SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Master of Technology
Structural Engineering

M. Tech. I Semester I

Subject Name: Thin Plates and Shells **Subject Code:** MTST14104

Type of course: PE - II

Prerequisite: Engineering Mechanics, Strength of Materials, Structural Analysis & Engineering Mathematics

Rationale: Modern Age Structures includes Plates and Shells as Structural Forms. Analysis of such structure requires rigorous understanding of their structural behaviour under the action of expected loading conditions. Proper understanding structural behaviour leads to structural analysis and design component which will be safe and serviceable. This course on Thin Plates and Shell reinforces the students with analysis methodology of plates and shell.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Laterally Loaded Plates** : Theory of bending of thin plates with lateral loads-Governing differential equation and various boundary conditions - in Cartesian and Polar coordination.	07	15%
2	**Rectilinear Plates**: Classical solution for rectangular plates with different types of loads and boundary conditions - Navier's and Levy's solution methods - continuous plates (introduction only).	07	15%
3	**Circular Plates**: Symmetrical bending of circular plates, plates on elastic foundation.	07	15%
4	NUMERICAL AND APPROXIMATE METHODS: Finite Difference Methods - improved finite difference Methods - Energy Methods - Variational Methods - Galerkin's Methods - Matrix displacement Methods - Lattice analogy - application to plates.	07	15%
5	**Classification Of Shells And Shell Theories**: Singly curved and doubly curved shells - developable and non-developable - other special types Classification of shell theories - non-linear shell theory - Indian Code Recommendations - Recommendations of ACI committee 334.	04	10%
6	**Membrane Theory Of Thin Shells:** Cylindrical Shell, Spherical Shell, Conical Shell	06	15%

PE - II: Programme Elective - II

7	**Bending Theory Of Thin Shells:** Cylindrical Shell, Spherical Shell, Conical Shell	**07**	**15%**

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**30**	**20**	**10**	**10**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of Publication	Publication Edition
01	Theory of plates and shells	Stephen P. Timoshenko, J. N. Goodier	McGraw Hill	2010	3rd Edition
02	Stresses in Plates and Shells	Ansel C. Ugural	McGraw Hill	2001	2nd Edition
03	Theory of Plates	Chandrashekhara K.,	Universities Press 9788173712531	2000	1st Edition
04	Theory and Analysis of Elastic Plates	J.N. Reddy	Taylor & Francis	2006	2nd Edition
05	Theory and Analysis of Plates : Classical and Numerical Methods	R. Szilard	Prentice Hall	1973	1st Edition
06	Fundamentals of the Analysis and Design of Shell Structures	V.S. Kelker and R.T. Sewell	Prentice Hall	1987	1st Edition

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	To understand behaviour of Thin Plates under different loading and support conditions *(R, U, A – Cognitive Level)*	30%
CO-2	Use the analytical method for solution of thin rectilinear and circular plates *(U, N, E, C – Cognitive Level)*	25%
CO-3	To understand different types of thin shell geometry and its behaviour under different loading conditions *(R, U, A – Cognitive Level)*	15%
CO-4	Use the Membrane Theory for solution of thin shells – Cylindrical, Spherical and Conical *(U, N, E, C – Cognitive Level)*	15%
CO-5	Use the Bending Theory for solution of thin shells – Cylindrical, Spherical and Conical *(U, N, E, C – Cognitive Level)*	15%

FOR TUTORIAL SESSIONS:

List of Tasks:

- Group of Students have to prepare presentation based on topics of subject as well as individually students have to write / solve assignments
- Group of Students have to model application problem based on Plate and Shell Structure in Computer Software and undergo analysis / behaviour study

List of Open Source/learning website:

- https://ocw.mit.edu/courses/mechanical-engineering/2-081j-plates-and-shells-spring-2007/download-course-materials/
    - Course Materials on Plates and Shells
- http://nptel.ac.in/courses/112101095/34
    - Course Materials on Plates and Shells by Prof. S. K. Maiti