

# EAS 4312/6312: Geodynamics

THE GEORGIA INSTITUTE OF TECHNOLOGY

August 24 - December 9, 2010  
Tues., Thurs. 12:05 - 1:25 pm in ES&T L1116

Instructor: Andrew Newman ([anewman@gatech.edu](mailto:anewman@gatech.edu))

<http://geophysics.eas.gatech.edu/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, Mondays from 10-11 am, and Thursdays from 1:30 - 3 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: 2<sup>nd</sup> Edition*, Cambridge University Press, 456 pp., 2002.

### Referenced Text; no need to purchase:

- 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	Aug. 24 - Sept. 2	Introduction to Plate Tectonics, Geodynamics and mathematical approximation	
3,4	Sept. 7 - 16	Stress and Strain in Solids	
5,6	Sept. 21 - 30	Elastic Deformation	
7-9	Oct. 5 - 21	Heat Transfer (Driving force for Tectonics)	
8	Oct. 14		Exam 1
9	Oct. 19	<i>Fall break (no class)</i>	
10	Oct. 26 - 28	Gravity	
11,12	Nov. 2 - 11	Fluid Mechanics	
13-15	Nov. 16 - 30	Rock Rheology and Faulting	
14	Nov. 25	<i>Thanksgiving (no class)</i>	
15,16	Dec. 2 - 7	Project Presentations	
16	Dec. 9		Exam 2

**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: Geodynamics]. In emailing me for class, please add [EAS: Geodynamics] to the subject line and identify yourself by name in the message since not all prism accounts clearly identify the email's author.

## Evaluation

Students enrolled in EAS-4312 will be evaluated independently of those enrolled in EAS-6312. Those enrolled in EAS-6312 will be required to perform all homework assignments and exams as students in EAS-4312, as well as additional homework assignments, exam questions and project requirements.

For students enrolled in:

*EAS-4312*: Grade is based on homework (30%), exams (60%), and project (10%).

*EAS-6312*: Grade is based on homework (20%), exams (60%), and project (20%).

**Homework:** Homework will be assigned approximately every 2 weeks 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. Students enrolled in EAS-6312 can expect extended homework requirements that include reporting on results from scientific literature.

**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. Students enrolled in EAS-6312 will be responsible for additional in-depth questions during exams.

**Project:** All students 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.

All students will present a 15 minute AGU-style talk (12 minute presentation with 3 minutes of questions). Students enrolled in *EAS-4312* will be graded on the quality of the presentation (80%), and participation during others' presentations (20%).

Students enrolled in *EAS-6312* will additionally be responsible for a manuscript written up in journal form suitable for *Geophysical Research Letters* (GRL). For guidelines on document preparations for GRL submissions go to [http://www.agu.org/pubs/au\\_contrib\\_rev.html](http://www.agu.org/pubs/au_contrib_rev.html). Grading of your project will be on the quality of the manuscript (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 submission of material that is wholly or substantially identical to that created or published by another person or persons, without adequate credit notations indicating authorship <sup>1</sup>.

**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.

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<sup>1</sup>as defined by the Georgia Tech Academic Honor Code (<http://www.deanofstudents.gatech.edu/Honor/>)