

COURSE CODE	COURSE TITLE	L	T	P	C
1152AE112	Composite Materials& Structures	3	0	0	3

COURSE CATEGORY:

Program Elective

a. Preamble:

The aim of the course is to give a thorough treatment of the classification and properties of composite materials and also the different ways composites can be laid up and how they can be analyzed, with emphasis on physical understanding. The course provides the necessary knowledge and experience to enable the student to perform independent analyses. The use of composite materials is increasing in many fields e.g. in transportation (sea, land, air, space), the oil industry, civil engineering construction, sports equipment, biomechanics and medicine

b. Prerequisite courses:

- Strength of Materials
- Aircraft structural Mechanics
- Aircraft structural Analysis

c. Course Educational Objectives:

- To develop an understanding of the linear elastic analysis of composite materials.
- To have an understanding of different types of composite materials and its behavior with the different analyzing method.
- To undertake design projects involving application of composites

d. Course Outcomes:

Students who successfully complete the course will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Describe the basic concepts of composite materials	K3
CO2	Apply Micro & macro Mechanics approach to analyze composites and apply MATLAB functions to solve the problems	K3
CO3	Develop the differential equation for different types of laminates and understand the failure theories of composites	K3,K2
CO4	Describe the concepts involved in sandwich constructions	K2
CO5	Select the most appropriate manufacturing process for fabricating composite components	K3

(K1 – Remember; K2 – Understand; K3 – Apply)

e. Correlation of COs with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H		H	H	H		H		
CO2	H			H		H	H	H		H		
CO3	H			H		H	H	H		H		
CO4	H			H		H	H	H		H		
CO5	H			H		H	H	H		H		

H- High; M-Medium; L-Low

f. Course Content:

UNIT I INTRODUCTION AND BASIC CONCEPTS

L- 6 P-2

Introduction-Classification of composite materials-Advantages and disadvantage of composite materials-Application of composite materials– Generalized Hooke’s Law – Elastic constants for anisotropic, orthotropic and isotropic materials

Experiment: MATLAB introduction-MATLAB functions used for mechanics of composite materials.

UNIT II METHODS OF ANALYSIS

L- 9 P-3

Micro mechanics – Mechanics of materials approach, elasticity approach to determine material properties – Macro Mechanics – Stress-strain relations with respect to natural axis, arbitrary axis – Determination of material properties

Experiment: MATLAB problems for micro and macro mechanics.

UNIT III LAMINATED PLATES

L- 5 P-5

Governing differential equation for a general laminate, angle ply and cross ply laminates. Failure criteria for composites.

Experiment: laminate analysis using MATLAB problems laminated plates.

UNIT I IV - SANDWICH CONSTRUCTIONS

L-9

Basic design concepts of sandwich construction -Materials used for sandwich construction - Failure modes of sandwich panels.

UNIT I V - FABRICATION PROCESS

L- 6

Various Open and closed mould processes. Manufacture of fibers – Types of resins and properties and applications – Netting analysis.

Total Periods: 45

TEXT BOOKS

1. Calcote, L R. “The Analysis of laminated Composite Structures”, Von – Nostrand Reinhold Company, New York 1998.
2. Jones, R.M., “Mechanics of Composite Materials”, McGraw-Hill, Kogakusha Ltd., Tokyo, 1985.

REFERENCES

1. Agarwal, B.D., and Broutman, L.J., “Analysis and Performance of Fibre Composites”, John Wiley and sons.Inc., New York, 1995.
2. Lubin, G., “Handbook on Advanced Plastics and Fibre Glass”, Von Nostrand Reinhold Co., New York, 1989.