LABORATORIO ACQUISIZIONE ED ELABORAZIONE DATI GEOFISICI

(GEOPHYSICAL DATA ACQUISITION AND PROCESSING LABORATORY)

Academic year: 2021-2022

Second teaching period
6 CFU, Code: 9545M

Teacher: prof. Emanuele Forte (ph. +39 040 5582271, e-mail: eforte@units.it)

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.

UD5 Magnetic methods

Physical base 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 made available 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 Report must be prepared according to the scheme provided during the course.
- Oral examination about the report and the course contents.