COURSE CONTENT

ADVANCED STRUCTURAL ANALYSIS LABORATORY								
II Semester: AE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BAEE24	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	4	2	40	60	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**		
Prerequisite: Aerospace Structure								

I.COURSE OVERVIEW:

The course encourages introducing analytical tools from an Engineering perspective. The course efforts to provide the basic knowledge of analytical methodology outline the importance of aircraft structures. The aircraft structural laboratory is used to enhance the learning of the Postgraduate students by encouraging them to undertake projects in the area of structural analysis of thin-walled structural components, wings, fuselage, and landing gears. The major emphasis of this course is to solve a complex geometrical structure under a given load, these methods do not have analytical solutions. Software like ANSYS is utilized to interpret results for complex geometries.

II. COURSES OBJECTIVES:

The students will try to learn:

I. The mechanical behaviour of materials like aluminium, mild steel, and cast iron.
II. The crack detection using various NDT methods and also discuss the changing strength due to these defects.
III. How to model a structural crack in ANSYS and determining its failure loads.
IV. How to model complex composite structures in ANSYS and determining the stresses and strains.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1 Demonstrate the properties of Composite materials subjected to tensile loads using the magnitude of stress and strain for engineering applications
CO 2 Demonstrate the deflections of beams subjected to transverse loads under various end conditions for aerospace structural design
CO 3 Determine the failure mode during the fracture of an aircraft component for assessing crack propagation.
CO 4 Illustrate the critical buckling loads of columns subjected to Compression loads for efficient design of structures under various end conditions.
CO 5 Develop an appropriate method for predicting the ultimate load on the wing using ANSYS.
CO 6 Explain the Unsymmetrical Bending behavior of a Beam for designing aerospace structures.

IV. COURSE CONTENT:

Exercise -1: AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-I
Determination of Structural analysis of aircraft wing

Exercise -2: AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-II
Determination of Structural analysis of aircraft wing (composite material)

Exercise -3: AEROSPACESTRUCTURALANALYSISUSINGANSYS-III
Determination of Structural analysis of fuselage.

Exercise -4: AEROSPACESTRUCTURALANALYSISUSINGANSYS-IV
Determination of Structural analysis of Rocket motor case

Exercise -5: AEROSPACESTRUCTURALANALYSISUSINGANSYS-IV
Determination of Structural Analysis of Rocket Nozzle

Exercise -6: BUCKLING TEST
Determination of Critical buckling loads by Compression tests on long columns

Exercise -7: COMPRESSION TEST
Determination of Critical buckling loads, Southwell plot by Compression tests on short columns

Exercise -8: BENDING TEST
Determine the unsymmetrical Bending of a Beam

Exercise -9: SHEAR CENTRE FOR OPEN SECTION
Determination of Shear Centre of an Open Section Beam.

Exercise -10: SHEAR CENTRE FOR CLOSED SECTION
Determination of Shear Centre of a Closed Section Beam.

Exercise -11: SHEAR STRESS OF RIVETED JOINTS
Determination of Shear strength of riveted joint (double riveted Zig-Zag lap joint) between two given metals

Exercise -12: SANDWICH PANEL TENSION TEST (COMPOSITE MATERIALS)
Fabrication and determination of young's Modulus of Sandwich Panel (Composite Materials)

Exercise -13: NON-LINEAR ANALYSIS
Non-linear behavior with large deflections
Non-linear behavior with materials

Exercise -14: HARMONIC RESPONSE ANALYSIS
Random Vibration Analysis of a deep simply-supported beam
Harmonic response of a spring-mass system

V. TEXTBOOKS:

1. R.K Bansal, "Strength of Materials", Laxmi publications, 5th edition, 2012.
2. T. H. G. Megson, "Aircraft Structures for Engineering Students", Butterworth-Heinemann Ltd, 5th edition, 2012.

3. Gere, Timoshenko, “Mechanics of Materials”, McGraw Hill, 3rd edition,1993.

VI. REFERENCE BOOKS:

1. Peery, D.J. and Azar, J.J., Aircraft Structures, 2nd Ed., McGra-Hill,1982, ISBN0-07-049196-8
2. Bruhn. E.H, Analysis and Design of Flight Vehicles Structures, Tri-state Off-set Company, USA,1965
3. Lakshmi Narasaiah, G., Aircraft Structures, BS Publications, 2010.

VII. ELECTRONICS RESOURCES:

1. https://akanksha.iare.ac.in/index?route=course/details&course_id=88

VIII. MATERIALS ONLINE

1. Course Template
2. Laboratory Manual