

ANALYSIS OF LAMINATED COMPOSITE PLATES

III Semester: ST																													
Course Code	Category	Hours / Week			Credits	Maximum Marks																							
BSTC27	Elective	L	T	P	C	CIA	SEE	Total																					
		3	0	0	3	30	70	100																					
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45																								
<p>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.</p> <p>II. COURSE OBJECTIVES: The student will try to learn:</p> <ol style="list-style-type: none"> 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. <p>III. COURSE OUTCOMES:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="3" style="text-align: left; padding: 5px;">After successful completion of the course, students should be able to:</th> </tr> </thead> <tbody> <tr> <td style="width: 10%; text-align: center;">CO 1</td> <td style="width: 70%;">Apprehend the stress strain relationship of orthotropic and anisotropic materials.</td> <td style="width: 20%; text-align: center;">Understand</td> </tr> <tr> <td style="text-align: center;">CO 2</td> <td>Assess the failure criterion and fracture mechanics of composites.</td> <td style="text-align: center;">Understand</td> </tr> <tr> <td style="text-align: center;">CO 3</td> <td>Analyze the rectangular composite plates using the analytical methods.</td> <td style="text-align: center;">Analyze</td> </tr> <tr> <td style="text-align: center;">CO 4</td> <td>Analyze the composite plates using advanced finite element method</td> <td style="text-align: center;">Analyze</td> </tr> <tr> <td style="text-align: center;">CO 5</td> <td>Develop the computer programs for the analysis of composite plates</td> <td style="text-align: center;">Create</td> </tr> <tr> <td style="text-align: center;">CO 6</td> <td>Analyze the rectangular laminated plates using finite element methods</td> <td style="text-align: center;">Analyze</td> </tr> </tbody> </table> <p>IV. COURSE SYLLABUS:</p> <p>MODULE-I: INTRODUCTION (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.</p> <p>MODULE-II: GOVERNING EQUATIONS (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.</p> <p>MODULE-III: FINITE ELEMENT SOLUTIONS (09) Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT.</p>									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
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Stiffness Matrix and Truss element, truss element stiffness matrix, truss element bending function and Beam element

MODULE-IV: INTRODUCTION TO FINITE ELEMENT METHOD (09)

Introduction to Finite Element Method, Rectangular Elements, Formation of Stiffness Matrix, Formation of Load Vector, Numerical Integration, Post Computation of Stresses

MODULE-V: FEM MODELLING OF LAMINATED PLATES (09)

Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT. Finite Element Model, Element Formulation, Post Computation of Stresses.
Analysis of Rectangular Composite Plates using Analytical Methods.

V. TEXT BOOKS:

1. J. N. Reddy, “Mechanics of Laminated Composite Plates and Shells”, 1997.
2. Ye, Jianqiao. “Laminated Composite Plates and Shells: 3D Modeling”. Springer Science & Business Media, 2002.

VI. REFERENCE BOOKS:

1. Reddy J. N., CRC Press, “Mechanics of Laminated Composites Plates and Shells”, 1997.

VII. WEB REFERENCES:

1. <http://ethesis.nitrkl.ac.in/5685/1/110ME0327-3.pdf>

VIII. E-TEXT BOOKS:

1. <http://ethesis.nitrkl.ac.in/5878/1/110ME0335-6.pdf>