SEMESTER 4

AIRCRAFT STRUCTURES -1

Course Code	PCAOT403	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Engineering Mechanics, Mechanics of Aircraft Materials	Course Type	Theory

Course Objectives:

1. To perform stress and deformation analysis on common structural member in aircraft.
2. To practice various method for analysis of stresses in structural members.
3. To describe the theories of failure employed in the analysis of structural elements.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Statically Determinate and Indeterminate structures:** Types of Structures, Structural components of Aircraft. General loads on aircraft. Basic concept of determinate and indeterminate structure, Plane Truss Analysis- Method of joints, Method of section and Method of shear. Clapeyron's 3 moment equation and moment distribution method for indeterminate beams.	11

2	**Energy Methods:** Principle of Virtual work, Principal of superposition, St. Venant's principle, Maxwell's Reciprocal Theorem, Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and their applications, Energy methods applied to statically determinate and indeterminate beams- dummy load & unit load methods, frames, rings & trusses.	**11**
3	**Column:** Euler's column curve – inelastic buckling – effect of initial curvature – Southwell plot – columns with eccentricity – use of energy methods – Rankine formula. theory of beam columns – beam columns with different end conditions – stresses in beam columns.	**11**
4	**Theories of failures**- Maximum principal stress theory, Maximum shear stress theory, Maximum shear strain theory, Maximum strain energy theory, Maximum shear strain energy theory. Thermal stresses – impact loading – Fatigue – Creep - Stress Relaxation	**11**

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Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

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	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Calculate loads distributed along the connected structural members of truss and frame.	**K3**
CO2	Solve deflection of beams under various loading conditions through various analytical methods.	**K3**
CO3	Calculate the buckling load in columns and struts under various boundary conditions.	**K3**
CO4	Understand the theory of failures and induced stresses acting on structural member.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	-	-	-	2
CO2	3	3	1	1	-	-	-	-	-	-	-	2
CO3	3	3	1	1	-	-	-	-	-	-	-	2
CO4	2	3	1	1	-	-	-	-	-	-	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Analysis and Design of Flight Vehicles Structures	Bruhn. E.H	Tri- state off-set Company	1985
2	Aircraft Structures for Engineering Students	Megson T M G	Elsevier Ltd,2012	2012

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Aircraft Structures",	Peery, D.J., and Azar, J.J.,	2e McGraw Hill	1999
2	Airframe structural Design	Michael Chun-Yung Niu,	Conmilit Press Ltd	1998
3	Fundamentals of Aircraft Structural Analysis	Howard D Curtis	WCB- McGraw Hill	1997
4	Theory and Analysis of Flight Structures	Rivello, R.M.,	McGraw Hill	1993