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GEOL 437.01: Seismology and Magnetics

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Geology 437 – Seismology and Magnetics, Fall 2002, 4 credits.

You are the subject of an experiment. This course will combine some of the theory and global aspects of seismology and magnetics as well as their practical application to environmental problems. Because I want to make sure we get the field work in relatively early in the semester the schedule will seem a little convoluted at first. Basically we will start with enough background in seismology and then magnetic to get started with field assignments and equipment use and then return to the global and deep interior aspects of each subdiscipline later in the semester.

Text: Lowrie, *Fundamentals of Geophysics.* I expect you to read and study the text as appropriate for topics we are covering in class. The most important use of the text is to get a different perspective/approach to a topic than mine. Other useful texts are available in the library. For spring semester I'll order Reynolds, *An Introduction to Applied and Environmental Geophysics.* In reality both would be useful this semester so if you are feeling rich and intend to take the spring semester you could order Reynolds on your own now.

Grading: One midterm (~30% each), one final (~35%), field oriented assignments (~25%), problem sets (~10%). These percentage assignments are all approximate for a number of reasons. For example, if you don't do the problem sets or assignments I'll weight them as 80%. If you do them and miss them all I'll probably weight them less than 10%. Your participation and discussion during the semester will count towards your grade.

Computation: I expect you to have some familiarity with spreadsheets and that you will learn some of the other software we'll need for the fieldwork. If you think you need to develop these skills now is the time to start.

Field Assignments: These will involve you working with two to four others and taking appropriate equipment out and performing an assigned task. You will write a short report on the experiment and results where syntax, grammar and presentation count as does content. I'll provide guidance as we progress. Each individual in a group is responsible for writing their own independent report; work together, write independently.

Exams: I do some derivations in class and use a reasonable number of equations to develop topics. I do not expect you to memorize equations or derivations; you'll get a sheet to use during the exams with all appropriate equations. I do expect you to understand the equations, recognize the variables, and be able to use them to solve geologic problems.

Exam Schedule: I prefer to determine the midterm exam time when the schedule is right, when we get through with major topics. We'll schedule it at least a week in advance.

Course content will jump around a little to accommodate fieldwork. Interpret this as weather, not disorganization. Maybe it will go like thi**s:**

Seismology

- Basic theory, history, multilayer refraction
- Engineering/environmental scale refraction (field and lab)

Magnetics

- Basic magnetics; magnetic exploration
- Magnetic field assignment
- Rock Magnetism & Paleomagnetism

• Exploiting magnetic anomalies

Seismology

• Seismology (T-delta curves, earthquakes, reflection seismology)
• Reflection seismology (crustal scale)

My goals for the course

• Introduce you to some of the topics in seismology and magnetics solid-earth and exploration geophysics
• Teach some of the standard mathematical/geophysical techniques you will need to understand geophysical
applications to many geologic problems
• Get you to a level where you can read and understand geophysical literature so you can evaluate geophysical
applications to geological problems and so you can investigate the use of geophysics in geological problems.
• I believe that any senior level course in our department should prepare you to read the professional literature for the
course's topic – that's an excellent way for you to evaluate a course as well. I try to talk about problem solving and
experimental design; any good course in science should teach you the techniques and problems of the discipline. I
expect you to read the textbook for the descriptive aspects of the material.