GEOL 457 Seismology

Syllabus

Instructor:

Dr. Laurent G. J. Montesi
Department of Geology, Assistant Professor
Office: CSS 2239
Tel: 5-7534
email: montesi@geology.umd.edu

Office hours: Hour following each lecture and by appointment.

Don't hesitate to send an email at the address above.

When in town, I hope to answer within one to two days.

Lectures

Official time: Tuesday, Thursday, 9:00 – 10:15 am, CSS-0201

Class Description and Outline

General overview of the basics of seismology, starting with wave propagation, seismic reflection and refraction. Application to the determination of the seismic velocity and anisotropy structure of the Earth. Earthquake generation, postseismic deformation and creep events, relation to faulting and plate tectonics.

Texts

Required:

An Introduction to Seismology, Earthquakes, and Earth Structure, by Seth Stein and Michael Wysession (required), Blackwell Publishing, 2002, ISBN 0865420785

One copy available as class reserve.

Additional references

Introduction to Seismology, by Peter Shearer, Cambridge University Press, 1999, ISBN 0521669537

Vibrations and Waves, by A.P. French, The M.I.T. Introductory Physics Series, W.W. Norton, 1971, ISBN 0748744479

To go further

Quantitative Seismology, 2nd edition by K. Aki and P.G. Richards, University Science Books, 2002, ISBN 0-9035702-96-2

Principles of Seismology, by A. Udias, Cambridge University Press, 1999, ISBN 0 521 62434 7

Website

A website is available for the class. To access it, go to http://www.elms.umd.edu/, enter your directory ID and password, and click on the link for the class to which you are registered.

The website will contain lecture synopsis. In general, these synopses are not full lecture notes. If you miss a lecture you must get full notes from a colleague

Expectation of students

GEOL 489A/789A presents an overview of the theory and applications of seismology. As an upper level course, we will derived several mathematical relations and describe their usage in Earth sciences. A minimum of mathematics ability is expected. We will introduce in class basic differential equations and their solution, and we will use complex numbers.

It is expected that students are familiar with calculus and have had an introduction to physical geology (GEOL100/110).

Academic integrity

The Student Honor Council observes that, "The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student

Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit

http://www.studenthonorcouncil.umd.edu/whatis.html."

Any evidence of dishonesty on any exam or assignment will result in a referral to the Office of Student Conduct.

You are expected to take thee Student Honor Pledge

http://www.studentconduct.umd.edu/aca/honorpledge.html

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination

Textbook and Online Resources

Readings from the textbook or other appropriate resource will complement the lectures. Students are welcome to read and try to understand the material before the class so that there can be better discussion. Any reading from a source other than the required text will be available as copies or in electronic form.

Several assignments will require access to the internet, either to the class website or to various online databases.

Attendance

Although attendance won't be taken, lecture attendance is required. University Policy, www.testudo.umd.edu/soc/atedasse.html, provides several cases for which student

absence is excused. Note that the student must request an excuse in writing and supply appropriate documentation.

If the campus is closed for any reason during a scheduled lecture, the material of that day will either be incorporated with future lectures or left as reading in the textbook.

Special Events

If possible, you should try and attend lectures related to seismology on campus. We are aware of two relevant colloquia Dr. Maureen Long (Feb. 15) and Pr. Matthew Fouch (March 7). More information will be given when the colloquia approach.

Electronic devices

Cell phones can be used only in case of emergency, including text messaging. Computers may be used to take not unless they become a distraction for the rest of the class.

Special Needs

I will make every possible effort to accommodate your request for special accommodations, when justified. However, any requests must be submitted as soon as possible but no later than the end of the schedule adjustment period. *Do not wait!*

Students with Disabilities

If you have a documented disability, you should contact Disability Support Services 0126 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms, which you can provide to your professors as proof of your eligibility for accommodations. The rules for eligibility and the types ofaccommodations a student may request can be reviewed on the DSS web site.

Religious Observances

The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs, students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. *It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance.*

Grading

The bulk of the grade will be determined from the performance on homework problem sets (60%) and on a term report (40%). The details of the conversion from points to a letter grade will be decided only at the end of the semester.

