EAS 6312: Geodynamics

The Georgia Institute of Technology

January 06 - April 23, 2009
Tues., Thurs. 9:35 - 10:55 am in ES&T L1175

Instructor: Andrew Newman (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, Tuesday’s and Thursdays from 11 am - 12 pm, or by appointment. If I am not in my office please check the Geophysics Lab (room 2235).

Required Text:


Referenced Text; no need to purchase:


Course Outline

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

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1,2</td>
<td>Jan 6 - 15</td>
<td>Introduction to Plate Tectonics, Geodynamics and mathematical approximation</td>
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<tr>
<td>3,4</td>
<td>Jan 20 - 29</td>
<td>Stress and Strain in Solids</td>
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<td>5,6</td>
<td>Feb 3 - 12</td>
<td>Elastic Deformation</td>
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<td>7,8</td>
<td>Feb 17 - 26</td>
<td>Heat Transfer (Driving force for Tectonics)</td>
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<td>9</td>
<td>Mar 3</td>
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<tr>
<td>9,10</td>
<td>Mar 5 - 12</td>
<td>Gravity</td>
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<td>11</td>
<td>Mar 16 - 20</td>
<td>Spring break (no class)</td>
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<tr>
<td>12</td>
<td>Mar 24 - Mar 26</td>
<td>Fluid Mechanics</td>
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<td>13-15</td>
<td>Mar 31 - Apr 14</td>
<td>Rock Rheology and Faulting</td>
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<tr>
<td>15,16</td>
<td>Apr 19 - 26</td>
<td>Project Presentations</td>
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<tr>
<td>16</td>
<td>Apr 23</td>
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</tbody>
</table>

Exam 1

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 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](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 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 ¹.

**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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¹as defined by the Georgia Tech Academic Honor Code ([http://www.deanofstudents.gatech.edu/Honor/](http://www.deanofstudents.gatech.edu/Honor/))