EAS 6314/4314: SEISMOLOGY - FALL SEMESTER 2020

Time and Location: Monday/Wednesday 12:30–1:45 pm, ES & T L1116

Office Hours: Monday/Wednesday 1:45 pm–2:45 pm (or by appointment, online only)

Instructor: Zhigang Peng, ES&T 2256, 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.

COVID-19 Update: This course will be taught in a hybrid mode. Most classes will be delivered remotely (via bluejeans). However, on a few occasions, you can attend the lectures in the classroom observing social distancing practices during planned class sessions. The schedule for these visits will be announced later and published in the syllabus/canvas. Attendance at those events is recommended but not mandatory. The homework submission and quizzes will be managed online.

Grading (to be updated soon): Homework assignment (56%); Online Quiz (20%); Optional Field Trip (4%); Course project (20%)

Final Grade:
Letter grade: A≥ 90% > B ≥ 80% > C ≥ 70% > D ≥ 60% > F
Satisfactory/Unsatisfactory grade: Satisfactory ≥ 70% > Unsatisfactory

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, 2nd edition, W.H. Freeman and Co.
T. Lay and T.C. Wallace, Modern Global Seismology, Academic Press.
P. Shearer, Introduction to Seismology, 2nd edition, Cambridge University Press.

Class website: http://geophysics.eas.gatech.edu/people/zpeng/Teaching/IntroSeis_2020/
Canvas: https://gatech.instructure.com/courses/146666 (graduate student)
https://gatech.instructure.com/courses/146664 (undergraduate student)

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 56% of your overall course grade, with each counting 7%.

Online Quizzes*: There will be several online quizzes throughout the semester. The quiz is meant to help students to understand better the material learned recently in the class. More details will be provided later. The quiz will count 20% of the grade.

Field Trip: We plan to have an optional local field trip (location/time TBD) this fall to learn how to deploy geophone and seismometers. We will ask students to 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 4%. Those who cannot participate in the field trip can submit a 3-page report on the development of seismic sensor deployment.

Course Project: You are required to write a term paper (20%) 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. 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 quizzes will be assigned to graduate and undergraduate students.