



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Bergmekanik och bergbyggnad **Rock Mechanics and Construction**

VTGF01, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED V

Date of Decision: 2023-03-21

General Information

Main field: Technology.

Elective Compulsory for: V3

Language of instruction: The course will be given in Swedish

Aim

The aim of the course is to enhance the student's knowledge and skills in rock geology and rock engineering as a tool to handle infrastructure and building projects and to take into account the general goals for development of a sustainable society. The course is of value for all civil engineers and particularly appropriate for the specializations towards civil engineering and water resources within the civil engineering programme.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to define and explain basic conceptions and principles regarding rock characteristics and structural features and also how rock discontinuities influence the localisation, orientation and design of for example tunnels, caverns and bridges.
- be able to describe the basic principles for rock engineering classification, rock mechanics, tunnelling techniques and construction techniques in rocks.

Competences and skills

For a passing grade the student must

- be able to interpret a geological map and erect a geological cross-section with geological strata and also be able to apply a conceptual engineering geological expectation model in

- three dimensions, taking into account other civil engineering and construction aspects.
- show an ability to evaluate engineering geological preinvestigation methodology, in particular drilling, sampling and geophysical investigations.
- be able to outline a rock engineering proposal for drilling, blasting, tunnelling and rock support based on the mechanical properties of the rocks and a conceptual engineering geological model of the rock characteristics.
- be able to estimate, discuss and also to present orally and in written form information from archive material and field investigations, concerning engineering geology, rock mechanics and rock construction. The presentation shall be directed to engineers, politicians as well as to the public.

Judgement and approach

For a passing grade the student must

- indicate an understanding of the need for alternate localisation and construction proposals and also an analysis of the consequences regarding the technical, climatic and environmental requirements on constructions in rock.

Contents

The following is included in the course contents:

- Basic rock geology emphasizing characteristics of rocks, in particular structural features and the importance of discontinuities in rock construction works. Examples on situations with magmatic, metamorphic and sedimentary rocks of various age and in different parts of the world. Weathering, clay alteration, fracturation and hardness. Engineering geological prognosis of the rock characteristics.
- Rock mechanics. Reasons for variation in strength of rock and rock mass. Load, strain and deformation of rock, the response curve of the rock mass (reference to descriptions of soil mechanics in the course VGTF05). Influence of discontinuities and anisotropy on the strength of the rock mass and on the possibilities of building constructions.
- Rock construction. Techniques for rock foundation works and anchorage of e.g. dams, bridges and embankment sides and also for construction of rock caverns and tunnels. Methods for rock support. Proposals for support of strength and running of construction works in rocks based on conceptual engineering geological models, assessment of the Q-value and of the mechanical characteristics of the rock mass.
- The influence of the groundwater conditions on the characteristics of the rock mass, in particular concerning strength and stability but also rock construction technique and environmental consequences.
- Techniques for drilling and rock sampling and also field investigations. Borehole investigations including geophysical logging.
- Environmental requirements and influence on the climate.

At least two field exercises and study visits in rock quarries and at rock construction sites. A comprehensive rock construction assignment is running in parallel with the course. The students get the responsibility for a particular part of the assignment in groups of about three-four persons. The assignment is presented as a written report and orally at the final seminar of the course. Each student group is offered a detailed written and oral supervision and feedback. Each group shall also carry out a written peer review of a report dealing with another part of the assignment.

Examination details

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

Assessment: Both parts of the course (0117, 0217) have to be approved to obtain a final mark. The final mark is a weighted average of the assessment of the written test (80%) and the written and oral presentation of a rock engineering tasks (20%) rounded off downwards to an integer.

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: 0119. **Name:** Written Examination.

Credits: 5. **Grading scale:** TH. **Assessment:** Assessment of answers on a written examination. **Contents:** The written examination consists of one theory part which is solved without any books, and one problem part where listed books and similar are allowed.

Code: 0219. **Name:** Presentations of Assignments, Excursions and Study Visits..

Credits: 2,5. **Grading scale:** UG. **Assessment:** Approved written report and oral presentation of assignment. Active participation in compulsory excursions, study visit and final seminar.

Admission

Admission requirements:

- VTGA01 Engineering Geology

Assumed prior knowledge: VSMA05 Structural Mechanics AND VBKF15 Structural Engineering, Basic Course AND VVRA05 Water AND FMIF50 Environmental Science, Especially Environmental Chemistry AND VGTF05 Soil Mechanics.

The number of participants is limited to: No

Reading list

- Svensson, C.: Större makrostrukturer i berggrunden. Kompendium säljes av teknisk geologi, 2001. Available in Swedish only.
- Svensson, C.: Kompendium i Teknisk geologi AK. KFS, 2012. Available in Swedish only.
- Lindblom, U.: Bergbyggnad. Liber, 2010, ISBN: 978-91-47-09409-7.

Contact and other information

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

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

Further information: Field exercises, excursions and study visits are accounted as laboratory work in the time plan.