GLY 5457: Environmental Geophysics

Instructor:

Dr. Xavier Comas

Prerequisites:

Graduate standing in Geology or related discipline; or permission by instructor

Number of credits:

3 (5000 level course suggested)

Class textbook: (recommended)

"*An Introduction to Applied and Environmental Geophysics*", by J. M. Reynolds, New York, Wiley and Sons, 1997, 726 pp.

Course description:

The course gives an introduction to near-surface geophysical methods for mapping the ground at shallow depths. Emphasis is given to electromagnetic and electrical methods such as ground penetrating radar (GPR) and resistivity imaging with an emphasis on environmental applications. A field-based case study using an integrated array of real geophysical data sets collected in a local site will be conducted to give students a practical approach to applied geophysical methods

Course Objectives:

1) To provide an overview of the theoretical basis and principles of near-surface geophysical methods; 2) to examine the most common applications and how these methodologies can help understanding certain environmental issues; 3) to present an overview of geophysical data collection and processing of real data sets (with emphasis on ground penetrating radar and resistivity imaging); 4) to become familiar with case studies and exercises related to geophysical data processing

Method of instruction:

Combination of both classroom and lab/field

Contents:

The general course structure will be as follows:
1) Introduction: general overview of geophysical methods with emphasis on near-surface techniques

2) Electrical methods: theoretical and practical basis of electrical methods (e.g. resistivity, self-potential, and induced polarization)
3) Electromagnetic methods: theoretical and practical basis of electromagnetic methods (e.g. ground penetrating radar and terrain conductivity)
4) Seismology: theoretical basis of seismic methods with emphasis on environmental applications (e.g. refraction and reflection methods)
5) Potential field methods: theoretical basis of potential methods with emphasis on environmental applications (e.g. gravimetric and geomagnetic methods)

Suggested activities:

A short field trip at a local site will serve as the basis for developing a class project that will include: 1) data collection; 2) data processing; 3) data preparation and discussion; 4) data presentation (both oral and written). The project intends to give students a practical overview of the entire routine involved in a geophysical field based study from data acquisition to final data presentation while encouraging critical thinking.

Assessment procedure:

Exams:	Mid-term:	35%
	Final:	35%
Field project (write up and presentation):		25%
Quizzes:		5%

Grading scheme:

A	93-100%
A-	90-92.9%
B+	87-89.9%
B	83-86.9%
B-	80-82.9%
C+	77-79.9%
C	70-76.9%
D	63-69.9%
F	63% or lower

Suggested bibliography:

1. *An Introduction to Applied and Environmental Geophysics*, by J. M. Reynolds, Wiley and Sons, New York, 1997, 726 pp.

2. *Environmental and Engineering Geophysics*, by P. V. Sharma, Cambridge University Press, Cambridge, 1997, 475 pp.

3. *Hydrogeophysics*, by Y. Rubin and S. Hubbard, Water and Science Technology Library, V. 50, Springer, Netherlands, 2005, 523 pp.

4. *Applied Geophysics,* 2nd edition, by W.M. Telford, L.P. Geldart and R.E. Sheriff, Cambridge University Press, Cambridge, 1991, 770 pp.

5. *The Solid Earth: An Introduction to Global Geophysics*, 2nd edition, by C. M. Fowler, R. Cambridge University Press, Cambridge, 2004, 704 pp.

6. *Looking into the Earth: An Introduction to Geological Geophysics,* by M. Mussett and M. A. Khan, Cambridge University Press, Cambridge, 2001, 608 pp.

7. *Field Geophysics (Geological Field Guide),* 3rd edition, by J. Milsom, John Wiley & Sons, New York, 2003, 232 pp.

8. *Ground Penetrating Radar in Sediments*, Geological Society Special Publication, by C. S. Bristow and H. M. Jol, Geological Society of London, 2003, 330 pp.

9. *Ground-penetrating radar and its use in sedimentology: principles, problems and progress*, by A. Neal, Earth-Science Reviews, 66, Elsevier B. V., 2004, 261-330.