

CE 231 / MSE 211 – Mechanics of Solids

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Web: See bCourses; material from prior years can be found at
<http://www.ce.berkeley.edu/~sanjay/ce231mse211>

Required Textbook: L. Anand, *Introduction to Mechanics of Solid Materials* (2016).
Can be downloaded from bCourses.

Other useful books (not required):

- The linearized theory of elasticity (2002) William S Slaughter
- Elastic and Inelastic Stress Analysis (1997) I.H. Shames and F.A. Cozzarelli
- Nonlinear solid mechanics (2000) G. Holzapfel
- An introduction to continuum mechanics (1981) M.E. Gurtin
- Continuum mechanics (1999) P. Chadwick.

(The last three books are more advanced but you will find lots of interesting information in them. The first two have been used as the course text in prior years.)

Conduct of Course: Homework will normally be assigned weekly and due the following the week (on Wednesdays).

There will be one midterm examination and a final exam. Exams will be take home.

Course grade is based on: Homework 20%, Midterm 30%, Final 50%.

Rough Outline:

1. Introduction
2. Mathematical Preliminaries
 - (a) Scalars, Vectors, and Tensors
 - (b) Basic Tensor Calculus
3. Kinematics
 - (a) Meaningful Ways of Describing Deformation
 - (b) Finite Measures of Strain
 - (c) Infinitesimal Measures of Strain
 - (d) Interpretation of Strain Tensors
4. Balance of Momenta
 - (a) Introduction to Stress
 - (b) Cauchy's Theorem
 - (c) Interpretation of Stress Tensors
5. Constitutive Response: Elasticity
 - (a) Linear Elasticity
 - (b) Anisotropy
 - (c) Classical methods of solution
 - (d) Variational setting
6. Constitutive Response: Viscoelasticity
 - (a) Linear viscoelastic rate forms
 - (b) Convolution forms
 - (c) Thermal effects
7. Constitutive Response: Plasticity
 - (a) Perfect plasticity
 - (b) Linear kinematic and isotropic hardening
8. Selected Topics of Interest to the Class