



AMITY UNIVERSITY

UTTAR PRADESH

Course Title: AIRCRAFT COMPOSITE MATERIALS

Credit Units: 03

Course Code: AERO401

Course Level: UG

L	T	P/S	SW/ FW	TOTAL CREDIT UNITS
3	-	-	-	3

Course Objectives

The objective of this course is to provide an understanding of the strength and stress behaviour of the composite materials as explained by certain recent theories on the subject. The students are to be equipped with the knowledge of the composite material performance under fatigue, impact and other adverse conditions that an aircraft is subjected to.

Pre-requisites: Material Science

Course Contents/Syllabus:

	Weightage (%)
Module I : Introduction to Aerospace Composites	15
Descriptors/Topics : Classification and characteristics of Composite materials. Elementary study of mechanical behaviour of composite materials. Advantages of composite materials when applied to Aerospace fabrications.	
Module II : Macro-mechanical Behaviour of a Lamina	25
Descriptors/Topics : Analysis of a lamina: Constitutive equations for the lamina of an arbitrary – Orientation, Transformation relations. Strength concepts, Experimental determination of strength and stiffness. Biaxial strength theories for an orthotropic Lamina: Maximum stress theory, maximum strain theory, Tsai - Hill theory. Tsai tensor theory, as applied to aerospace structures.	
Module III : Micro-mechanical Behaviour of a Lamina	20

Descriptors/Topics : Determination of elastic constants of an orthotropic Lamina by mechanics of materials approach for a aircraft Wing Body. Determination of tensile and compressive strength of a lamina in the fibre direction of mechanics of materials approach.	
Module IV : Analysis of Laminated Components	20
Descriptors/Topics : Classical Lamination Theory: Lamina Stress-Strain behaviour, strain and stress behaviour in a Laminate. Resultant Laminated forces and moments. Laminate Stiffnesses: Symmetric, Anti-symmetric and non-symmetric Laminate stiffness, Laminate strength: Laminate strength analysis procedure. Laminate, strength criteria, thermal and mechanical strength analysis, strength of cross-ply and Angle-ply laminates.	
Module V : Special Topics relating to Aircraft Composite Materials	20
Descriptors / Topics: Inter-laminar stresses and their implications. Performance of composites under fatigue. Impact and adverse environment.	

Student Learning Outcomes:

- Explain stress strain relation of composite material.
- Describe performance of composite components under fatigue, impact and other flight conditions.
- Differentiate and examine various types of aircraft composite materials
- Evaluate strength of composite materials.

Pedagogy for Course Delivery: Session Plan / course-material uploading, Class-room teaching associated with assignments, presentations, quiz, viva-voce and evaluation.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100	NA	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment - 30					End Term Examination
Components (Drop down)	A	CT	S/V/Q	HA	70
Weightage (%)	5	10	8	7	70

Text & References:

- R.M. Jones, “Mechanics of Composite Materials”.
- Sabodh K. Garg, “Analysis of Structural Composite Materials”.
- Robert Nicholle, “Composite Construction Materials Handbook”.
- Bhagwan D. Agarwal and Lawrence, “Analysis and performance of Fibre Composites”, Broutman, John Wiley.
- Ronald and F. Gibson, “Principles of composite Materials Mechanics”, McGraw Hill Int. Ltd.

Any other Study Material:

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