(CE506) THEORY OF PLATES AND SHELLS

Objective of the Course:

To enable the student analyse and design thin shell structures including domes, hyperbolic, paraboloid, elliptic and cylindrical shells.

UNIT-I:

Bending of Long Rectangular Plates to a Cylindrical Surface

Differential equation for cylindrical bending of plates – Uniformly loaded rectangular plates with simple supported edges and with built in edges.

UNIT-II:

Pure bending of plates

Slopes – Curvatures of bent plates – Relations between bending moments and curvature –

Particular cases – Strain energy in pure bending – Limitations. Symmetrical bending of circular plates: Differential equation – Boundary conditions.

UNIT-III:

Simply supported rectangular plates under sinusoidal loading

Naviers solution and its application to concentrated load – Levy's solution for uniformly distributed load or hydrostatic pressure.

UNIT-IV

Introduction to Shells

Parametric representation of a surface; The first quadratic form; Equation to the normal of a surface; The second quadratic form; Principal curvatures, Gauss curvature, and lines of curvature; Some definitions; Classification of shell surfaces.

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. Theory of plates and shells by S.P.Timoshenko and S.Woinowsky-Krieger, McGraw-Hill, 1959.
2. Stresses in plates and shells by A.C.Ugural, McGraw-Hill, 1999.

REFERENCE BOOKS:

1. Analysis of plates by T.K.Varadan and K.Bhaskar , Narosa Publishing House, 1999.
2. "Stresses in Shells" by Flugge. Blaisdell Publishing Co, 1966
3. Design and construction of concrete shell roofs by G.S.Ramaswamy, CBS Publishers& Distributors,1986.