PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
SCHOOL OF ENGINEERING
DEPARTMENT OF STRUCTURAL AND GEOTECHNICAL ENGINEERING
ABET COURSE SYLLABI

ICE2643 GEOPHYSICAL METHODS FOR ENGINEERING

Credits and contact hours: 10 UC credits / 10 hours (3 h. Lectures; 1,5 h. Assistantship; 1 h. Labs and 4,5 h. Independent learning experiences)

Instructor's name: Gonzalo Yáñez

Course coordinator's name Gonzalo Yáñez

Textbook: Lowrie, W. (2002) Fundamentals of geophysics. Cambrige University Press.

Course Catalog Description: This course presents an introduction to the fundamentals of Exploration Geophysics and its application to engineering problems, resource exploration and assessment of geological risks, throughout an indirect reconnaissance (non-invasive) of the physical properties that characterizes the sub-surface. The course is oriented to gain familiarity with experimental techniques, the mathematical tools and geophysical theory used for the study and quantitative analysis of the earth interior.

Prerequisite Courses: MAT1620 Calculus II and FIS1533 Electricity and Magnetism and (ICE1513 or FIS1513) Statics and Dynamic

Co-requisite Courses: None

Status in the Curriculum: Required

Course Learning Outcomes:

1. Identify the critical variables that conditions the appropriate geophysical experiment design for each potential application of exploration geophysics.
2. Appropriate use of the geophysical instrumentation throughout field experiments (laboratories)
3. Identification and critical evaluation of the inherent limitations and potentialities of each methodologies, throughout its practical application (laboratories).
4. Identify the appropriate geophysical methodology for the characterization of the sub-soil physical properties of interest and its linkage with the problem/question.
5. Process, analyze, and proper interpretation of experimental information.
6. Scientific method application into the comprehension of a geophysical exploration problem throughout the establishment of a working hypothesis, experimental design and execution of testing mechanisms.
7. Team work experience for the solution of a geophysical problem in to their stages: working hypothesis, testing experiment, data analysis,

and conclusions (theoretical and practical knowledge).

Relation of Course to ABET Criteria:

a. Knowledge of mathematics, science and engineering
b. Design and conduct experiments: analyze and interpret data
d. Multidisciplinary teams
e. Identify, formulate, and solve engineering problems
k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. The geophysics as an exploration tool.
   - 1.1. Course presentation. The geophysics as an indirect tool for the exploration of earth interior, working scales and resolution.
   - 1.2. Mining, hydric and energy resources exploration.
   - 1.3. Near Surface geophysics, engineering, environment, and archeology.
   - 1.4. Physical properties of rocks.
2. Gravity and magnetism.
   - 2.1. Gravity potential.
   - 2.2. Magnetic potential
   - 2.3. Data reduction.
   - 2.4. 2 and 3D models
   - 2.5. Instrumentation
   - 2.6. Field work (gravity and magnetics)
   - 2.7. Results and interpretation
3. Geo-electricity
   - 3.1. Electric potential.
   - 3.2. SEV Method
   - 3.3. Magnetotelluric method
   - 3.4. TEM method
   - 3.5. Instrumentation
   - 3.6. Field work (SEV)
   - 3.7. Results and interpretation
4. Seismic
   - 4.1. Elasticity principles.
   - 4.2. Seismic Reflection
   - 4.3. Seismic Refraction
   - 4.4. Surface waves
   - 4.5. Instrumentation
   - 4.6. Field work (refraction and surface waves)
   - 4.7. Results and interpretation
5. Synthesis and integration
   - 5.1. Review of complementary information
   - 5.2. Joint interpretation and discussion.