ADVANCED COMPUTATIONAL STRUCTURES LABORATORY

II Semester: AE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BAEC24	Core	--	-	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes:36				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 students will try to learn:

I. The utilization of ANSYS and NASTRAN software to obtain the solution for complex geometrical structures.
II. The mathematical methods involved in structural mechanics along with its strengths and weakness.
III. Modeling a structural crack in ANSYS and NASTRAN and determine its failure loads.
IV. Modeling a complex composite structure in ANSYS and NASTRAN and determine the stresses and strains.

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**

IV. LIST OF EXPERIMENTS

Week-1: AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-I

Implement the following task

1.Structural analysis of aircraft wing

Week-2: AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-II

Implement the following task

1.Structural analysis of aircraft win g(composite material)

Week-3 : AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-III

Implement the following task

1.Analysis of fuselage

Week-4: AEROSPACE STRUCTURAL ANALYSIS USING ANSYS-IV

Implement the following task

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 task

1.Fractural mechanics of crack propagation

Week-7: AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-I

Implement the following task

1.Structural analysis of aircraft wing

Week-8: AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-II

Implement the following task

1.Structural analysis of aircraft wing (composite material)

Week-9: AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-III

Implement the following task

1.Analysis of fuselage

Week-10: AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-IV

Implement the following tasks

Rocket motor case analysis

Week-11: AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-V

Implement the following task

1.Structural and thermal analysis of rocket nozzles

Week-12: AEROSPACE STRUCTURAL ANALYSIS USING NASTRA-VI

Implement the following task

1.Fractural mechanics of crack propagation

V. 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 Tanne hill, 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.

VI. 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/