



GG650: Seismology (in the course catalog)

or

GG631: Geophysics - Solid, Fluid & Wave Mechanics (future course name)

Instructors:

Robert Dunn (seismology)

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Clint Conrad (continuum mechanics)

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Office hours: after class, by appointment

Lectures: Tues. & Thur. 1:30-2:45 in 702 POST

Texts:

Introduction to Continuum Mechanics, by Lai, Rubin, & Krempl
Geodynamics, by Turcotte & Schubert

Seismic texts and handouts:

An introduction to seismology, earthquakes, and earth structure, by Stein & Wysession. Seismic Ray Theory, by Cerveny; Quantitative Seismology, Aki & Richards; Principles of Seismology, Udias

The solid Earth deforms over a wide range of length scales, locations, and time scales, and in a variety of different ways in response to different forcing mechanisms. In this class, we will study continuum mechanics in geophysics, as applied to the deformation of Earth materials (elastic, viscoelastic, and plastic deformations) and seismic wave propagation (body waves, surface waves, anisotropy, and attenuation).

Grading and Assignments

Homework assignments will be assigned approximately weekly, and students will periodically be required to present lecture material in class. The relative weightings of homework assignments and class participation (including in-class presentations) are as follows:

Homework	70%
<u>Class Presentations and Participation</u>	<u>30%</u>
Total	100%

Cooperation: Collaboration is encouraged in order to discuss approaches to solving problems. However, do not copy answers to problem sets – work out the solutions yourself.

Preliminary Schedule:

Week	Lecture	Topic	Reading
1	Aug. 26	Course Introduction, Tensor Review	Lai Ch. 2
	Aug. 28	Tensor Review	
2	Sept. 2	Stress in Solids	Lai Ch. 4
	Sept. 4	The Stress Tensor	
3	Sept. 9	Rock Failure	TS Ch. 8
	Sept. 11	Moment Tensors for Earthquakes	
4	Sept. 16	Infinitesimal Strain	Lai Ch. 3; TS Ch. 2
	Sept. 18	Finite Strain and Geological Applications	
5	Sept. 23	Elasticity	Lai Ch. 5; TS Ch. 3
	Sept. 25	Elastic Deformation in the Earth	
6	Sept. 30	Ductile Rheology	TS Ch. 7; Lai Ch. 6
	Oct. 2	Navier-Stokes Equation	
7	Oct. 7	Viscous Flows (Couette & Poiseuille)	TS Ch. 6
	Oct. 9	Stokes Flow	TS Ch. 6
8	Oct. 14	The Stream Function	TS Ch. 6
	Oct. 16	Corner Flow / Non-Newtonian Rheology	
9	Oct. 21	Wave Mechanics – Equation of Motion	SW Ch. 2.3
	Oct. 23	Wave Mechanics – Boundary Conditions	
10	Oct. 28	Vector Wave Equation	SW Ch. 2.4
	Oct. 30	Vector Wave Equation	
11	Nov. 4	NO CLASS (Election Day)	SW Ch. 2.5
	Nov. 6	Wavefield Energy	
12	Nov. 11	NO CLASS (Veterans Day)	SW Ch. 2.6
	Nov. 13	Wavefields at Boundaries and Waveguides	
13	Nov. 18	Reflection and Transmission	Cerv Ch. 2.4
	Nov. 20	R&T Coefficients and Zoeppritz Equations	
14	Nov. 25	Eikonal Equation	Cerv Ch. 3
	Nov. 27	NO CLASS (Thanksgiving)	
15	Dec. 2	Ray Tracing Systems	AR Ch. 7
	Dec. 4	Surface Waves	
16	Dec. 9	Surface Wave Eigen-solutions	AR Ch. 5.6, Udias 14
	Dec. 11	Seismic Anisotropy / Seismic Attenuation	

Note: We will deviate from this schedule as necessary!