Special Topics
in
MECHANICS OF MATERIALS

CVEN 6831-002, Call No 23839
Spring 2001

Instructor: Kaspar Willam
Office: ECOT 456, hrs: MWF 10:00 - 11:00 a.m.,
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Prerequisites: Interest in Mechanics of Materials

Course Work:

- Lectures: MWF 11:00-11:50 p.m., ECCR 108
- Assignments (20 %): Homework and Reading Assignments.
- Term-Project (30 %): One Term-Project.
- One Take-Home Midterm Examination (20 %)
- Final Examination (30 %): Tuesday, May 8, 2001, 7:30 - 10:00 p.m.

Reference Texts:

- Irving H. Shames and Francis A. Cozzarelli, “Elastic and Inelastic Stress Analysis”,
- W.-F. Chen and D.J. Han, “Plasticity for Structural Engineers”,
- Kaspar J. Willam, “ Constitutive Models for Materials”,
  http://civil.colorado.edu/ willam/mat101.pdf

Software:

- Constitutive Driver for Plasticity and Elastic Degradation, by E. Hansen, PhD 2000
  Visual C++, Digital Fortran
- MATLAB, MATHEMATICA, Indigenous FE-Software
Course Outline

1. Preliminaries
   - Principles of Mechanics and Materials
   - Physical Mechanisms at Different Levels of Observation
   - Elements of Continuum Mechanics

2. Classification of Material Behavior
   - Experimental Techniques
   - Schematic Representation of Input-Output
   - Rheological Elements of Elastic and Inelastic Material Behavior

3. Linear Elasticity
   - Phenomenological Aspects of Stiffness
   - Isotropic and Anisotropic Elasticity
   - Thermoelasticity, Poroelasticity
   - Computational Elements of Coupled Elasticity

4. Plasticity
   - Phenomenological Aspects of Strength
   - Elastoplastic Material Models
   - Limit Load Theorems and Shake-Down Analysis
   - Computational Elements of Plasticity

5. Damage Mechanics
   - Phenomenological Aspects of Stiffness Degradation
   - Elastic Scalar Damage Models
   - Thermodynamic Background
   - Computational Elements of Elastic Degradation

6. Fracture Mechanics
   - Phenomenological Aspects of Fracture
   - Crack Initiation and Crack Propagation
   - Fatigue and Fracture
   - Computational Elements of Fracture Mechanics