COMPUTATIONAL STRUCTURES LABORATORY

II Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BAEB20	Core	-	-	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 48			Total Classes: 36			

I. COURSE OVERVIEW:

The major emphasis of this course is to solve a complex geometrical structure under a given loads, these methods does not have analytical solutions. Software's like ANSYS and NASTRAN is utilized to interpret results for complex geometries. Modeling of crack and composite structures help the students to solve realistic problems which are common in industries. Structural analysis on aircraft structures and Rocket components are delt to obtain the solution for bending and torsion under the applied aerodynamic loads.

II. COURSE OBJECTIVES:

The course should enable the students to:

I. Identify the strength of ANSYS and NASTRAN software for the solution of fluid mechanics and structural mechanics problems.
II. Describe steps necessary to solve a particular problem.
III. Solve practical problems.
IV. Interpret the results obtain from ANSYS and NASTRAN software.

III. COURSE OUTCOMES:

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

CO 1	**Develop** the appropriate method for predicting ultimate load on wing using ANSYS.	**Analyze**
CO 2	**Estimate** the rocket motor case loading for the launch vehicle by using computational tools.	**Analyze**
CO 3	**Examine** the thermal and structural loading on exposed components during the flight mission for obtaining airworthiness suitability.	**Analyze**
CO 4	**Make use of** the structural fatigue concept for obtaining desired operational characteristics.	**Analyze**
CO 5	**Analyze** the effect of fracture during bird hit using L S Dyna simulation for failure rate of an aircraft.	**Analyze**
CO 6	**Determine** the failure mode during fracture of an aircraft component for assessing crack propagation.	**Analyze**

LIST OF EXPERIMENTS

Week-1	**AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-I**

Implement the following tasks

1. Structural analysis of aircraft wing

Week-2	**AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-II**
Implement the following tasks 1. Structural analysis of aircraft wing (composite material)	
Week-3	**AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-III**
Implement the following tasks 1. Analysis of fuselage	
Week-4	**AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-IV**
Implement the following tasks 1. Rocket motor case analysis	
Week-5	**AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-V**
Implement the following tasks 1. Structural and thermal analysis of rocket nozzles	
Week-6	**AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-VI**
Implement the following tasks 1. Fractural mechanics of crack propagation	
Week-7	**AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-I**
Implement the following tasks 1. Structural analysis of aircraft wing	
Week-8	**AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-II**
Implement the following tasks 1. Structural analysis of aircraft wing (composite material)	
Week-9	**AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-III**
Implement the following tasks 1. Analysis of fuselage	
Week-10	**AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-IV**
Implement the following tasks 1. Rocket motor case analysis	
Week-11	**AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-V**
Implement the following tasks 1. Structural and thermal analysis of rocketnozzles	
Week-12	**AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-VI**

Implement the following tasks

1. Fractural mechanics of crackpropagation

Reference Books:

1. Y. Nakasone, S.Yoshimoto, T.A. Stolarski, "Engineering analysis with ANSYS software", Elsevier Publication,2006.
2. MSC Nastran 2014.1 Quick Reference Guide, Jun.2015.
3. John C Tannehill, Dale A Anderson, Richard H Pletcher, "Computational Fluid Mechanics And Heat Transfer", Taylor & Francis Publication , 2nd Edition,1997.
4. T J Chug, "Computational Fluid Dynamics", Cambridge University Press, 2002.

Web References:

1. http://resource.ansys.com/staticassets/ANSYS/staticassets/resourcelibrary/article/AA-V4-I1-Teaching-Simulation-to-Future-Engineers.pdf
2. http://www.autodesk.in/products/simulation/overview
3. http://www.serc.iisc.in/facilities/ansys-13-0-cfd/