

# EAS 3610/8803: INTRODUCTION TO GEOPHYSICS

## FALL SEMESTER 2017

**Time and Location:** Tuesday/Thursday 8:00–9:15 am, ES&T 1116

**Office Hours:** Tuesday/ Thursday 9:15 am–10:00 am (or by appointment)

**Instructor:** Zhigang Peng, ES&T 2256, 404-894-0231, [zpeng@gatech.edu](mailto:zpeng@gatech.edu)

**General Description:** This course contains a survey of various geophysical techniques used to understand the structures and dynamics of the Solid Earth system from surface to the inner core. These techniques include, but not limited to, seismology, geodesy, gravity, heat flow and magnetism.

### **Grading:**

Homework assignment (30%); Midterm exam (20%); Final exam (30%); Course project (15%); Quiz (5%)

### **Text Books**

#### **Required:**

Flower, C.M.R. (2005), *The Solid Earth: An introduction to Global Geophysics*, 2<sup>nd</sup> Edition, Cambridge University Press, pp 685.

#### **Recommended:**

F. D. Stacey and P.M. Davis, *Physics of the Earth*, 4<sup>th</sup> edition, Cambridge University Press.  
W. Lowrie, *Fundamentals of Geophysics*, 2<sup>nd</sup> edition, Cambridge University Press

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

### **Course Outline:**

1. Introduction
  - a. Why Geophysics
  - b. Math Review
2. Plate Tectonics and Geodynamics
  - a. Geometry and Kinematics of Plate Motion
  - b. Measurement of Plate Motion
  - c. Present-day Plate Motion
  - d. Earth's Magnetic Field and Paleomagnetism
  - e. Reconstruction of Past Plate Motions
3. Seismology and the Earth's Internal Structure
  - a. Stress/Strain
  - b. Seismic Wave Propagation
  - c. Earthquake Seismology
  - d. Reflection/Refraction Seismology
  - e. Internal Structure of the Earth
4. Gravity of the Earth

- a. Gravitational Potential
  - b. The Shape and Gravity of the Earth
  - c. Gravity/Geoid Anomalies
5. Heat
- a. Conductive Heat Flow
  - b. Total Heat Balance Inside the Earth
  - c. Oceanic/Continental Heat Flow
  - d. Geothermal Energy
6. Oceanic and Continental Lithosphere
- a. Structure of Mid-Ocean Ridges
  - b. Transform Faults and Subduction Zones
  - c. Growth of Continents
  - d. Continental Margins and Rift Zones

**Homework Assignment:** There will be six homework assignments\*, which will involve deriving equations, solving geophysics-related programs, computer simulations, or data analysis. The homework is designed for each student to work by him/herself. The homework will count as 30% of your overall course grade, with each counting 5%.

**Exams:** There will be a midterm\* (20%) and a final exam\* (30%). Both of them are close book. Reference to texts or other documents such as previous semester course materials during exams is strictly forbidden. Using these materials will be considered a direct violation of academic policy and will be dealt with according to the GT Academic Honor Code. The use of electronic devices (e.g. cellular phones, computers etc.) other than non-programmable calculators during exams and quizzes is not allowed.

**Course Project:** You are required to write a term paper on any topic related to geophysics. This can be a literature review of a selected topic, or research project involving calculations, data analysis, or theoretical results done in consultation with the instructor. The topic needed to be approved by the instructor right after the midterm. Your paper should be written up in a journal form with length, figures and referencing in a format suitable for submission to journals like Geophysical Research Letters (GRL). The minimum length is 10 page (double-space, including figures, references). Graduate students are required to present your term paper in a 15 minute AGU-style talk; a 12 minute presentation with 3 minutes of questions. The project will count as 15% of your overall course grade. Grading for graduate students will be based on the 10% of the quality of the research and the written paper, and 5% of your presentation.

**Quiz:** Before some classes I will give short quizzes. They are meant to check whether you understood the material from the previous class. Students need to be present in the class in order to take the quiz. This will count a total of 5% of your grade.

**Academic Honesty:** 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. The complete text of the Georgia Tech Academic Honor Code is at <http://www.honor.gatech.edu/>.

\* Different homework problems and exams will be assigned to graduate and undergraduate students.