

EAS 3610/8803: Introduction to Geophysics

THE GEORGIA INSTITUTE OF TECHNOLOGY

August 21 - December 04, 2018

Tues. Thurs., 3p - 4:15 p in ES&T L1175

Instructor: Andrew Newman, anewman@gatech.edu, office:404-894-3976, ES&T 2254

<http://geophysics.eas.gatech.edu/classes/Geophysics>

General

This course is an introduction to methods used to visualize and understand the history, shape, mechanical structure, and dynamics of the solid-earth system. We will discuss how geophysical tools, including seismology, gravity, magnetism, heat flow, geochronology, and geodesy, are used to understand the age, whole-earth, and near-surface structure, and to quantify the kinematics and dynamics of plate tectonics.

Prerequisites: Physics 2212: *Introduction to Physics I* and EAS 2600: *Earth Processes*

Instructor Office Hours: ES&T 2254, Wed. 1:30 pm - 3:00 pm, or by appointment.

Required Text: Fowler, C.M.R., *The Solid Earth: An Introduction to Global Geophysics*, 2nd Edition, Cambridge University Press, 685 pp., 2005.

Class Communication: You will occasionally receive class emails via your GT account. Because this information may not be communicated in class, read messages identified as [EAS: Geophysics]. In emailing me for class, please add [EAS: Geophysics] to the subject and identify yourself by name in the message in case your account name is enigmatic.

Students with Disabilities: If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Evaluation

Course Grade:

Undergraduate section: Your grade is based on homework (30%), and exams (70%).

Graduate Section: Your grade is based on homework (30%), exams (60%), and an oral presentation (10%).

The Undergraduate and Graduate sections will be graded and possibly curved independently.

- Letter Grade: $A \geq 90\% > B \geq 80\% > C \geq 70\% > D \geq 60\% > F$
- Satisfactory/Unsatisfactory: $S \geq 70\% > U$

Homework: Homework will be assigned approximately every 2 weeks and will be due one week from assignment. Graduate students will be assigned additional problems in each of the assigned problem sets. Late homework will not be accepted without prior authorization. See the academic honesty section (below), for information on working together.

Exams: There will be three mid-terms administered during class time (no exams during Finals). The exams are equally weighted, with the lowest score being dropped. Thus, if you are satisfied with your performance after the second mid-term exam you do not need to take the third. Missed exams will receive zero credit and the first would be considered your dropped exam.

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 (<http://www.honor.gatech.edu/>).

Problem Sets: Students are encouraged to work together on developing solutions to problem sets; however, the solutions 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).

Exams: 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.

Student-Faculty Expectations

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty and students. Please see <http://catalog.gatech.edu/rules/22/> for some basic expectation that we should have of each other. Ultimately, we should respect each others time, hard work, and quest for knowledge. We all should strive to build an environment for cordial and effective interaction.

Course Outline

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

Week	Date	Topic	Exam
1	8/21 - 8/23	Introduction: - Why Geophysics? - Math review - Geophysical approximation	
2-3	8/28 - 9/6	Plate tectonics and geodynamics - The geometry and kinematics of plate motions - Survey and characterization of plate motions - Types and importance of plate boundaries - Plate reconstructions and dating - Paleomagnetism and polar wander - Modern measurements of plate motions - Mechanisms and consequences of plate tectonics	
4-6	9/11 - 9/25	Seismology: Earth imaging and earthquake characterization - Seismic waves - Earthquake seismology - Seismic imaging: reflection, refraction, and tomography - The seismometer	
7-9	9/27 10/2 - 10/16	(<i>Thursday</i>) Earth gravity - Mass distribution and relation to gravity - Geopotential and the shape of the earth - Gravity anomalies - The gravimeter - Isostasy	Mid-term 1
	(no class 10/09)	(<i>Fall break</i>)	
9-10	10/18 - 10/23	Geochronology: - Geologic time: from relative to absolute - Principles of geochronology - Modern methods - Estimations of the Earth's age	
10-12	10/25 - 11/6	Internal heat engine: - Sources of Earth's heat - Mechanisms of heat transport - Global heat flow and heat loss - Tapping Earth heat: geothermal energy	
13-14	11/08 11/13 - 11/20	(<i>Thursday</i>) Deep Earth structure: - Internal structure from seismology - Planetary inertia and moment - Mantle convection - The geodynamo	Mid-term 2
	(no class 11/21-23)	(<i>Thanksgiving Break</i>)	
15	11/27	Lithospheric structure: - Oceanic lithospheric formation - Oceanic lithospheric destruction - Growth of continents - Formation of continental basins	
	11/29	(<i>Thursday - CHANGE FROM ORIGINAL</i>)	Mid-term 3

Campus Resources for Students

In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.

Academic support

- Center for Academic Success <http://success.gatech.edu>:
 - 1-to-1 tutoring <http://success.gatech.edu/1-1-tutoring>
 - Peer-Led Undergraduate Study (PLUS) <http://success.gatech.edu/tutoring/plus>
 - Academic coaching <http://success.gatech.edu/coaching>
- Drop-in tutoring for many 1000 level courses: *Residence Life's Learning Assistance Program*: <https://housing.gatech.edu/learning-assistance-program>
- Group study sessions and tutoring programs: <http://omed.gatech.edu/programs/academic-support>
- Individualized help with writing and multimedia projects: *Communication Center* (<http://www.communicationcenter.gatech.edu>)
- Academic advisors for your major: <http://advising.gatech.edu/>

Personal Support at Georgia Tech Resources

- The Office of the Dean of Students: <http://studentlife.gatech.edu/content/services>; 404-894-6367; Smithgall Student Services Building 2nd floor: *You also may request assistance at https://gatech-advocate.symplicity.com/care_report/*
- Counseling Center: <http://counseling.gatech.edu>; 404-894-2575; Smithgall Student Services Building 2nd floor
 - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
 - Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2204.
- Students Temporary Assistance and Resources (STAR): <http://studentlife.gatech.edu/content/need-help>: *Can assist with interview clothing, food, and housing needs.*
- Stamps Health Services: <https://health.gatech.edu>; 404-894-1420: *Primary care, pharmacy, womens health, psychiatry, immunization, allergy, health, nutrition*
- OMED: Educational Services: <http://www.omed.gatech.edu>
- Womens Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veterans Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500