SYLLABUS

Quantitative Interpretation of Geophysical Data 7.5 credits O7008K

Kvantitativ tolkning av geofysiska data

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2023-02-13

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LULEÅ TEKNISKA UNIVERSITET

Quantitative Interpretation of Geophysical Data 7.5 credits O7008K

Kvantitativ tolkning av geofysiska data

Second cycle, O7008K

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. 15 credits in Physics and O0001K or corresponding course

Selection

The selection is based on 30-285 credits

Course Aim

The aim of the course is to introduce approaches to analysis of geophysical data based on inverse theory and explore some of the questions that arise in solving linear and non-linear inverse problems.

After completing the course, the student is expected to be able to:
- explain and apply fundamental principles of geophysical data inversion
- formulate solutions of geophysical problems using Tikhonov regularization technique
- process and evaluate quality of geophysical data
- obtains experience from inversion of real and synthetic data
- explain strength and weakness of geophysical methods
- explain and apply inversion techniques for potential field data
- explain and apply inversion techniques for electromagnetic data

Contents

Inversion of geophysical data: Characterization of data and data errors. What are the characteristics of a good model? Model parameterization and Tikhonov regularization. Forward responses and Sensitivities. Solving linear and non-linear inverse problems. Relation between data errors and model parameters uncertainty. Trade-off between resolution and variance. Á priori information. Bayesian inversion. Examples with inversion of various types of geophysical data. Applications in mineral explorations and environmental investigations.

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 laboratory training. Participation in the laboratory training is compulsory. The lectures will be focused on basic theory and applications on geophysical data. The laboratory part will be focused on determination of physical properties of geological material and interpretation of geophysical data. Geophysical software packages are used to illustrate the interpretation and processing methods.

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. A written assignment exercise assesses the ability to formulate and solve simple inverse problems rising in geophysical/petrophysical measurements by applying inverse theory methods (U/G). An oral exam assesses the ability for problem-solving and describing fundamental principles of geophysical data inversion. The exam also evaluates the ability to formulate the inverse problem and explain solutions for geophysical methods presented during the course. (G U 3 4 5).

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.

Remarks

O7008K is equivalent to KGG003 and cannot be combined.

Course offered by

Department of Civil, Environmental and Natural Resources Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0008	Exam	G U 3 4 5	7	Mandatory	A23	
0009	Assignment	U G#	0.5	Mandatory	A23	

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 2023-02-13

Syllabus established

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