

53:246 (58:258) Continuum Mechanics and Plasticity

1. Introduction
2. Infinitesimal theory of plasticity
 - (i) Experimental observations
 - (ii) Classical theory: Tresca, von Mises, strain-hardening
 - (iii) Multi-axial effects:
 - (a) Combined axial-torsion of mild steel, strain-control, stress-control
 - (b) Ohashi's experiments
 - (iv) Applications: 3-bar truss, beam
 - (v) Modern theories (Homework: write about two-surface theory)
3. Finite plastic deformation
 - (i) Experiments in finite deformation
 - (ii) Multiplicative decomposition of deformation
 - (iii) Objective rates and the concept of plastic spin
 - (iv) The classical theory in finite deformation
4. Curvilinear coordinate system
Fundamentals in tensor calculus
Large plastic deformation
5. Thermo-mechanical theory of plasticity
 - (i) Concepts of thermodynamics
 - (ii) Internal variables approach
 - (iii) The endochronic theory of plasticity

Exams:

Two midterms (100 points each) plus a term paper and oral presentation at the end of the semester (100 points).

Books on reserve in the Engineering Library:

1. Hill, R., *The Mathematical Theory of Plasticity*, Clarendon Press: Oxford, 1950.
2. Chakrabarthy, J., *The Theory of Plasticity*, McGraw-Hill, 1987.
3. Khan & Huang, *Continuum Plasticity*, 1998.