



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

ANALYSIS OF LAMINATED COMPOSITE PLATES								
III Semester: ST								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BSTD27	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 48		Total Tutorials: Nil		Total Practical Classes: Nil			Total Classes: 48	
Prerequisite: Theory of Plates and Shells								

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 fatigue 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.
- CO 2 Assess the failure criterion and fracture mechanics of composites.
- CO 3 Analyze the rectangular composite plates using the analytical methods.
- CO 4 Analyze the composite plates using advanced finite element method
- CO 5 Develop the computer programs for the analysis of composite plates
- CO 6 Analyze the rectangular laminated plates using finite element methods

IV. COURSE CONTENT:

MODULE-I: INTRODUCTION (10)

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.

MODULE-II: GOVERNING EQUATIONS (10)

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.

MODULE-III: FINITE ELEMENT SOLUTIONS (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

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 (10)

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. ELECTRONICS RESOURCES:

1. <http://ethesis.nitrkl.ac.in/5685/1/110ME0327-3.pdf>
2. <http://ethesis.nitrkl.ac.in/5878/1/110ME0335-6.pdf>

VIII. MATERIALS ONLINE:

1. Course Template
2. Tutorial Question Bank
3. Assignments
4. Model Question Paper – I
5. Model Question Paper - II
6. Lecture Notes
7. Power point presentation