Course Code	Course Title	L	T	P	C
20SE018	THEORY OF PLATES AND SHELLS	3	0	0	3

PRE-REQUISITE COURSES: Theory of Elasticity

COURSE OBJECTIVES:

The aim of this course is to introduce the concept of plate theory, the behaviour and analysis of thin plates, rectangular plates, circular plates and to present the foundations of the classical theory of shells based on the Kirchhoff-Love assumptions. It also aims to study the classification of shell surfaces.

COURSE OUTCOMES:

At the end of the course student will be able to

CO's	Course Outcomes	PO's
1	Assess the strength of plate panels under point, linearly varying and uniformly distributed loads.	1,2
2	Analyze plates under different boundary conditions by various classical methods and approximate methods.	1,2
3	Familiar with classification of shells and classical shell theories and apply them in engineering design	1,2
4	Exposed to singly curved shells, doubly curved shells and cylindrical shells.	1,2

SKILLS:

- ✓ Ability to analyze the plate with different boundary conditions.
- ✓ Ability to understand the basis of finite element software.

UNIT-I:

INTRODUCTION TO PLATE THEORY: Thin Plates with small deflection. Laterally loaded thin plates, governing differential equation, various boundary conditions

UNIT-II:

RECTANGULAR PLATES: Rectangular plates. Simply supported rectangular plates, Navier solution and Levy's method, Rectangular plates with various edge conditions, plates on elastic foundation.

UNIT-III:

SYMMETRICAL BENDING OF CIRCULAR PLATES: Differential equation for symmetrical bending of laterally loaded circular plates - Simply supported edges - Clamped edges - Circular plate with a circular hole at the center - Circular plate concentrically loaded.

UNIT-IV:

INTRODUCTION TO SHELLS: Structural behavior of shells - classification of shells - translational and rotational shells - ruled surfaces - Gaussian curvature - synclastic and anticlastic surfaces. Principal curvatures and lines of curvature

UNIT-V:

CYLINDRICAL SHELLS: Membrane theory of cylindrical shells; Bending theory of cylindrical shells loaded Symmetrically – Approximate solution by Schorer's method, Beam method of analysis

TEXT BOOKS:

1. S.P.Timoshenko and S.Woinowsky-Krieger, "Theory of plates and shells" McGraw-Hill, 1959.
2. A.C.Ugural, "Stresses in Plates and Shells", McGraw-Hill, 1999.
3. Chandrashekahara, K., "Theory of Plates", University Press (India) Ltd., Hyderabad, 2001.

REFERENCE BOOKS:

1. T.K.Varadan and K.Bhaskar , "Analysis of plates", Narosa Publishing House, 1999.
2. Flugge. "Stresses in Shells" , Blaisdell Publishing Co, 1966
3. 3.G.S.Ramaswamy, "Design and construction of concrete shell roofs", CBS Publishers&
4. Distributors,1986.
5. Szilard.R, "Theory and Analysis of Plates – classical and numerical methods", Prentice Hall Inc., 2004
6. 5.Reddy J N, "Theory and Analysis of Elastic Plates and Shells", McGraw Hill Book company, 2006.

LABORATORY EXPERIMENTS

List of Experiments:

Any 6 of the following experiments are to be carried out:

1. Testing of I steel section for flexure and shear
2. Testing of steel column of different sections under axial loading
3. Testing of Welded and Bolted steel connections
4. Testing of portal frames
5. Testing of Light-gauge purlins and roof structures
6. Testing of beam column joints
7. Testing of Plastic analysis of steel sections
8. Testing of cold-formed steel sections
9. Analysis and design of steel sectionsunder different loading conditions by using latest software like STAAD Pro, Ansys etc.
10. Analysis and design of multi storey buildings by using latest software like STAAD Pro etc.
11. Analysis and design of Industrial building by using latest software like STAAD Pro etc