

Florida International University
Department of Earth and Environment

GLY 4450 Spring 2013
Environmental and Exploration Geophysics

Lec: MWF 2:00-2:50, Room: PC 341

Note: This syllabus supercedes all previous versions (1/2/13)

Dr. Dean Whitman
Office Hours: MW: 3:00-5:00PM, Tu 11-12
after class, or by appointment

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Required Text: Burger, H. R, A. F. Sheehan, and C. H. Jones *Introduction to Applied Geophysics, Exploring the Shallow Subsurface*, 2005. ISBN 0-393-92637, \$90

Grading: Homework exercises 50%; Midterm 20%; Final Exam 30%

Description:

Geophysics is the application of physical principles to the study of the Earth's structure and physical properties. Exploration or applied geophysical techniques are used to determine the physical properties of the subsurface from measurements made by instrumentation placed on the surface or in boreholes in the ground. These techniques were first developed as an aid in the exploration for mineral and petroleum deposits but in recent years, they have been increasingly applied to environmental problems such as hydrogeology and site remediation. Applications of geophysical methods include the determination of subsurface stratigraphy and soil properties, characterization of groundwater flow and storage, the identification and tracing of hazardous substances and contaminants in the subsurface, the detection of buried objects and unexploded ordinance, the characterization of soil and bedrock properties for stability, and the exploration of the subsurface for valuable mineral and energy resources.

Learning Objectives/Outcomes

This course will provide an introduction to the basic field and interpretation methods used in exploration and environmental geophysics. Topics include seismic methods, gravity and magnetic (potential fields), electrical and electromagnetic methods, ground penetrating radar (GPR) and borehole methods,. The course includes 1-2 field trips to sites in Miami-Dade County and will also include exercises on data reduction, modeling, and interpretation.

Prerequisites: GLY1010 or 3039, MAC 2311, PHY 2048 & 2049 or PHY 2053 & 2054

Note: PHY 2049 or PHY 2054 may be taken concurrently with this course

Internet Resources

A course webpage will be maintained with **Blackboard Learn**. This page will contain this syllabus, software, data, and lecture notes for the course.

To access this resource, go to <https://ecampus.fiu.edu/> and click on **Blackboard Learn Login**. Then click the *Click Here to Login* button and enter your FIU MyAccounts User Name and Password. Select [1131 - GLY4450 & GLY5495 - Environmental and Exploration Geophysics & Seminar in Geophysics - Sections U01 - Spring 2013](#) (*unavailable - will be available Monday, January 7, 2013*). For help with Blackboard, click the *Student Information* tab or call the UTS Help Center at (305) 348-2284.

Tentative Schedule

Week	Topic	Reading
1	Introduction Seismic Waves	Ch 1, Ch 2
2	Seismic wave propagation <i>Ex 1:</i> Seismic Wave Propagation	Ch 2, Ch 3
3	Seismic refraction method <i>Ex 2:</i> Seismic Refraction Method	Ch 3
4	Seismic reflection method <i>Ex 3:</i> Seismic Reflection Method	Ch 4
5	Seismic Surveying <i>Ex 4:</i> Seismic Reflection Interpretation	Ch 4
6	Review Midterm (Seismic Methods, Chs. 1 - 4) Gravity on the Earth	Ch 6
7	Gravity surveying and reduction Regional gravity studies and anomalies <i>Ex 5</i> Gravity Data Collection and Reduction	Ch 6
8	Gravity Anomalies Due to Simple Shapes 2-D Gravity Anomalies <i>Ex 6:</i> Gravity Modeling	Ch 6
9	Earth Magnetism Magnetic surveying	Ch 7
10	Spring Break	
11	Magnetic Anomalies <i>Ex 7:</i> Magnetic modeling	Ch 7
12	Electrical resistivity	Ch 5
13	Electromagnetic methods <i>Ex 8:</i> Resistivity Modeling and Interpretation	Ch 8
14	Ground Penetration Radar <i>Ex 9:</i> GPR interpretation	Ch 8
15	Borehole Methods Review and Questions	TBA

Selected Applied Geophysics References (in reverse chronological order)

- Reynolds, J.M., 2011, An Introduction to Applied and Environmental Geophysics, Wiley, 712 pp.
- Burger, H. R, A. F. Sheehan, and C. H. Jones, 2005, Introduction to Applied Geophysics, Exploring the Shallow Subsurface, Norton,
- Kearey, P., M. Brooks, and I. Hill, 2002, An introduction to geophysical exploration Blackwell Scientific Publications, 3rd E., 259 p.
- Mussett, A. E., and M. A. Khan, 2000, Looking into the Earth: An Introduction to Geological Geophysics, Cambriadge Univ. Press
- Parasnis, D.S., 1997, Principles of applied geophysics, 5th ed., Chapman and Hall, 429 p.
- Telford, W.M., L.P. Geldart, and R.E. Sheriff, 1990, Applied Geophysics, 2nd ed., Cambridge University Press.
- Ward, S.H., ed., 1990, Geotechnical and Environmental Geophysics, Society of Exploration Geophysics investigations in Geophysics,
- Milsom, J., 1989, Field geophysics , Open University Press, 182 p
- Carmichael, R.S., 1989, Practical Handbook of Physical Properties of Rocks and Minerals, CRC Press, 741 pp.
- Robinson, E.S., and C. Coruh, 1988, Basic Exploration Geophysics, John Wiley, 562 p.
- Dobrin, M.B., and C.H. Savit, 1988, Introduction to Geophysical Prospecting, 4th ed., Mc Graw-Hill, 867 pp.
- Hinze, W.J. ed. 1985, The Utility of regional gravity and magnetic anomaly maps , Society of Exploration Geophysicists, 454 p
- Sheriff, Robert E., 1984, Encyclopedic dictionary of exploration geophysics 2nd ed., Society of Exploration Geophysicists, 323 p.
- Beck, A. E., 1981, Physical principles of exploration methods : an introductory text for geology and geophysics students, John Wiley, 234 p.
- Society of Exploration Geophysicists, 1967, Mining geophysics. vols I and II, Society of Exploration Geophysicists
- Keller, G.V. and F. C. Frischknecht., 1966, Electrical methods in geophysical prospecting, Pergamon Press, 519 p.