Ground Exploration Methods

Ground Exploration Methods

Module number	Credits	Workload	Semester[s]	Duration	Group size
SE-CO-11	10 CP	300 h	3. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Geophysical Inverse Problems	a) 3 WLH (45 h)	a) 105 h	a) each winter
b) Seismic and electromagnetic field methods	b) 3 WLH (45 h)	b) 105 h	b) each winter

Module coordinator and lecturer(s)

Prof. Dr. Wolfgang Friederich

a) Prof. Dr. Wolfgang Friederich

b) Prof. Dr. Wolfgang Friederich

Admission requirements

Learning outcome, core skills

- Students understand the theoretical foundations of seismic and electromagnetic field methods and know up-to-date measuring and data-acquisition procedures. They know and understand state-of-the-art methods of data analysis and interpretation.
- Students understand the general philosophy of how to properly set up and solve geophysical inverse problems to create subsurface models from geophysical field surveys. They know different approaches to mathematically formulate an inverse problem and various techniques to obtain solutions in practice. They are able to solve small-scale problems themselves by writing a computer program.

Contents

a)

Mathematical precursor on linear vector and Hilbert spaces, the continuous linear inverse problem with exact and uncertain data, discrete linear inverse problems with uncertain data, singular value decomposition, resolution analysis, conjugate gradient minimization, linearized iterative inverse problems

b)

Data acquisition in reflection seismics, seismic data processing, ray and wave-equation migration, basic electromagnetic theory, electromagnetic fields in matter, geoelectric sounding and induced polarization, electromagnetic diffusion and waves in matter and ground penetrating radar

Educational form / Language

a) Lecture (3 WLH) / English

b) Lecture (3 WLH) / English / German

Examination methods

• Written exam 'Ground Exploration Methods' (120 min., Part of modul grade 100 %)

Requirements for the award of credit points

- Passed module examination, bonus points for voluntary presentation of solutions to exercises

Module applicability

- M.Sc. Subsurface Engineering
- M.Sc. Geosciences

Weight of the mark for the final score

Percentage of total grade [%] = 10 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information Literature: Parker, R.: Geophysical Inverse Problems; Menke, W.: Geophysical Data Analysis, Discrete Inverse Theory; Feynman: Lectures on Electrodynamics; Telford, Geldart, Sheriff: Applied Geophysics, Everett, M., Near surface applied geophysics, 403 pp. Cambridge University Press, 2013