

# THEORY OF PLATES AND SHELLS

MTM G232, Key 36745, Fall 2008

**INSTRUCTOR** : Prof. Sinan Müftü, 369 SN, 617-373-4743, smuftu@coe.neu.edu

**CLASS HOURS** : Tuesday, Friday, 11:45am - 1:25 pm

**OFFICE HOURS** : 2-3 pm Fridays or by appointment

**CLASS LOCATION:** 243 Ryder Hall

**PREREQUISITE** : MTM G200 or G201, and MTMG220, consent of the instructor

**TEXTBOOK** : **Thin Plates and Shells: Theory, Analysis and Applications**  
by Eduard Ventsel and Theodor Krauthammer  
Marcel Dekker, Inc. New York, Basel, ISBN: 0-8247-0575-0

**WEB PAGE** : <http://blackboard.neu.edu>

## COURSE DESCRIPTION:

This course covers the mechanics of plates using classical theory (cylindrical bending, rectangular plates, and circular plates) and plate theory with shear deformation. Includes combined effects of bending and in-plane forces, buckling of plates, moderately large deflections, membrane theory of shells, analysis of thin cylindrical shells of revolution, and general theory of thin elastic shells.

## EXAMS AND GRADING:

Homeworks -	20%
Mid-Term Exam I -	22.5%
Mid-Term Exam II -	22.5%
Final Exam -	35%

- No late homework will be accepted.
- Make-up exams will only be given under unusual conditions with the *prior* approval of the instructor. A grade penalty may be applied.
- Grades of incomplete ("I" Grades) will be given only under extraordinary circumstances at the discretion of the instructor.

## SCHEDULE

Tuesday	October 21, 2008	Conference
Tuesday	November 11, 2008	Veterans' day (no class)
Friday	November 28, 2008	Thanksgiving Holiday (no class)
Monday	December 15, 2008	First day of final exams

## TOPICS COVERED

### 1. Introduction

## THIN ELASTIC PLATES

### 2. Governing Equations of Small Deflection Plate Theory

### 3. Analytical Solutions for Rectangular Plates

### 4. Analytical Solutions for Circular Plates

### 5. Large Deflection Theory of Plates

### 6. *Advanced Topics* (As time allows)

- *Multilayered plates*

- *Sandwich plates*

- *Buckling of plates*

- *Vibration of Plates*

## THIN ELASTIC SHELLS

### 7. Introduction

### 8. Geometry of the middle surface

### 9. General Theory of Shells

### 10. Membrane theory of shells

### 11. Bending Theory of Shells

## REFERENCES

- **Theory of Plates and Shells**, S.P. Timoshenko and S. Woinkowsky-Krieger, McGraw-Hill Book Company, NY. 2<sup>nd</sup> edition 1959, reissued 1987 ([QA931 .T56 1959](#))
- **Stresses in Shells**. W. Flügge, Springer-Verlag, Berlin, 2<sup>nd</sup> Edition, 1960, 2<sup>nd</sup> printing, 1990 ([TA660.S5 F58 1973](#)).
- **Beams, Plates and Shells**, L.H. Donnell, McGraw-Hill Book Company, NY., 1976 ([TA660.B4 D66](#))
- **Shell Theory**, F. I. Niordson, North-Holland, Amsterdam, 1985 ([TA660.S5 N56 1985](#))
- **Stresses in Plates and Shells**, A. Ugural, McGraw Hill, 1999. ([TA660.P6 U39 1999](#))
- **Analysis of Shells and Plates**, P.L. Gould, Springer-Verlag, 1988, ([TA660.S5 G644 1988](#))
- **Structural mechanics: the behavior of plates and shells**, J. R. Vinson, Wiley, New York, 1974, ([TA660.P6 V55 1974](#))
- **The Buckling of Plates and Shells**, H.L. Cox, Macmillan, NY, 1962 ([TA460 .C6x](#))
- **Introduction to the Theory of Shells**, C.L. Dym, Hampshire Publishing Corp., 1990. ([QA935 .D89 1990](#))
- **The Behavior of Thin Walled Structures: Beams, Plates and Shells**, J.R. Vinson, Dordrecht, Netherlands ; Boston : Kluwer Academic Publishers, 1989 ([TA660.T5 V56 1989](#)).
- **Theory of Elastic Stability**, S.P. Timoshenko and J.M. Gere, McGraw-Hill, NY, 1961, ([QA931 .T54 1961](#))