Homework/problem sets

Problem sets will usually be assigned on Thursdays, to be due the following Thursday. There is no TA for the class, so you need to talk to the instructor if you encounter any problem. Remember that I am here to help you, and I hope you will come and seek help if you have any difficulty. I am not interested in correcting wrong or

incomplete homework. You are welcome to discuss with each other the problem set but you need to write the answers yourself.

Problem sets will be available on the website. It will be possible for you to give the answers online. Grades and corrections will be posted online.

Term project

You are required to submit a report on a term project. Students registering for GEOL789A (graduates) are expected to work on a science project. For instance, they could study the seismicity of a region of interest. A presentation of these projects will be the topic of the last class lecture. Students registering for GEOL489A (undergraduate) will be expected only to present a literature study and are not expected to do an oral presentation. They can gain up to 10 extra credits point by doing the same as the graduate students.

Appeal of grades

You may appeal your grade on any exam prior to the posting of final course grades. In this as in all college courses, you should retain all graded items until proper grades have been recorded on your transcript.

Extra Credit

Students registering for the undergraduate version (489A) can earn 5 extra credit points if presented their project orally and 5 extra credit points if they project involves significant research, to part with the enrolled graduate students

CORE

This class does not fulfill CORE requirements.

Labs

There is no labs. Some problem sets require accessing online databases or programming.

Schedule

Note: this schedule is subject to change, depending on how each lecture goes, and on possible University closing. Always check the website, section syllabus, for an updated schedule.

There will be four parts to the class

Part 1: Mathematical background and vibrations: This will be used to provide the necessary foundation for the study of seismic waves.

Part 2: Seismological theory: At this point, we will derive the fundamental characteristics of seismic waves

Part 3: Earth Structure: We will give an overview of the various ways by which seismic waves are used to study the structure of the Earth

Part 4: Earthquake source: We will give an overview of the various ways by which seismic waves are used to mechanics of Earthquakes

Occasionally, lectures are replaced by a discussion of paper to be assigned

	Date	Topic	Reading
	Part 1: Vibrations/Mathematics		
1	Jan. 29	Introduction/motivation	
2	Jan. 31/Feb 01	Math review / Periodic motion	SW A.3 to A.6
3	Feb. 05	Periodic motion / complex numbers	French 1, SW A.2
4	Feb. 07/08	Oscillators / Attenuation	French 2, 3
5	Feb. 12	Waves on a string	SW 2.2
	Part 2: Seismological theory		
6	Feb. 14/25	Elasticity	SW 2.3
	Feb. 15	*Maureen Long Colloquium*	
7	Feb. 19	Body waves	SW 2.4
8	Feb. 21/22	Ray theory	SW 2.5
9	Feb. 26	Plane wave reflection/refraction	SW 2.6
10	Feb. 28/29	Surface waves	SW 2.7, 2.8
11	Mar. 04	Normal Modes	SW 2.9
	Part 3: Earth Structure		
12	Mar. 06/07	Reflection / Refraction	Shearer 7, SW 3.2
	Mar. 07	*Matthew Fouch Colloquium*	
13	Mar. 11	Reflection applications	SW 3.3
14	Mar. 13/14	Receiver functions	TBD (paper)
	Mar. 18	*Spring Break*	
	Mar. 20	*Spring Break*	
15	Mar. 25	Global Earth Structure	SW 3.4/3.5
16	Mar. 27/28	Tomography	SW 7.3
17	Apr. 01	Anisotropy	SW 3.6
18	Apr. 03/04	Subduction zone structure	TBD (Paper)
	Part 4: Earthquake source		
19	Apr. 08	Focal mechanisms	SW 4.2
20	Apr. 10/11	Waveform modeling	SW 4.3
21	Apr. 15	Moment Tensors	SW 4.4
22	Apr. 17/18	Earthquake Parameters	SW 4.6
23	Apr. 22	Earthquake statistics / aftershocks	SW 4.7
24	Apr. 24/25	Earthquake location	SW 7.2
25	Apr. 29	Moment summation	TBD (paper)
26	May 01/02	Geodesy	SW 4.5
27	May 06	Slow earthquakes	TBD (paper)
28	May 08/09	Seismic hazards	SW 1, SCEC
29	May 13	*Term reports*	