THEORY OF PLATES AND SHELLS

I Semester: ST								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BSTC03	**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**		

I. COURSE OVERVIEW:

Plates and shells exhibit two dimensional structural actions that result in stronger, thinner and lighter structures and therefore, have economic advantage. This has opened the scope for the wide use of such elements in all fields of engineering due to significant increase of strength/weight ratio. The exposure to this course and its completion are very essential in understanding the behaviour of thin structures for their applications in design.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Formulation of differential equations for bending of thin rectangular and circular plates.
II. The theory of large deflection of plates for efficient and economical design.
III. The numerical techniques and tools for the complex problems in thin plates.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Analyse the analytical solutions for rectangular plates by using Navier and Levy's methods, distributed and concentrated loads	Analyse
CO 2	Explain Governing differential equations in polar coordinate system of a annular plate subjected to different loading conditions for the design of thin plates.	Understand
CO 3	Examine the governing differential equation of rectangular plates on elastic foundations for the design of foundations.	Analyse
CO 4	Outline the general theory in bending of cylindrical shell, simplified method for analysis and design of the shells.	Apply
CO 5	Solve the governing equation of plate bending under the combined action of in plane loading and lateral loads for the design of plates.	Apply
CO 6	Examine the buckling of rectangular plates by compressive forces acting in one and two directions for the analysis of plates.	Analyze

IV. SYLLABUS:

MODULE-I: THIN RECTANGULAR PLATES (09)

Bending of thin plates, assumptions, governing differential equations in cartesian coordinate system, Boundary conditions, analytical solutions for rectangular plates by Navier and Levy's methods, distributed and concentrated loads.

MODULE-II: CIRCULAR PLATES (09)

Circular plates: Governing differential equations in polar coordinate system, annular plate, rotationally symmetric loading, eccentric concentrated load, simultaneous bending and stretching of thin plates, introduction to large deflection theory of plates.

MODULE-III: PLATES ON ELASTIC FOUNDATIONS (09)

Plates on elastic foundations, governing differential equation and deflection of uniformly loaded simply supported rectangular plate.

Navier and Levy type solutions, large plate loaded at equidistant points by concentrated forces.

MODULE-IV: SHELLS (09)

Shells , geometry and classifications, stress resultants, membrane theory and its applications to shells of surface of revolutions, membrane theory for cylindrical shell, general theory in bending of cylindrical shell, simplified method for cylindrical shell.

MODULE-V: BUCKLING OF THIN PLATES (09)

Buckling of plates: Governing equation for bending of plate under the combined action of inplane loading and lateral loads, buckling of rectangular plates by compressive forces acting inone and two directions in the middle plane of plate.

V.TEXT BOOKS:

1. Timoshenko S. and Krieger, "Theory of Plates and Shells", W. McGraw Hill, 1959.
2. Chandra shekhara. K, "Theory of Plates", Universities Press, 2001.
3. Timoshenko ,"Theory of Plates and Shells" , Tata MC Graw Hill, 1959.

VI.REFERENCE BOOKS:

1. UguralAnselC,"Stresses in Plates and Shells", McGraw Hill, 2009.
2. Kraus.H, "Thin Elastic Shells", John Wiley and Sons, 1998.
3. Rama swamy.G.S., "Design and Construction of Concrete Shells", 2001.

VII. WEB REFERENCES:

1. https://pdfs.semanticscholar.org/presentation/ce6d/b61238325d60d3f6dc0f1fbe7af33e397 2c1.pdf

VIII. E-TEXT BOOKS:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-081j-plates-and-shells-spring-2007/readings/lecturenote.pdf.
2. http://community.wvu.edu/~bpbettig/MAE456/Lecture_10_Shell_Elements_b.pdf