MECHANICS OF MATERIALS II

CVEN 4161-010

Spring 2006

Instructor: Kaspar Willam

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Prerequisites: CVEN 3161 Mechanics of Materials I

Course Organization:

- Lectures: TR 12:30-1:45 pm, ECCR 1B51
- Assignments (20 %): Homework and Reading.
- Two Midterm Examinations (20 %): Feb 21 and March 21, 2006
- Final Examination (30 %): Saturday, May 6, 2006, 10:30 am - 1:00 pm
- Term-Projects (30 %): Individual Reports of three Lab Experiments.

Textbook:

- Bedford & Lichti, *"Mechanics of Materials"*
  Prentice-Hall Inc., Upper Saddle River NJ 07458, 2000.

Background References:

- Arthur P. Boresi and Richard J. Schmidt, "Advanced Mechanics of Materials"
  Sixth Edition, John Wiley & Sons, Inc., New York, 2003.
- Kaspar J. Willam, "Constitutive Models for Materials",
  Encyclopedia of Physical Science & Technology, 3rd Edition, Academic Press, 2002.
  http://civil.colorado.edu/∼willam/matl01.pdf

Software:

- MATLAB, MATHEMATICA, ABAQUS Finite Element Software

Course Outline

1. Preliminaries — Jan 17 - Jan 19
   - Principles of Mechanics of Materials
   - Elements of Stress and Strain
   - Mohr Circle vs Eigenvalue Analysis
2. States of Stress — Jan 24 - Jan 31
   - Transformations in Plane Stress, Mohr's Circle
   - Principal Stresses in 3-D
   - Tetrahedron Argument
3. States of Strain — Feb 2 - Feb 7
   - Transformations in Plane Strain, Strain Rosette
   - Principal Strains in 3-D
4. Material Behavior — Feb 9 - Feb 16
   - Stress-Strain Relations
   - Linear Elastic Material Behavior
   - Failure Conditions: Strength, Ductility and Toughness

   Midterm Examination 1: Tuesday, Feb 21, 2006
5. Flexure of Elastic Beams — Feb 23 - Mar 2
   - Elementary Beam Theory
   - Symmetric Cross Sections
   - Unsymmetric Cross Sections
   - Deflections of Beams
6. Stability of Columns — Mar 2 - Mar 21
   - Concepts of Stability
   - Elastic Buckling: Euler Buckling Load
   - Column under Eccentric Loading
   - Secant Formula
   - Inelastic Buckling: Tangent vs Reduced Moduli Methods

   Midterm Examination #2: Thursday, Mar 23, 2006
7. Failure Analysis — Apr 4 - May 4
   - Failure due Overloads and Repeated Loads
   - Elastic Stress Concentrations
   - Plastic Yielding: Limit Analysis
   - Fracture and Fatigue
   - Fatigue

   Final Examination: Saturday, May 6, 2006, 10:30 am - 1:00 pm