

## Mechanical Earth, GEOL 455/555

Fall 2007, CRN 15923/15924

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### Pre-Requisites

GEOL 315 (Earth Physics), MATH 256 (Differential Equations), PHYS 202 or 252 (General Physics)

### Course Description

Several advanced topics in solid earth geophysics, such as lithospheric deformation and mantle convection, require an understanding of how fluids and solids behave under an applied stress and internal heat. This course is designed to provide a strong foundation in geophysical theory that can then be used to understand more advanced concepts. Topics to be covered include stress and strain, rheology, the laws of conservation and momentum, and continuum mechanics. The course format will include a combination of lecture, discussion, and group exercises.

### Course Textbook: *Mechanics in the Earth and Environmental Sciences*

By Middleton and Wilcock, Cambridge University Press, pp 459, 1994.

### Course Schedule (subject to revision)

Week 1: Chapter 4, Friction, Slope Stability  
Week 2-3: Chapter 4, Stress, Strength of Materials  
Week 4: Chapter 4, State of Stress, Mohr Circles  
Week 5: Chapter 4, Tensor Notation, Stress Tensors

Week 6: Chapter 5, Pressure, Isostasy  
Week 7: Chapter 7, Strain  
Week 8-9: Chapter 8, Elasticity  
Weeks 10: Chapter 9, Viscous Fluids

### Problem Sets

Homework problems will be due on Mondays at the beginning of class. There will be time at the end of class on Monday for students to ask questions about the assigned problems. In order to receive partial credit for the homework, you must make a significant attempt to solve the problems.

### Weekly Quizzes

Each Wednesday, there will be a short quiz at the beginning of class. The questions on the quiz will be derived from the assigned homework that was due the prior Monday. The purpose of the quizzes is to motivate students to complete and ask questions about the assigned homework.

### Group Exercises and Discussion

Periodically throughout the term, a portion of the class time will be devoted to group exercises that emphasize critical thinking of the material. We will also read and discuss a selection of scientific articles that utilize the concepts introduced in lecture. These papers will provide examples of how the material can be applied to current problems in the earth sciences.

### Grading Policy

Homework	15%
Weekly Quizzes	48% (6% each)
Comprehensive Final Exam	37%

The lowest quiz score will be dropped out of the 9 quizzes administered during the term. Missed quizzes cannot be made up. Final grades will be curved based on the overall class performance.