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GEO 439.01: Applied Magnetics - Tectonics, Structure, and Exploration

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Geoscience 439 – Applied Magnetics: Tectonics, Structure and Exploration
Spring 2013, 3 credits
Professor Steven Sheriff

http://www.umt.edu/geosciences/faculty/sheriff/495-Applied Magnetics/495AppliedMagnetics.html

This course combines some of the theory and global aspects of magnetics and their practical application to exploration at the environmental to crustal scale. Pre/co-requisites: MATH 153 or 158, GEOS 100 &101N, PHYS 121N.

Text: There is no required text, but I have links to open source books on the web site. However, given this is a senior level course, I expect you to spend plenty of time in the library, or online, reading and investigating relevant professional literature. It is your responsibility to do the background work necessary to understand the material presented in discussions and lectures. There are a number of applied geophysics textbooks in the library. The most important use of these is to get a different perspective and approach to a topic than mine.

Grading: One midterm (~30% each), one final (~35%), lab & field oriented assignments (~20%), problem sets (~15%). 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 all but get them wrong I'll weigh them a lot less than 15%. Your participation and discussion during the semester will count towards your grade. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. A note from the Provost: all students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/SA/VPSA/index.cfm/page/1321.

Computation: I expect you to have familiarity with spreadsheets and that you will learn the other software we'll need as the semester progresses. This includes much specialized software operating either in the DOS or windows environment. If you think you need to develop these skills now is the time to start. Note the "free excel exercises" on the course's home page.

Project Assignments: These vary but may involve you working with two to four others, perhaps 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. In other words, 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. Previous exams are linked to the course web site. The final exam will be at the official UM-designated time.

General Course Content:

- Geomagnetism, rock magnetism, paleomagnetism
- Magnetic anomalies and magnetic exploration
- Processing and interpreting aeromagnetic data
- Acquisition, processing, and interpretation of ground-based magnetic data

My goals for the course

- Introduce you to some of the topics in magnetics pertinent to solid-earth and exploration geophysics
- Teach some of the standard mathematical/geophysical techniques you will need to understand the application of paleomagnetism or aeromagnetic data s to many geologic problems
- Get you to a level where you can read and understand the geophysical literature and applications in magnetics so you can: 1) evaluate magnetic applications to geological problems, and 2) investigate the use of magnetics 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 on your own for the descriptive aspects of the material.**