected to various loading and support conditions based on principles of equilibrium and constitutional relationships.
- 14. Explain the stress transformation and concept of principle plane and principle stresses.
- 15. Evaluate principal stresses, strains and apply the concept of failure theories for design.
- 16. Acquire Basic knowledge to solve real time problems in Aircraft structure with different loading conditions.
- 17. Apply the fundamental concepts in competitive examinations.

UNIT-I	INTRODUCTION	Classes: 10
Mechanica modulii, w Torsion of force and b	l properties of materials; Stresses and strains; Hooke's law, elastic constant, r orking stress, factor of safety, poisons ratio ; bars of varying cross section; T solid and hollow circular shafts and shear stress variations; Power transmission ending moment diagrams for different types of beams with various loads.	elation between hermal stresses. in shafts; Shear
UNIT-II	STRESSES IN BEAMS	Classes: 08
Bending st uniform st sections of	resses and Shear stress variation in beams of symmetric and un-symmetric sec rength; Flexural stresses: Bending equations, calculation of bending stresse beams like I, L, T, C, angle section.	tions; Beams of es for different
UNIT-III	BEAMS AND COLUMNS	Classes: 10
Deflection beam meth Columns, t values and	of beams by Double integration method, Macaulay's method, moment area me od; Principle of superposition. ypes of columns, Euler's formula instability of columns, Rakine's and Jonson's Eigen modes, concept of beam-column.	ethod, conjugate formula, Eigen
UNIT-IV	REDUNDANT STRUCTURES	Classes: 09
plane strain principal s constructio	tresses and strains by analytical method and graphical method - Mohr's ns.	circles and its
UNIT-V	THEORY OF ELASTISITY	Classes: 08
Equilibriur plane strain principal s constructio	n and compatibility conditions and constitute relations for elastic solid and plan to cases Airy's stress function Stress on inclined planes, stress transformations of tresses and strains by analytical method and graphical method - Mohr's ns.	ane: generalized letermination of circles and its
Text Book	s:	
 R. K T. H. Edition Gere, 	Bansal, —Strength of Materials , Laxmi publications, 5th Edition, 2012. G. Megson, —Aircraft Structures for Engineering Students , Butterworth-Heiner n, 2012 Timoshenko, —Mechanics of Materials , McGraw Hill, 3rd Edition, 1993.	mann Ltd, 5th
Reference		
	S:	
 Dym, Steph 3rd E R. K. Timos Prince 	C. L, Shames, I. H, —Solid Mechanics ^{II} , McGraw Hill, Kogakusha, Tokyo, 7th en Timoshenko, —Strength of Materials ^{II} , Vol I & II, CBS Publishers and Distrib dition, 2004. Rajput, —Strength of Materials ^{II} , S. Chand and Co., 1st Edition, 1999 shenko, S, Young, D. H. —Elements of Strength of Materials ^{II} , T. Van Nostrand eton N.J, 4th Edition, 1977.	Edition, 2007. outors, Co. Inc.,

- 1. https://onlinelibrary.wiley.com/doi/book/10.1002/9783433602638
- 2. https://nptel.ac.in/downloads/105105109/
- 3. https://onlinelibrary.wiley.com/doi/book/10.1002/9783433602638
- 4. http://www.mu.edu.et/iphc/images/liblary/Heritage/Heritage_Culture_and_Tourism/Theory_of_Struc ture/theorys_of_structures.pdf

E-Text Books:

- 1. https://books.google.co.in/books/about/Theory_of_Structures.html?id=7wMkywAACAAJ
- $2. \ https://www.amazon.in/Theory-Structures-Units-R-S-Khurmi/dp/8121905206$
- 3. https://www.goodreads.com/book/show/8797803-theory-of-structures

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HOD, AE