THE UNIVERSITY OF TEXAS AT AUSTIN

EM 388/ASE 384P.1: Solid Mechanics I

Fall 2005

SYLLABUS

UNIQUE NUMBERS: 12910, 13305

INSTRUCTOR: Rui Huang
WRW 117D, 471-7558, ruihuang@mail.utexas.edu

CLASS TIME: T/Th 9:30 to 11 a.m.

CLASS ROOM: WRW 312

OFFICE HOURS: Open

SYNOPSIS:
"Elasticity is one of the crowning achievements of western culture!" (George Zahalak)
This course introduces the mathematical theory of linear elasticity and presents solution procedures to some basic problems that are of engineering interest. It establishes the foundation for more advanced studies in related areas of solid mechanics.

PREREQUISITES: Strength of Materials or equivalent

TEXTBOOK:
Phillip L. Gould, ***Introduction to Linear Elasticity*** (Second Edition), Springer-Verlag, NY 1994.

Recommended References:

Martin H. Sadd, ***Elasticity: Theory, Applications, and Numerics***, Elsevier, 2005.
L.D. Landau and E.M. Lifshitz, ***Theory of Elasticity*** (3rd edition), Pergamon Press, 1986.
S. Timoshenko and J. N. Goodier, ***Theory of Elasticity***, McGraw-Hill, l951.
Y. C. Fung, ***Foundations of Solid Mechanics***, Prentice Hall, l965.
J.R. Barber, ***Elasticity***, Kluwer Academic Publishers, 1992.
E. E. Sechler, ***Elasticity in Engineering***, Dover Productions l952.
I.S. Sokolnikoff, ***Mathematical Theory of Elasticity*** (Second Edition), McGraw-Hill, l956.
J.P. Ward, ***Solid Mechanics, an Introduction***, Kluwer Academic Publishers, 1992.

TOPICS:

- **Introduction and Mathematical Preliminaries**: scalar, vector, and tensor; index notation; coordinate transformation; tensor algebra and calculus; integral theorems

- **Stress and Equilibrium**: forces and tractions; state of stress; stress transformation; principal stresses; stress invariants; equilibrium equations

- **Displacement and Strain**: general deformation; small deformation theory; strain tensor; compatibility

- **Linear Elasticity:** strain energy; generalized Hooke's Law; anisotropic and isotropic elastic constants; displacement equation of motion; boundary conditions and uniqueness; general solution procedures

- **Plane Problems**: plane-stress and plane-strain equations; Airy stress function; axisymmetric problems; bending; torsion

- **Selected Problems**: crack-tip solution; dislocation; 3D surface loading

GRADING: Homework (25%), Midterm Exam (25%), and Final (50%).

EVALUATION:
The Measurement and Evaluation Center forms for the College of Engineering will be used during the last week of class to evaluate the course and the instructor.

SPECIAL NOTES:
The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TDD or the College of Engineering Director of Students with Disabilities at 471-4321.