BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
FIRST SEMESTER 2015-2016
Course Handout Part II

Date: 03-08-2015

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **CE G553**

Course Title : **Theory of Plates and Shells**

Instructor-in-charge : **SHUVENDU NARAYAN PATEL**

❖ Scope and Objective of the Course:

The understanding about the analysis procedure and the theory of plates and shells is required for accurately design such structure. Plates act similar to beams with bending and shear stresses, whereas shells are analogous to a cable which resists loads through tensile stresses. A primary difference between a shell structure and a plate structure is that, in the unstressed state, the shell structure has curvature as opposed to plated structure which is flat. Membrane action in a shell is primarily caused by in-plane forces, though there may be secondary forces resulting from flexural deformations. Typical applications of shells are fuselages of aeroplane, containment shells, mechanical and automobile parts, and roof structures.

This course introduces theory, design, and stability analysis of plates and shells. The course is aimed at providing students with advanced knowledge of principles and applications of bending of plates, membrane theory and bending of shells, and stability of plates and shells.

❖ Text Book:

- Timoshenko, S.P. and Kreiger, S.W., Theory of plates and shells, McGraw-Hill, 2nd ed., 1959.

Reference Book:

- Gould, P.L., Analysis of shells and plates, Springer Verlag, 1988
- Reddy, J.N., Theory and analysis of elastic plates and shells, 2nd ed., 2007
- Dayaratnam, P., Design of Reinforced Concrete structures, Oxford and IBH Publications, 1983,
- Ramawamy, G.S., Design and Construction of concrete Shell Roofs, McGraw-Hill, 1968.

❖ Course Plan :

Topic	No of Lectures	Reference
Introduction to the analysis of plates and shells structure	2	
Bending theory of flat plates:	7	T: Ch 2

Thin plates: Kirchoff theory – strain-displacement relations, constitutive equations, equilibrium equations, boundary conditions, derivation of theory from principle of virtual work,		
Rectangular plates-solution by double Fourier series	3	T: Ch 5
Circular plates	2	T: Ch 3
Edge effects	3	T: Ch 6
Anisotropic and layered plates	2	T: Ch 11, J
Thick plates: Reissner-Mindlin-Naghadi type theories	2	J
Plates on elastic foundation	2	T: Ch 8, J
Moderate deflection analysis and buckling of plates	2	T: Ch 12 & CH 13, J
Membrane theory of shells: equilibrium equations, application to shells of revolution under axi-symmetric loads, applications to cylindrical shells under asymmetric loads	9	T: Ch 14
Bending theory of shells: kinetic assumptions and strain displacement relations, cylindrical shell under axi-symmetric loads, bending of cylindrical shells	9	T: Ch15 & Ch 16, J

Note: J → Journal Papers

- **Evaluation Scheme:**

Evaluation Component No	Evaluation Component	Duration	Weightage	Date time and Venue	Nature of component.
1	Mid-Semester Test	1-hour and 30-minutes	25%	5/10 4:00 - 5:30 PM	CB
2	Project, Assignments, Seminars, Take Home Tests, Class Test.		40%	Continuous	OB
3	Comprehensive Examination	3-hours	35%	2/12 AN	CB

- **Chamber Consultation Hour:** To be announced in the class.
- **Notice:** All concerning notices will be displayed on the **Notice Board of Civil Engg Department only**.

Instructor-in-charge
CE G553