

## GEODYNAMICS- SIO 234

<http://topex.ucsd.edu/geodynamics>

**A general course on the dynamics and kinematics of the solid earth based on the text of Turcotte and Schubert.**

Prerequisite: some familiarity with (or willingness to learn ) partial differential equations and fourier transforms.

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Lecture course, 4-units, letter grade or S/U grade, homework, presentations, quizzes.

MWF, 8:50 - 9:40 AM, - Munk Conference Room

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### SYLLABUS

DATE	TOPIC
	<b><i>Introduction and Plate Tectonics</i></b>
03 OCT	Class Overview <a href="#">Plate Tectonics - Observations</a> <a href="#">KML files</a>
06 OCT	<a href="#">Plate Tectonic - Theory</a> <a href="#">Plate Map</a>
08 OCT	<a href="#">Applications of Fourier Transforms</a>
10 OCT	<a href="#">Marine Magnetic Anomalies</a>
13 OCT	<b>No Class</b> - <a href="#">View Videos on Plate Tectonics</a> Maria Seton Dick Hey John Tarduno
15 OCT	Quiz: Plate Tectonics and Fourier Transforms exercises
	<b><i>Heat Flow</i></b>
17 OCT	<a href="#">Heat Conduction, Heat Flow Measurements, and Global Heat Budget</a>
20 OCT	<a href="#">Cooling of the Oceanic Lithosphere</a>

22 OCT	<a href="#">Ocean Floor Topography</a>
24 OCT	Buoyancy of the Lithosphere; Thermoelastic Stress
27 OCT	<a href="#">Cooling of a Lava Lake (Stefan Problem)</a> <a href="#">Summary of Boundary Layer Cooling</a>
	<b><i>Isostasy, Rheology, and Flexure</i></b>
29 OCT	<a href="#">Isostasy and Crustal Thickness;</a> <a href="#">Review Stress and Strain</a>
31 OCT	Presentations of heat flow problems
03 NOV	Presentations of heat flow problems
05 NOV	Presentations of heat flow problems  Rheology of the Lithosphere Moment vs. Curvature
07 NOV	<a href="#">Flexure Theory</a>
10 NOV	<a href="#">Flexure Examples</a>
	<b><i>Earthquakes</i></b>
12 NOV	Theories of Faulting; Seismic cycle.
14 NOV	Heat Flow Paradox of the San Andreas Fault
	<b><i>Gravity</i></b>
17 NOV	<a href="#">Reference Gravity</a> <a href="#">Gravity Anomalies</a>
19 NOV	<a href="#">Laplace's Equation and Satellite Altimetry</a>
21 NOV	<a href="#">Poisson's Equation and Bouguer Anomalies</a>
24 NOV	<a href="#">Gravity/topography transfer function; Isostatic geoid anomalies, Swell-push force</a>
	<b><i>Fluid Mechanics</i></b>
26 NOV	Channel Flow and Stream Function

01 DEC	Presentations for HW6	
03 DEC	Presentations for HW6	HW8 - Problems from T&S, Ch. 6 6-1, 6-3, 6-6, 6-11 Due Dec 12
05 DEC	Presentations for HW6	
08 DEC	Postglacial Rebound	
10 DEC	Review	

## SIO 234 SUGGESTED BOOKS:

### Textbooks:

*Geodynamics: Second Edition*, Turcotte, D. L. and Schubert, G., Cambridge University Press, 2002.

or

*Geodynamics: Third Edition*, Turcotte, D. L. and Schubert, G., Cambridge University Press, 2014.

### Reference Books:

*Mantle Dynamics: [Mantle Convection in the Earth and Planets, Schubert, G., Turcotte, D. L. and P. Olson, Cambridge University Press, 2001](#)*

Fourier Transforms: *The Fourier Transform and its Application*, Bracewell, R. N., McGraw-Hill Book Co., New York, 1978. (Chapters 2, 6)

Marine Geophysics: *The Ocean Basins: Their Structure and Evolution*, The Open University, Pergamon Press, 1989. (Chapters 2, 3)

General Ref.: *Physics of the Earth*, Stacey, F. D., John Wiley & Sons, New York, 1969.

### Computer Homework:

Computer homework can be done using Fortran, C, or *MATLAB* which runs on most machines. If you do not have a computer account we will set you up.

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