GEO 145: Shallow Subsurface Imaging

Prerequisite(s):
GEO 001 with a grade of "C-" or better; MATH 009A or MATH 09HA; MATH 009B or MATH 09HB; PHYS 002A or PHYS 040A; PHYS 002B or PHYS 040B; PHYS 002C or PHYS 040C; or consent of instructor.

Textbook:
'Introduction to applied and environmental geophysics' by J. Reynolds, published by Wiley.

Objectives:
1) Acquire data using several different geophysical techniques
2) Process data both acquired during the course and that someone else has acquired
3) Quantitatively interpret and model subsurface structure
4) Make geological inferences from your physical model and ensure that the model is realistic
5) Work as an individual as in teams on different aspects of a project
6) Practice and/or learn various general and scientific skills

Overview:
This course covers techniques of geophysical investigation of the shallow subsurface as they apply to solving groundwater, environmental, archaeological, and engineering problems. Emphasizes methods, survey design, and interpretation with focus on case studies. Laboratory consists of both field training and computer exercises using geographic information systems for analysis of spatial data.

During the quarter you will acquire data at several field locations in southern California. It is likely that we will acquire more data than is feasible to process in the course, but you will gain experience working with several types of geophysical equipment. We will focus on several geophysical techniques that include shallow seismic refraction, gravity, resistivity, magnetic and EM.

Assessment will be based on a combination of homework that will emphasize the material covered in lecture. The homework assignments are useful preparation for the field portion of the course. In addition, assessment will be based on a final technical report will be due in which you process and interpret the data from several geophysical techniques at one locale.

Outline

Week	Topic	Data Sets/Field Work
1	Introduction Gravity	
2	Geomagnetic Potential Field Modeling	1. Local survey for buried pipes
3	Applied Seismology Introduction Seismic Refraction Surveying	
4	Seismic Reflection Surveying Seismic Interpretation	2. Interpreting seismic reflection data
5	Field Locale Background Geophysical Equipment Introduction	3. Weekend field trip to San Andreas fault
6	Electrical Methods Electrical Resistivity	
7	Self Potential Induced Polarization	
8	Electromagnetic methods I Electromagnetic methods II	4. EM Dike survey
9	Ground Penetrating Radar Current uses of Geophysical Data	
10	Future of Geophysical Methods	