SEMESTER 3

MECHANICS OF AIRCRAFT MATERIALS

Course Code	**PCAOT303**	**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	**Course Type**	Theory

Course Objectives:

1. To understand the concepts of stress, strain, and deformation under the influence of various loads.
2. To assess the stresses and deformation in simple structural members like beams, bars and shafts.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Introduction:** Stress & Strain, Poisson's ratio. Stress – strain curves for mild steel in tension, aluminium alloy, hard and soft rubber, brittle material and copper in compression. Hooke's law for linearly elastic isotropic material under axial and shear deformation, Bulk modulus, biaxial and triaxial deformations. Relationship between material constant (Derivations). Stress and strain tensors and its components, Factor of safety, Margin of safety.	**11**
2	**Deformation in axially loaded bars**: Principle of superposition. Calculation of stresses in straight, Stepped and tapered sections, Composite sections, Stresses due to temperature change Deformation of prismatic and conical bar under its self-weight. Strain energy, resilience and toughness – for pure axial loading, prismatic and conical bar under self-weight.	**11**
3	**Beams**: Types of Loads, types of Support, types of Beams, bending couple and twisting couple (Concept Only). Determination of support reaction, Shear force and bending moments, Relationships between loads-shear force-bending moments (Derivation for all the cases). Bending moment and shear force diagrams of beams (cantilever and simply supported) subjected to	**11**

	concentrated load, uniformly distributed loads, uniformly varying loads, couples and their combinations, Point of contra flexure, point and magnitude of maximum bending point and maximum shear force.	
4	**Flexural stresses:** Theory of simple bending, Assumptions, derivation of equation of bending, neutral axis, determination of bending stresses (rectangular, square, triangular, solid circular and hollow circular sections only). Torsion - Derivation of equation of torsion, Assumptions, application of torsional equation to solid and hollow circular shaft, torsional rigidity. Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress – Mohr's circle method.	**11**

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

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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:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the basic principles of stress and strain, deformations, and their relationship.	**K2**
CO2	Discuss the effects of axial loads on stresses, strains, and elongations in axially loaded bars and columns under different boundary conditions.	**K3**
CO3	Construct the shear force and bending moment diagrams for various members under varying loading conditions and to identify critical points in a structure.	**K3**
CO4	Apply the bending and torsional concepts to find out the flexural stress on various cross sections.	**K3**

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

CO-PO Mapping Table:

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

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Mechanics of Materials	James Gere & Barry Goodno.	Thomson-Engineering	9th Edition, 2022.
2	Strength of Materials	S. Ramamrutham & R. Narayanan	Dhanpat Rai Publishing Company	20th Edition, 2020
3	A Textbook of Strength of Materials - Mechanics of Solids	Bansal R. K.	Laxmi Publications	6th Edition, 2022
4	Mechanics of Materials	James Gere & Barry Goodno.	Thomson-Engineering	9th Edition, 2022.

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Strength of Materials	S. S. Rattan	2e McGraw Hill Education India	2011
2	Aircraft Materials and Processes	Titterton.G	Pitman Publishing Company	5th Edition, 1995
3	Strength of Materials	R. Subramanian	Oxford University	3rd Edition, 2016.

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://youtu.be/jyLIqUvwdtY https://youtu.be/Q1ON3aYVgPc
2	https://youtu.be/HP3N7lVjfz0
3	https://youtu.be/mgQU04-ilCA
4	https://youtu.be/5gRCCllP2IA

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