

| COURSE CODE | COURSE TITLE | L | T | P | C |
|-------------|-----------------------------|---|---|---|---|
| 1152AE137 | Theory of plates and shells | 3 | 0 | 0 | 3 |

Course Category:

Programme Elective

a. Preamble:

The course involves the ideas about classical theory of plates on rectangular and circular plates with various boundary conditions. The students will get introduced to approximation methods for free vibration analysis of plates and shells.

b. Prerequisite Courses:

Aircraft structural analysis

Engineering mathematics

c. Related Courses:

Nil

d. Course Educational Objectives:

- To understand the bending of thin plates with small deflection
- Circular plates, rectangular plates and their stability analysis
- To design and analyse circular and cylindrical shells

e. Course Outcomes:

Upon the successful completion of the course, students will be able to:

| CO Nos. | Course Outcomes | Knowledge Level (Based on revised Bloom's Taxonomy) |
|---------|--|---|
| CO1 | Understand concept of Classical Plate Theory | K2 |
| CO2 | Analyse lateral loaded rectangular and circular plates | K3 |
| CO3 | Determine the Eigen values of Rectangular Plates | K3 |
| CO4 | Use approximation methods for rectangular plates | K3 |
| CO5 | Design of circular and cylindrical shells | K3 |

f. Correlation of COs with POs:

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

H- High; M-Medium; L-Low

UNIT I CLASSICAL PLATE THEORY 9

Classical Plate Theory – Assumptions – Differential Equation – Boundary Conditions.

UNIT II PLATES OF VARIOUS SHADES 9

Navier’s Method of Solution for Simply Supported Rectangular Plates –
Leavy’s Method of Solution for Rectangular Plates under Different Boundary Conditions.
Governing Equation – Solution for Axi-symmetric loading – Annular Plates – Plates of other shapes.

UNIT III EIGEN VALUE ANALYSIS 9

Stability and free Vibration Analysis of Rectangular Plates.

UNIT IV APPROXIMATE METHODS 9

Rayleigh – Ritz, Galerkin Methods– Finite Difference Method – Application to Rectangular Plates for Static, Free Vibration and Stability Analysis.

UNIT V SHELLS 9

Basic Concepts of Shell Type of Structures – Membrane and Bending Theories for Circular Cylindrical Shells.

TOTAL : 45

REFERENCES:

1. Timoshenko, S.P. Winowsky. S., and Kreger, “Theory of Plates and Shells”, McGraw-Hill Book Co. 1990.
- 2.K.Chandrashekhara, “Theory of Plates”, Universities Press.
3. S.S Bhavikatti, “Theory of Plates and Shells”.
4. Flugge, W., Stresses in Shells, Springer - Verlag, 1980.