

SYLLABUS

Exploration and Environmental Geophysics 7.5 credits 07007K

Geofysik för prospektering och miljöundersökning

Course syllabus admitted: Autumn 2023 Sp 1 - Present

**DECISION DATE
2021-02-17**

Exploration and Environmental Geophysics 7.5 credits O7007K

Geofysik för prospektering och miljöundersökning

Second cycle, O7007K

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Geofysik	Earth Science and Physical Geography

Main field of study

Geosciences

Entry requirements

90 credits in geoscience

Selection

The selection is based on 30-285 credits

Course Aim

After completing the course participants should be able to:

- suggest geophysical methods for solving exploration and environmental related problems
- describe limitations for the geophysical methods
- explain qualitatively Solid Earth Physics, physical fields, composition and structure of the Earth
- explain basic interpretation principles, including here the principles for choosing of principal/conceptual model when interpreting geophysical data, ambiguity, relation between data uncertainty and uncertainty on model parameters, application of petrophysical measurements and other a priori information
- explain and apply the concepts of convolution, Fourier transformation and filtering and provide examples for use in geophysics
- explain the significance of data sampling density and the concept of aliasing
- describe basic principles (physics, measurement techniques and interpretation) for the geophysical methods treated in the course.

Contents

Continuous and discrete data: Sampling; spectra; Fourier transformation and filtering.

The magnetic field of the Earth – magnetometry: The Earth magnetic field. Magnetic properties of rocks and unconsolidated sediments. Measuring techniques and data processing. Exploration for mineral resources.

The gravity field of the Earth – gravimetry: Geodesy with emphasis on the gravity field of the Earth. Density of rocks and unconsolidated sediments. Corrections to gravity data and the calculation of Bouguer anomalies.

Regional/residual anomaly separation. Gravity method in exploration.

Electric and electromagnetic methods: Electric conductivity of rocks and unconsolidated sediments. Dielectric constants of rocks and unconsolidated sediments. Electric methods based on natural and artificial currents.

Electrical sounding and mapping. Examples in mineral exploration, environmental studies, prospecting for and planning of water resources, pollution of ground water. Electromagnetic fields. Depth of penetration.

Electromagnetic methods with examples of application in mineral exploration and environmental studies.

Ground Penetrating Radar and borehole radar with examples in environmental studies.

Magnetic resonance sounding.

Radiometric method: Measuring of gamma radiation and applications.

Borehole methods and logging: acoustic/sonic log; calliper log; density log; gamma log, induction/conductivity log, neutron log, resistivity log, SP-log (self-potential); temperature log; IP log (induced polarization) and magnetic log.

Examples from logging in hard rock and sediments.

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

The teaching will be as lectures and one compulsory laboratory training on petrophysical parameter estimation. Lectures are complemented by computer exercises performed in dedicated lecture rooms with computers and software. The lectures are focused on basic theory and applications.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Petrophysical laboratory work with written report.

Written examination with differentiated grades (G U 3 4 5) will be arranged at the end of the teaching period. The examination will include theory as well as problem solving.

Petrophysical laboratory work with written report is graded (G U).

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Overlap

The course O7007K is equal to KGG003

Course offered by

Department of Civil, Environmental and Natural Resources Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Written exam	G U 3 4 5	7	Mandatory	A15	
0003	Laboratory work	U G#	0.5	Mandatory	A15	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Assistant Director of Undergraduate Studies Eva Gunneriusson, Department of Civil, Environmental and Natural Resources Engineering 2021-02-17

Syllabus established

Course plan approved by the Department of Chemical Engineering and Geosciences 2007-02-28.