

ANALYSIS OF LAMINATED COMPOSITE PLATES

III Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
BSTB23	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

I. COURSE OVERVIEW:

Laminated composite materials are increasingly being used in a large variety of structures including aerospace, marine and civil infrastructure owing to the many advantages they offer: high strength/stiffness for lower weight, superior fa-tigue response characteristics, facility to vary fiber orientation, material and stacking pattern, resistance to electro-chemical corrosion, and other superior material properties of composites.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The analysis of rectangular composite plates using different analytical methods.

II. The Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT

III. The development of computer programs for the analysis of composite plates.

III.COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Apprehend the stress strain relationship of orthotropic and anisotropic materials.	Understand
CO 2	Assess the failure criterion and fracture mechanics of composites.	Understand
CO 3	Analyze the rectangular composite plates using the analytical methods.	Analyze
CO 4	Analyze the composite plates using advanced finite element method	Analyze
CO 5	Develop the computer programs for the analysis of composite plates	Create
CO 6	Analyze the rectangular laminated plates using finite element methods	Analyze

IV. SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09
Displacement Field Approximations for Classical Laminated Plate Theory (CLPT)and First Order Shear Deformation Theory (FSDT), Analytical Solutions for Bending of Rectangular Laminated Plates using CLPT.		
UNIT-II	GOVERNING EQUATIONS.	Classes: 09
Navier Solutions of Cross-Ply and Angle-Ply Laminated Simply-Supported Plates, Determination of Stresses. Levy Solutions for Plates with Other Boundary Conditions, Analytical Solutions for Bending of Rectangular Laminated Plates Using FSDT.		

UNIT-III	FINITE ELEMENT SOLUTIONS	Classes: 09
Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT. Stiffness Matrix and Truss element, truss element stiffness matrix, truss element bending function and Beam element		
UNIT-IV	INTRODUCTION TO FINITE ELEMENT METHOD	Classes: 09
Introduction to Finite Element Method, Rectangular Elements, Formation of Stiffness Matrix, Formation of Load Vector, Numerical Integration, Post Computation of Stresses		
UNIT-V	FEM MODELLING OF LAMINATED PLATES	Classes: 09
Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT. Finite Element Model, C0 Element Formulation, Post Computation of Stresses. Analysis of Rectangular Composite Plates using Analytical Methods.		
Text Books:		
1. J. N. Reddy , “Mechanics of Laminated Composite Plates and Shells”.		
Reference Books:		
1. Reddy J. N., CRC Press, “Mechanics of Laminated Composites Plates and Shells”.		
Web References:		
1. http://ethesis.nitrkl.ac.in/5685/1/110ME0327-3.pdf		
E-Text Books:		
1. http://ethesis.nitrkl.ac.in/5878/1/110ME0335-6.pdf		