Fall 9-1-2000

GEOL 437.01: Introduction to Geophysics

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Geology 437 - Introduction to Geophysics, Fall 2000

Text: Fowler, *The Solid Earth, An Introduction to Global 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.

Grading: Two midterms (~20% each), one final (~25%), term paper (~15%), problem sets (20%?). These percentage assignments are all approximate for a number of reasons. For example, if you don't do the problem sets I'll weight them as 80%; if you do them and miss them all I'll probably weight them less than 20%. Your participation and discussion during the semester will count towards your grade.

Term Paper: The term paper should be a project, research paper, advanced problem, or computer program/simulation of something that comes up during the course that you want to know more about. It must be less than or equal to eight double-spaced pages and must be "typed." Syntax, grammar and presentation count as does content. Th most important component of the paper is your thinking and your ideas on the topic.

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 times when the schedule is right, when we get through with major topics. We'll schedule them as least a week in advance. If works best (everybody always seems more relaxed and takes their time) if we can schedule the midterms in an evening rather than class time – we'll discuss this as the event approaches.

Course content will go roughly as the book does:

Plate tectonics

- plate kinematics, plate cooling, plates through time
- Paleomagnetism.

Earth's Interior

- Gravity (mass, moment, Earth-moon system)
- Seismology (T-delta curves, multi layer refraction, earthquakes)

Lithosphere and crust

- Gravity; exploiting Bouguer, free air, and isostatic anomalies
- Magnetics; exploiting magnetic anomalies
- Heat flow; geotherms and source distributions

My goals for the course

- Introduce you to some broad topics in 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.

Introduction to Geophysics - Geology 437

Professor: Steve Sheriff

Grading: Based on exams, problem sets, term paper, participation

The venue for this course is Science Complex 348, a multimedia equipped teaching room.

This page simply provides problems sets, associated data, and some old exams for your perusal. So far the most convenient and expedient way to distribute the information seems to be to provide the material in Adobe's .PDF format. Thus these exercises and notes are provided as .PDF files and you need Adobe's free Acrobat Reader installed in your browser to view them.

If your browser is not currently set up to read and print such files, download Acrobat Reader from Adobe's web page, close your browser (preferably version 4.0 or greater of MS Internet Explorer or Netscape), install the reader, restart your browser, click on one of my links pointing to a set of notes or problems, and Acrobat Reader should pop up with the .PDF file.

Fall 2000

- Syllabus
- September 6: Here's a few simple problems to get you started thinking about what we will be doing in this course. We'll talk about them monday.

Fall 1999 Problem Sets:

- Problem set #1 - just to get you started thinking about what we will be doing in this course.
- Problem set #2 - a couple simple distance and Euler pole problems.
- Problem set #3 - Virtual geomagnetic poles and Earth's main-field geometry.
- Problem set #4 - Applied paleomagnetism (here's the data in Excel's format).
- Problem set #5 - Two parts to this one, a T-delta problem, and an epicenter problem.
- Problem Set #6 - A mix of ancient analysis, mass, moment, and seismic refraction.
- Problem Set #7 - Seismic refraction and crustal structure - western Montana. Here are the data in an Excel spreadsheet.
- Problem set #8 - Isostacy and gravity modeling.

Fall 1998 Problem Sets:

- Exercise #1: Relative velocity vectors and finding Euler poles from spreading rates.
- Exercise #2: Some questions concerning apparent pole positions, Euler poles, virtual geomagnetic poles (VGP), and the like.
- Exercise #3: Locating an epicenter from 3D data and constructing T-delta curves.
- Exercise #4: Here's a two-layer seismic refraction problem that let's you design a refraction experiment in East Missoula.
- Exercise #5: This time it is a mix of ancient analysis, mass, moment, and seismic refraction.
- Exercise #6: Regional/residual separation, gravity modeling, and isostacy.

Free Recreation (old exams) from Geol 437 - Introduction to Geophysics.

On the earlier exams, some hand-drawn figures are missing; given your notes you can figure out the questions or you can ask me about them.

Midterms

- The 1999 second midterm
- The 1999 first midterm
- The 1998 midterm covered the first third of the course.
- The 1996 midterm.

- The 1995 midterm.
- The 1994 midterm.

Finals

- The 1999 final
- The 1998 final
- The 1997 final.
- The 1996 final.
- The 1995 final.
- The 1994 final.

Free Spreadsheet exercises from Computation and Computer Methods in Geology

- First, here's how to trick Excel into plotting data on a stereonet as a worksheet and pdf file.

- Exercise one covers relative versus absolute addresses and graphing equations.
- Exercise two introduces Excel's array functions for transposing, multiplying and inverting matrices.
- Exercise three uses the array functions for solving simultaneous equations and fitting lines to linear data.
- Exercise four demonstrates Excel's LINEST() function for least squares.
- Exercise five requires importing ASCII data, sorting, MEDIAN(), and AVERAGE.

Auxiliary exercises

- Erosion and landscape evolution

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