

# EAS 6314/4314: SEISMOLOGY - FALL SEMESTER 2018

**Time and Location:** Tuesday/Thursday 12:05–1:25 pm, ES & T L1118

**Office Hours:** Tuesday/ Thursday 1:30 pm–2:30 pm (or by appointment)

**Instructor:** Zhigang Peng, ES&T 2256, 404-894-0231, zpeng@gatech.edu

**General Description:** This course contains a broad overview of basic seismological theory, and applications of seismic waves to study the Earth structure and sources that generate seismic waves.

## **Grading:**

Homework assignment (40%); First midterm exam (20%); Field Trip (5%); Second midterm exam (20%); Course project (15%)

## **Text Books**

### **Required:**

S. Stein and M. Wysession (2003), An Introduction to Seismology, Earthquakes, and Earth Structure, Blackwell Publishing.

### **Recommended:**

K. Aki and P.G. Richards, Quantitative Seismology, 2<sup>nd</sup> edition, W.H. Freeman and Co.

T. Lay and T.C. Wallace, Modern Global Seismology, Academic Press.

P. Shearer, Introduction to Seismology, 2<sup>nd</sup> edition, Cambridge University Press.

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

## **Course Outline:**

1. Introduction
  - a. History of seismology
  - b. Seismology and society
2. Basic Seismological Theory
  - a. Stress and strain
  - b. Seismic waves
  - c. Snell's law
  - d. Plane wave reflection and transmission
  - e. Surface waves and dispersion
  - f. Normal modes
3. Seismometers and Seismograms
  - a. Seismometers and seismic networks
  - b. Basic seismic analysis technique
4. Earth Structure
  - a. Refraction/Reflection seismology
  - b. Seismic waves in a spherical earth
  - c. 3D and anisotropic earth structure
  - d. Attenuation and anelasticity

## 5. Earthquake Source

- a. Earthquake location
- b. Focal mechanisms and moment tensors
- c. Earthquake source parameters
- d. Earthquake statistics and interaction

**Homework Assignment:** There will be eight homework problems\*, which will involve deriving equations, computer simulations, or data analysis. The homework is designed for each student to work by him/herself. The homework will count as 40% of your overall course grade, with each counting 5%.

**Exams:** There will be two midterm exams, with each counting 20%. 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.

**Field Trip:** We will have a local field trip (location/time TBD) this fall to learn how to deploy geophone and seismometers. We will ask students to form small groups, and give a short presentation on what they have learned from the field trip. You will be evaluated by your participation and presentation, which count as 5%.

**Course Project:** You are required to write a term paper (15%) on any topic related to seismology. 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 before 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). Preliminary version of the final paper should be shown to the instructor for approval at least two weeks before the due date. The minimum length is 10-page (including figures and references), and the font size is 12 (double space).

**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.