Geology 495 – Subsurface Imaging for Archaeologists, Spring 2009, 3 credits. Syllabus

My intent is to provide participants with a working knowledge of the principal geophysical techniques currently available for the detection of buried archaeological features. These methods and approaches are directly applicable to any geophysical investigation of the shallow subsurface such as resource exploration or environmental site assessment. I will cover some of the theory necessary to understand the applications together with the mathematical principles relevant to the detailed understanding of detection methods. I will do that with a mix of lectures and responses during our discussions. I will place emphasis on the use of case study examples to investigate technical aspects, as well as archaeological interpretation and survey strategies. My emphasis will be on geophysical techniques, I expect you to have a working knowledge of site surveying and scientific sampling.

Early in the semester we will focus on background theory, case studies, and experimental design. The latter part of the semester will include integration of fieldwork, subsequent data processing, presentation, and project reports. All projects will have a classroom presentation.

Text: Field Geophysics, John Milsom, Wiley, 2003, 3rd edition. Given that this is s 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/approach to a topic than mine. If you are feeling rich and intend to be a professional in the field, you could order Reynolds, *An Introduction to Applied and Environmental Geophysics*, John Wiley & Sons, 1997; the Amazon source is a money saver.

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 all but get them wrong I'll weigh them a lot less than 10%. Your participation and discussion during the semester will count towards your grade. Attendance is also an important component of your grade. We only meet once per week, so missing one day is nearly 7% of the class – that's way too much to miss. 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. 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 some familiarity with spreadsheets and that you will learn some of the other software we'll need for the fieldwork and data processing. I expect previous fulfillment of general education requirements in math and natural science or permission of instructor. In addition, there is spreadsheet manipulation and processing of your data as well as use of specialized software for data processing and visualization. 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 a self-designed experiment. 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 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.

My goals for the course:

- Introduce you to some of the techniques in gravity, electrical methods ,magnetics, and radar pertinent to archaeological targets
- Teach some of the standard mathematical/geophysical techniques you will need to understand the techniques.
- Get you to a level where you can read and understand geophysical literature so you can: 1) evaluate geophysical applications to archaeological problems, and 2) investigate the use of geophysics in those problems.
- I believe that any senior level course 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.