



Course syllabus

Fältundersökningsmetodik Field Investigation Methodology

VTGN01, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED V

Date of Decision: 2023-03-21

General Information

Elective for: V5-at, W5-ms

Language of instruction: The course will be given in English

Aim

The main aim of the course is to increase the student's knowledge of the importance and possible content of preinvestigations concerning large infrastructural projects. Geological methodology for reconnaissance and mapping is included as an important part, and geophysical measurement technology is a central part of the course. Furthermore, drilling and sampling technology including methodology of classification and interpretation are parts of the course. A main theme of the course is integrated utilization and interpretation of the different steps and methods within the field investigation process. An important part of the content is consisting of field measurements for engineering and environmental applications, which here mean investigations applied on problems related to engineering geology, foundation engineering, hydrogeology, groundwater protection and contaminated soil. The course includes training in applied interpretation and evaluation methodology and also presentation techniques, as essential parts of the course are organized as a real field investigation. Hereby, the ability of reviewing and producing background material for decisions for different demands and levels of investigation is improved, related to hydrogeological, environmental and large infrastructural projects.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to describe how information regarding the underground can be sampled, interpreted and presented in a modern way.
- be able to define and describe principles and basic theory of the geophysical methods included in the course.
- be able to describe non-destructive testing methods and how they can be connected to other kinds of field investigation methods and measurements.
- be able to give an account for possibilities and limitations of different field investigation methods within engineering and environmental applications.

Competences and skills

For a passing grade the student must

- have an ability to apply conceptual descriptions based on the geological conditions.
- be able to design a preinvestigation programme starting from the geological, hydrogeological and soil and rock mechanical prerequisites combined with the civil engineering and environmental demands of an infrastructural project.
- be able to use and understand the basic principles of softwares for simulation, analysis and interpretation of geophysical measurements.
- be able to carry out and interpret measurements with selected geophysical measuring instruments.
- be able to suggest relevant methods to verify indirect results from e.g., geophysical methods. Relevant methods are basic investigation drilling, sampling, in-situ measurements and geophysical wireline logging.
- be able to assess and also to present a preinvestigation orally and in written form for engineers, politicians and the public.
- show an ability to independently seek and assess the value of information regarding environmental issues including groundwater conditions.

Judgement and approach

For a passing grade the student must

- understand the preinvestigation process as such and its importance for civil engineering, building construction and environmental projects.
- demonstrate to have adopted an attitude, which will emphasize and value co-operation between different professionals and experts when planning and executing projects dealing with the application of geophysical methods within engineering geology, geotechnics, hydrogeology, groundwater protection and contaminated soil and rock.
- show evidence of realizing the need for a multidisciplinary attitude and simultaneous evaluation of geotechnical, geological, hydrological, hydraulic, chemical, ecological, anthropogenic and other conditions when dealing with problems related to ground, groundwater and environment.
- show an ability to reflect on the obtained results and be able to identify the need for additional information, knowledge and abilities.

Contents

The aim of the course is achieved by a combination of theoretical studies of measuring principles, planning and execution of field investigations, writing of a technical report and oral presentation at a seminar. The course is dominated by a major compulsory project work which is carried out in groups of three-four students. The field investigation project consists of establishing a conceptual model, numerical premodelling for design of investigation strategy, field investigation, data processing, inverse modelling, interpretation and also written and oral presentation of results. The field investigation comprises 2.5 days and consists of geological field reconnaissance, measurements with a couple of geophysical methods in combination with other field investigation methods as drilling, penetration testing and digging of test pits. Two of the days are carried out in small groups of about three-four students with one teacher per group.

During the project work with interpretation and reporting of the field investigations there are frequent possibilities to consult a teacher. The project assignment is presented as a written technical report and it is also presented orally by each group and discussed at the final seminar of the course. Detailed written and oral feedback from the teachers is offered to each group of three-four students .

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Written examination and also written and oral presentation of a field investigation project. The written examination and the project assignment have equal weight when the final grade of the course is determined.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0111. **Name:** Written Examination.

Credits: 4. **Grading scale:** TH. **Assessment:** To pass the written examination at least 50% of the given points must be obtained. There is one theoretical part and one problem part in the examination but no partial pass requirements. The course literature may be consulted when the theoretical part has been handed in. **Contents:** Basic theory, application and interpretation of field investigation methodology, applied geophysics and techniques for geotechnical verification.

Code: 0211. **Name:** Project Task.

Credits: 3,5. **Grading scale:** TH. **Assessment:** To obtain a pass mark on the project task, the minimum requirements on content and presentation must be met. This includes form and presentation as well as geological and geophysical content and also processing, interpretation and assessment of geophysical information and other data from field investigations and also other sources. **Contents:** Application of field investigation methodology and geophysical investigation methods. Analysis and synthesis of geological, geophysical and other data from field investigations related to civil engineering and environmental engineering.

Admission

Admission requirements:

- VTGA01 Engineering Geology or VTGA05 Engineering Geology
- FKFN35 Methods for Environmental Monitoring or FMIF05 Environmental Management or FMIN40 Environmental Systems Studies: Environmental Impact Assessment or VTGF01 Rock Mechanics and Construction or VTGN10 Groundwater Engineering

Assumed prior knowledge: FMAB30 Calculus in Several Variables.

The number of participants is limited to: No

Reading list

- Course material in the form of articles and text extracts. Distributed during the course.

Contact and other information

Course coordinator: Universitetsadjunkt Peter Jonsson, Peter.Jonsson@tg.lth.se

Course coordinator: Matteo Rossi, matteo.rossi@tg.lth.se

Course homepage: <http://www.tg.lth.se/grundutbildning/kurser>

Further information: The course is a part of the specialisation Civil Engineering within the MSc Programme in Civil Engineering and also the specialisation Environmental Systems within the MSc Programme in Environmental Engineering. It

is also very suitable within the specialisations in Water Resources within the MSc Programmes in Civil Engineering and Environmental Engineering. It is also suitable for students, who are interested in field investigations of the subsurface, for example in connection with estimations of environmental consequences at large infrastructural projects. The course is also suitable for Exchange students with adequate prerequisites.