



THE UNIVERSITY OF VIRGINIA
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE/AM 604 - Plates and Shells

Spring, 2008

AM/CE/MANE 604 - Plates and Shells

Instructor: Thomas T. Baber
D212 Thornton Hall
434-924-6360

Office Hours: To be announced

Recommended Text: Reddy, J. N., *Theory and Analysis of Elastic Plates*, Taylor and Francis, 1998.

Main References:

Shames and Dym, *Energy and Finite Element Methods in Structural Mechanics*, Ch. 6, 7.8-7.12, 8.13-8.16, 13.

Timoshenko and Woinowsky-Krieger, *Theory of Plates and Shells*

Ugural, *Stresses in Plates and Shells*, McGraw-Hill, 1999

Whitney, *Structural Analysis of Laminated Anisotropic Plates*

Zienkiewicz and Taylor, *The Finite Element Method*, Vol. 2 (4th edition), Ch. 1 & 2.

Additional References:

Bleich, *Buckling Strength of Metal Structures*, Ch. 9-12.

Timoshenko and Gere, *Theory of Elastic Stability*, Ch. 8 & 9.

These texts are referred to in the context of plate buckling.

Probable Coverage: (as time permits)

1. Thin Isotropic plates:

- Kirchhoff-Love Theory: Basic assumptions and Newtonian formulation of the governing equations, Boundary conditions.
- Solution of various bending problems involving distributed and point loadings
- Variational formulation of the theory
- non-conforming and C_1 (conforming) finite element models

2. Stability of Thin Plates

- Von Karman Theory, linearized buckling equations
- Solutions of various buckling problems
- Postbuckling behavior of plates
- Plates with initial geometric imperfections

3. Isotropic plates: Reissner-Mindlin Theory

- Basic assumptions and governing equations
- Solutions of the Reissner-Mindlin plate equations
- Variational formulation, and finite element models for shear deformable plates

4. Analysis of shells using flat plate finite element models and thick shell elements (This topic is actually a secondary result of the plate bending models introduced under topic 1.)

5. Possible additional topics as time permits:

- Bending and buckling of orthotropic and anisotropic laminated composite plates, first order theory
- Thin and shear deformable models of laminated plates using finite elements
- Introduction to thin shells - membrane and bending models
- Finite difference solutions for thin elastic plates

Grading:	Homework:	20%
	Tests:	40%
	Exam:	40%