21-460-406: Applied Geophysics
Spring 2018 Syllabus

Instructor: Dr. Lee Slater *Lab Instructor:* Chen Wang, Ph.D. candidate
Office: 140a Smith Hall (Office Hours: W 11:30 - 12:30)
Meeting Time: 8:30-11:20 am W (lecture) and 1:00-3:50 pm M (lab) – Smith 127

Course Description

This course provides an introduction to applied geophysical methods, with a focus on the application of these techniques in environmental & engineering studies. The material will provide the technical foundation needed to understand the use and limitations of the following techniques magnetometry, (EM) terrain conductivity, ground penetrating radar (GPR), direct current (DC) resistivity/induced polarization and seismics. Demonstration of commonly used methods will be provided in the field along with a description of preliminary data reduction techniques. Participation in problems set in class is expected.

The topics covered will include:

Low frequency electrical geophysics

Low frequency electrical properties of soils and rocks
Resistivity (& induced Polarization) methods
Electromagnetic methods
Case Studies of electrical and electromagnetic methods in environmental and engineering studies

High frequency electrical geophysics

High frequency electrical properties of soils and rocks
Ground penetrating radar (GPR) method
Case Studies of ground penetrating radar in environmental and engineering studies

Magnetic geophysics

Magnetic properties of soils and rocks
Magnetic methods
Case Studies of magnetic methods in environmental and engineering studies

Seismic geophysics

Seismic properties of soils and rocks
Seismic methods
Case Studies of seismic methods in environmental and engineering studies

Specific Learning Objectives:

- Solid understanding of physical properties of soil and rocks determining geophysical properties
- Basic knowledge obtained in the acquisition of field geophysical datasets
- Experience with software used to process geophysical datasets
- Understanding of limitations of geophysical surveys when applied to environmental and engineering studies.

Text:

There is no required text for this class. Instead I will use my own slides sets along with slides that were developed by Andrew Binley (Lancaster University, UK, http://www.es.lancs.ac.uk/people/amb/) for the lecture component of the class. I will also use my own exercises, in addition to some provided by Andrew Binley.

For those of you that would like a textbook as backup, I recommend the following text (available from the University Bookstore)
Rubin, Y. and Hubbard, S.S., 2005, Hydrogeophysics (Water Science and Technology Library), Springer, 523 pp, ISBN: 1402031017

Other texts that I will reference from include:

- Butler, D.B., Editor, 2007, Near Surface Geophysics, Investigations in Geophysics #13, Society of Exploration Geophysicists, Tulsa, OK.
- Reynolds, J. M., 1997, An Introduction to Applied and Environmental Geophysics, John Wiley & Sons
- Kelly, W.E. and Mareš, S., 1993, Developments in water science 44: applied geophysics in hydrogeological and engineering practice, Elsevier Science Publishers
- Milson, J., 2003, Field Geophysics, Third Edition, The Geological Field Guide Series, John Wiley & Sons
- Sharma, P. V., 1997, Environmental & engineering geophysics, Cambridge University Press
- Telford, W.M., Geldart, L.P. and Sheriff, R.E., 1990, Applied Geophysics, Second Edition, Cambridge University Press
- Vogelsang, D., 1995, Environmental geophysics: a practical guide, Springer-Verlag
- Ward, S. H., 1990, Geotechnical and environmental geophysics, Volumes I-III, Society of Exploration Geophysicists

The following are also useful references:

- Meju, M.A., 1994, Geophysical data analysis: understanding inverse problem theory and practice. SEG Course Notes Series, Volume 6 (S.N. Domenico, Editor), Society of Exploration Geophysicists

- Sheriff, R. E., 1994, Encyclopedic dictionary of exploration geophysics, Third Edition, Geophysical Reference Series 1, Society of Exploration Geophysicists

Your Assignments

- *Take home assignments*: You will need to write up your labwork when assigned- due in class the following week†
- *Written paper*: written in the format of a scientific journal
- *Mid-term*: in class (closed-book) format – time TBA
- *Final*: (closed book) format – time determined by Rutgers Exam Schedule
- *Quick quizzes:* in-class (closed book) format

†Write ups of the laboratory work are due in class the week following the lab. All labs must be typed up and show all calculations. I will not accept hand-written assignments. Assignments cannot be handed in late for grading – students that do not hand in the assignment in the following class will get a 0 for that assignment.

Grading:

The breakdown for the grading is as follows.

- *Take home assignments/lab write-ups*: 30%
- *Written paper*: 10%
- *Mid-term*: 25%
- *Final*: 25%
- *Quick quizzes:* 10%

SERIOUS STUFF:

Drop and withdrawal deadlines:
The last date for students to drop a course with no penalty: 1/28/14
The last date to withdraw from a course with a "W" grade: 3/31/14

Americans with Disabilities Act Statement: If you need accommodations because of a documented disability, contact the Disabled Student Services Office on x5300

University academic integrity: All students are expected to fully adhere to the university academic integrity policy: http://academicintegrity.rutgers.edu/ Cheating in any form will not be tolerated. The first occurrence of any of this behavior will result in a grade of "F".