

# LABORATORIO DI ACQUISIZIONE ED ELABORAZIONE DATI GEOFISICI

## (LABORATORY OF ACQUISITION AND PROCESSING OF GEOPHYSICAL DATA)

**Academic year: 2019-2020**

**Second teaching period  
6 cfu, Code: 9545M**

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The course is organized in 5 teaching units (UD) each divided in several lessons, including front lectures, at least TWO on-site surveys, and some computer sessions. The total number of hours is not less than 60. The units, with a short description of the content are the following:

### **UD1 Introduction to the geophysical methods**

Basic concepts, geophysical parameters, resolution, sensitivity, applicability. Survey design and synthetic data simulation..

### **UD2 Electrical methods**

Conductivity of the rocks. Self Potentials.  
Electrical Resistivity Tomography (ERT) data acquisition and inversion. Critical evaluation of results.  
Induced Polarization  
Low frequency EM methods: time and frequency domain.

### **UD3 Ground Penetrating Radar – GPR**

Basic principles and parameters.  
single-fold, multi-fold and multi-component acquisitions. Velocity analysis and depth conversion.  
Data processing: editing and geometry; drift removal (zero time correction); spectral analysis and filtering, background removal, amplitude analysis and gain, velocity analysis, vertical and horizontal stack, depth conversion and migration.

### **UD4 Seismic methods**

Basic principles: reflection/transmission coefficient.  
Reflection seismics.  
Refraction seismics.  
Multichannel Analysis of Surface Waves – MASW.

### **UD5 Magnetic methods**

Physical bases of the earth magnetism. Instruments and measurement techniques.

**Used Software:** Matlab (Geophysica); Prism2, Res2DINV, Prosys.

**Suggested readings in addition to the slides, which are all provided before the course:**

- Sharma P. V., Environmental and engineering geophysics, Cambridge University Press, 1997.
- Reynolds J. M., An introduction to applied and environmental geophysics, Wiley, 1997.
- Butler D.K., Near-Surface Geophysics, SEG Investigations in Geophysics Series No. 13, 2005, 758 pp.
- Jol H. M. (Editor) Ground Penetrating Radar: Theory and Applications, Elsevier, 2009.
- Young R. A., A Lab Manual of seismic reflection processing, EAGE publications, 2004.
- Yilmaz O., Seismic data analysis, Processing, Inversion and interpretation of seismic data, SEG, vol.1, 2001.
- Carrara E., Rapolla A. e Roberti N., Le indagini geofisiche per lo studio del sottosuolo: metodi geoelettrici e sismici, Liguori ed., 1992 (In Italian).
- Fedi M., Rapolla A., I metodi gravimetrico e magnetico nella geofisica della terra solida, Liguori ed., 1993. (In Italian).

**TESTS and EXAMINATION**

- Short report about one of the topics described into the course. The Reports must be prepared according to the scheme provided during the course.
- Oral examination about the report and the course contents.