Course code	Course Name	L-T-P-Credits	Year of Introduction
AO204	AIRCRAFT STRUCTURES -1	4-0-0-4	2016

Prerequisite : Nil

Course Objectives

- To provide an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- To understand the design process using different failure theories.

Syllabus

Plane truss analysis – Strain energy -Energy theorems- Euler's column curve – beam columns -Ductile and brittle materials – Theories of failure - Thermal stresses – Creep & Fatigue

Expected Outcome

The students will be able to

i. perform linear static analysis of determinate and indeterminate aircraft structural components
ii. design a component using different theories of failure

Text Books:

1. Timoshenko and Gere, "Mechanics of Materials", Tata McGraw Hill, 1993.
2. Megson T M G, "Aircraft Structures for Engineering students" Elsevier , 2007

References:

1. Donaldson, B.K., "Analysis of Aircraft Structures - An Introduction", McGraw Hill, 1993.
2. Bruhn E F, "Analysis and Design of Flight Vehicle Structures", Tri-State Off-set Company, USA,1985
3.Peery, D.J. and Azar,J.J., "Aircraft Structures", Ed.2, McGraw – Hill, N.Y, 1999.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Plane truss analysis – method of joints – method of sections – method of shear	2	15%
	3-D trusses	2	
	principle of super position	2	
	Clapeyron's 3 moment equation and moment distribution method for indeterminate beams.	3	
II	Strain Energy in axial loadings.	2	15%
	Strain Energy in bending	2	
	Strain Energy in torsion and shear loadings.	2	
	Castigliano's theorems and their applications	2	

FIRST INTERNAL EXAM			
III	Energy theorems	2	15%
	dummy load & unit load methods	2	
	energy methods applied to statically determinate and indeterminate beams,	2	
	energy methods applied to frames, rings & trusses	2	
IV	Euler's column curve – inelastic buckling	2	15%
	effect of initial curvature – the South well plot – columns with eccentricity	2	
	use of energy methods – theory of beam columns	2	
	beam columns with different end conditions – stresses in beam columns.	3	
SECOND INTERNAL EXAM			
V	Ductile and brittle materials	2	20%
	maximum principal stress theory - maximum principal strain theory - maximum shear stress theory	2	
	distortion energy theory	2	
	octahedral shear stress theory.	2	
VI	Thermal stresses	2	20%
	impact loading	2	
	Fatigue – Creep	2	
	Stress Relaxation	2	
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Exam duration: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.