

# EAS 8803 AVN- Earthquake Physics

THE GEORGIA INSTITUTE OF TECHNOLOGY

August 21 - December 6, 2007  
Tues., Thurs. 9:35 - 10:55 am in ES&T L1175

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<http://shadow.eas.gatech.edu/geophysics/classes/EQPhysics>

## General

This course consists of a series of graduate-level lectures, discussion and presentations of the current status of geophysical and mechanical understanding of processes that control earthquakes.

**Office Hours:** After class, from 11:00 am - 12:00 pm, or by appointment.

**Required Text:** No books are reserved at the bookstore. Please order online.

- Scholz, C.H., *The Mechanics of Earthquakes and Faulting*, 2<sup>nd</sup> Ed., Cambridge Univ. Press, 471 pp., 2002.
- Stein, S.A., & M. Wysession, *An Introduction to Seismology, Earthquakes, and Earth Structure*, Blackwell Pub., 498 pp., 2003.
- Additional material will be either handed out in class or made available on the course website.

## Course Outline

Classes	Date	Topic
<b>Lectures:</b>		
1-2	Aug 21 - 23	Brittle Fracture of Rocks
3-4	Aug 28 - 30	Rock Friction
5-7	Sept 4 - 11	Mechanics and Quantification of Faulting
8-11	Sept 13 - 25	Mechanics and Quantification of Earthquakes
12-14	Sept 27 - Oct 4	The Seismic Cycle
15-17	Oct 11- 18	Seismotectonics ( <i>No Class Oct 9: Fall break</i> )
18	Oct 23	<i>Exam over lectures</i>
<b>Discussion of Emergent Research</b>		
19	Oct 25	Wrap-up Lectures / Intro Modern Topics
20-21	Oct 30 - Nov 1	Earthquake Interactions
22-23	Nov 6 - 8	Fault Zone Evolution
24-25	Nov 13 - 15	Continuum of Fault Rupture Speeds
26	Nov 20	Earthquake Scaling ( <i>No Class Nov 22: Thanksgiving break</i> )
27-28	Nov 27 - 30	Earthquake Prediction
29-30	Dec 4 - 6	Project Presentations

\* *Topics and timing are subject to change during the semester.*

**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 [EQ Physics]. In emailing us for class, please add [EQ Physics] 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: exam (35%), discussion (40%), and project (25%).

**Exam:** There will be one exam covering all material presented during the lecture portion of the course. If you are having difficulties understanding topics, please discuss this with us outside of class, when it arises. Do not expect to do well by cramming just before the exam.

**Discussion:** Approximately half of this class will be comprised of detailed discussion of five topics of modern research in the field of earthquake physics (listed in the course outline). Before each discussion, you will be expected to read the assigned papers and submit (electronically) a 2 page summary of the topic. After discussion is completed on that topic, you will submit a new 4 page synthesis of your understanding of the current state-of-the-art of that topic. Discussion comprises 40% of your total course grade and is based on pre-discussion topic summaries (15%), post-discussion syntheses (15%), and in-class participation (10%).

**Project:** For your class project, you will review and present on a topic of your choosing in Earthquake Physics using relevant research and review articles from peer-reviewed scientific literature (journals like *Science*, *Nature*, *Journal of Geophysical Research*, *Earth and Planetary Science Letters*). In order to receive full credit for the project you must read and synthesize no less than 5 papers on the subject. You will have the opportunity to receive 20% extra credit on the project if you 1) outline a new approach to addressing an unresolved problem; 2) uniquely solve a problem; 3) perform significant unique numerical calculations to determine parameter sensitivities and/or feasibility of measurement; or 4) perform an appropriate unique 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). Your project comprises 25% of your total course grade and is based on the quality of the paper (10%), presentation (10%), and in-class participation (5%).

## 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.

**Topics Papers and Project:** Pre-discussion summaries, post-discussion syntheses, and Project papers, are expected to be the original work of the individual student. Hence, any papers that appear overly similar will be investigated and appropriate actions will be taken, if necessary. Likewise, Plagiarism is strictly forbidden. *Plagiarism* is the act of appropriating the literary composition of another, or parts of passages of his or her writings, or language or ideas of the same, and passing them off as the product of one's own mind. It involves the deliberate use of any outside source without proper acknowledgment<sup>1</sup>.

**Exam:** 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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<sup>1</sup>as defined by the Georgia Tech Academic Honor Code (<http://www.registrar.gatech.edu/rules/18d.php>)