

EAS 6312: Geodynamics

THE GEORGIA INSTITUTE OF TECHNOLOGY

January 09 - April 26, 2007

Tues., Thurs. 9:35 - 10:55 am in ES&T L1116

Instructor: Andrew Newman (anewman@gatech.edu)

<http://shadow.eas.gatech.edu/~anewman/classes/geodynamics>

General

This course is a quantitative discussion of the physical properties of earth materials and dynamic processes in the solid Earth. We will closely follow *Geodynamics* by Turcotte & Schubert, in covering topics in stress and strain, elasticity and flexure, heat transfer, gravity, fluid mechanics, rock rheology, and crustal faulting as mechanisms and consequences of plate tectonics.

Office Hours: Hours will be held in my office, ES&T room 2254, Tuesday 3:00 - 4:30 pm and Friday 2:00 - 3:30 pm, or by appointment. If I am not in my office please check the Geophysics Lab (room 2235).

Required Text:

- Turcotte, D.L., & G. Schubert, *Geodynamics: 2nd Edition*, Cambridge University Press, 456 pp., 2002.

Referenced Text; no need to purchase:

- Davies, G.F. *Dynamic Earth: Plates, Plumes and Mantle Convection*, Cambridge University Press, 458 pp., 1999.
- Harte, J., *Consider a Spherical Cow: A Course in Environmental Problem Solving*, University Science Books, 283 pp., 1988.
- Kearey, P. & F.J. Vine, *Global Tectonics*, Blackwell Publishing, 333 pp., 1996.
- Stein, S.A., & M. Wysession, *An Introduction to Seismology, Earthquakes, and Earth Structure*, Blackwell Publishing, 498 pp., 2003.

Course Outline

This is an approximate outline of topics and timing and is subject to change throughout the semester.

Week	Date	Topic	Exam
1,2	Jan 9 - 18	Introduction to Plate Tectonics, Geodynamics and mathematical approximation	
3,4	Jan 23 - Feb 1	Stress and Strain in Solids	
5,6	Feb 6 - 15	Elastic Deformation	
7,8	Feb 20 - Mar 1	Heat Transfer (Driving force for Tectonics)	
9,10	Mar 6 - 15	Gravity	Exam 1 (Mar 6)
11	Mar 19 - 23	<i>Spring break (no class)</i>	
12	Mar 27 - Mar 29	Fluid Mechanics	
13,14,15	Apr 3 - 17	Rock Rheology and Faulting	
15,16	Apr 19 - 26	Project Presentations	Exam 2 (Apr 26)

Class Communication: You will occasionally receive class information via email to your prism account. Because this information may not be communicated in class, you should be sure to read messages identified as [EAS 6312]. In emailing me for class, please add [EAS 6312] to the subject line and identify yourself by name in the message since not all prism accounts clearly identify the email's author.

Evaluation

Your course grade will be based on three criteria: homework (20%), exams (60%), and a project (20%).

Homework: Homework will be assigned approximately every 3rd week and will be due one week from assignment. I will not accept late homework without authorizing such beforehand. See the academic honesty section (below), for information on working together.

Exams: There will be two equally weighted exams that will be administered during normal class hours. Each exam will focus on material covered since the previous exam, however knowledge of previously covered material will be expected to fully complete any exam. Missed exams will receive a score of zero unless approved and rescheduled beforehand.

Project: For your class project, you will review and present on a topic of your choosing in geodynamics using relevant research and review articles from peer-reviewed scientific literature (not *National Geographic* or *Scientific American*, but journals like *Science*, *Nature*, *Journal of Geophysical Research*, *Earth and Planetary Science Letters*, etc...). In order to receive full credit for the project you must read and synthesize no less than three papers on the subject. You will, however have the opportunity to receive 10% extra credit on the project if you 1) outline a new approach to addressing an unresolved problem; 2) uniquely solve a problem; 3) perform unique numerical calculations to determine parameter sensitivities and/or feasibility of measurement; or 4) perform a physical analog or unique computational experiment to test hypothesis.

Your final project will be written up in journal form suitable for *Geophysical Research Letters* (GRL), and will be presented in a 15 minute AGU-style talk (12 minute presentation with 3 minutes of questions). For guidelines on document preparations for GRL submissions go to http://www.agu.org/pubs/au_contrib_rev.html. Grading for your project will be based on the quality of your paper (40%), presentation (40%) and participation during others' presentations (20%).

Academic Honesty

General: It is expected that all students are aware of their individual responsibilities under the Georgia Tech Academic Honor Code, which will be strictly adhered to in this class.

Problem Sets: Students are encouraged to work together on developing solutions to problem sets; however, the solutions/answers that are turned in must be the work of each individual. Include the name of individuals consulted for each problem that you sought aid in answering (including me).

Project: Each student is expected to develop her/his unique project, thus there should be no copying from others in class. Plagiarism is strictly forbidden. *Plagiarism* is the act of appropriating the literary composition of another, or parts of passages of his or her writings, or language or ideas of the same, and passing them off as the product of one's own mind. It involves the deliberate use of any outside source without proper acknowledgment¹.

Exams: All information required for exams will be supplied. Reference to texts or other documents during exams is strictly forbidden. The use of electronic devices (e.g. cellular phones, computers etc.) other than non-programmable calculators during exams and quizzes is not allowed.

¹as defined by the Georgia Tech Academic Honor Code (<http://www.registrar.gatech.edu/rules/18d.php>)