

SYLLABUS

Advanced rock mechanics

7.5 credits T7022B

Avancerad bergmekanik

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2023-02-13

Advanced rock mechanics 7.5 credits T7022B

Avancerad bergmekanik

Second cycle, T7022B

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Berg- och mineralteknik	Mining and Mineral Technology

Main field of study

Civil Engineering

Entry requirements

T0013B Rock Engineering and Rock Mechanics or equivalent knowledge and
T0014B Fundamentals of Rock Mechanics or T7001B Fundamentals of Rock Mechanics and
T7002B Design of Rock Constructions or equivalent knowledge.
Good knowledge in English, equivalent to English B/6.

Selection

The selection is based on 30-285 credits

Course Aim

The course will improve your understanding of rock mechanics and induced seismicity. After finishing the course you will be able to: - apply advanced stability analyses of rock construction, including slopes, tunnels, caverns, mines, etc. using numerical methods – understand the nature of the rockbursts and seismic events in underground mines and tunnels, seismic hazard and risk, process seismic data and analyze the seismicity recorded by microseismic networks in mines.

Knowledge and understanding

For a pass on the course, the student should be able to:

- Demonstrate knowledge of the basic elements of the numerical modelling software
- Demonstrate practical skills of application of the rock mechanical theory
- Describe the relationship between the seismicity and the mining operations
- Demonstrate knowledge of basic theory of seismic waves, seismic source parameters, seismic hazard, and risk
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Competence and skills

For a pass on the course, students shall be able to:

- Apply advanced stability analyses of rock construction using numerical methods
- Design different rock constructions such as tunnels, stopes, pillars, slopes, etc using numerical methods.
- Analyse the information from the seismic systems in mines
- Define the kinematic and dynamic parameters of the seismic events in mines
- Interpret results from the seismicity analysis
- Present the results of numerical modelling and seismological analysis

Judgement and approach

For a pass on the course, students shall demonstrate the ability to

- Make assessment which approach to be used in different cases for numerical modelling
- Make assessment with regard to scientific aspects of seismicity and seismic hazard in mines

Contents

The following topics will be covered:

- Numerical modelling applied to rock mechanics problems – software definitions and operation, numerical modelling theory, factors of safety in geotechnical engineering, modelling of physical instability, strength reduction, continuum models, static analysis, structural elements, interfaces, modelling examples, practical application
- Mining-induced seismicity - seismic waves, seismic events, instrumentation for recording seismic events, parameters of the seismic events, mechanism of seismic events and rockbursts, seismicity in mines, seismic hazard, factors affecting seismic hazard, practical applications

Realization

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

This course includes lectures, self-study, homework, project/assignments in groups and individually, written reports and a oral presentation. There are two assignments in numerical modelling and three assignments in mining-induced seismicity.

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. The course is assessed through written exam with differentiated grades (3.7HP) and approved project/assignments (3.8HP) during the course.

According to the ILOs, the ILOs under the headings of Knowledge and understanding and Judgement and approach are assessed through a written exam. Students who did not pass the assignment part are not allowed to take the written exam.

The ILOs under Competence and skills are assessed through a written reports and oral presentations/report for the assignments. Grades for the written exam are awarded according to a graded scale of G/U 3 4 5. i.e. Fail (U), Pass (3), Pass without distinction (4), Pass with distinction (5).

The grades for the written exam are assigned as follows: Grade 3: 50 - 70 %; Grade 4: 71 - 85 %; Grade 5: 86 - 100 %. The project assignments arer graded with G/U. i.e. Fail (U), Pass (G).

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.

Course offered by

Department of Civil, Environmental and Natural Resources Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Assignments	U G#	3.8	Mandatory	A12	
0003	Written exam	G U 3 4 5	3.7	Mandatory	S16	

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

by Eva Gunneriusson 2012-03-14