GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: STRUCTURAL ENGINEERING (20)
SUBJECT NAME: Theory of Thin plates & shells

SUBJECT CODE:3712016

Type of course: Elective (PE-II)

Prerequisite:
 Mechanics of Solids, Structural Analysis and Engineering Mathematics

Rationale:
Plates and Shells have become important structural forms of modern infrastructures. Analysis of such structure requires rigorous mathematical treatment. It is essential to understand structural behavior and analysis of plates and shells for their safe design. The course on Plates and Shell equips the students with analysis methodology of plates and shell using analytical methods.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No	Content	Total Hrs.	%Wt.
1.	**Introduction:** Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory,Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.	4	10 %
2.	**Static Analysis of Plates**: Governing Equation for a Rectangular Plate, NavierSolution for Simply- Supported Rectangular Plate under Various Loadings, Levy solution for Rectangular Plate with other Boundary Conditions	9	20 %
3.	**Circular Plates:** Analysis under Axi- Symmetric Loading, Governing Differential Equation in Polar Co-ordinates. Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates.	9	20 %
4.	**Static Analysis of Shells: Membrane Theory of Shells** - Cylindrical, Conical and Spherical Shells,	8	20 %
5.	**Shells of Revolution: with Bending Resistance** - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels.	8	20 %
6.	**Thermal Stresses in Plate/ Shell**	4	10 %

Reference Books:

• Theory of Plates and Shells, Timoshenko S. and Krieger W., McGraw Hill.
• Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
• Thin Elastic Shells, KrausH., John Wiley and Sons.
• Theory of Plates, Chandrashekhara K., Universities Press.
• Design and Construction of Concrete Shells, Ramaswamy G.S.

Course Outcome:

After learning the course the students should be able to:

1. Use analytical methods for the solution of thin plates and shells.
2. Use analytical methods for the solution of shells.
3. Apply the numerical techniques and tools for the complex problems in thin plates.
4. Apply the numerical techniques and tools for the complex problems in shells.

List of Experiments/Assignments:

Tutorial work shall consist of presentations / problems / preparation of learning material based on above topics. Apart from above assignments a group of students has to undertake one open ended design problem based on engineering application of Thin plates & shells.

List of Open Source Software/learning website:

- http://ocw.mit.edu/courses/mechanical-engineering/2-081j-plates-and-shells-spring-2007/
- http://nptel.ac.in/courses/112101095/34
- http://nptel.ac.in/courses/112101095/38