

## Questionnaire

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### Courses offered

Programme <sup>1</sup>	Course	Semester	Type <sup>2</sup>	Hrs <sup>3</sup>	CP <sup>4</sup>	Syllabus
B-M & T	Preparation of a bachelor thesis in the area of Subsurface Engineering	SS	C	0.5	6.25	Methodology of preparation of project reports (Data collection, data Processing, data analysis, structure of report, documentation) in the area of Subsurface Engineering.
M-M & T	Design of Underground Structures	SS	E	3	6	The goal is to understand the mechanical behaviour of rock/soil surrounding a tunnel and to discuss the dimensioning of the most important support elements.
B-M & T	Bachelorthesis in the area of Geomechanics	SS	C	1	4.5	Methodology of preparation of project reports (Data collection, data Processing, data analysis, structure of report, documentation) in the area of Subsurface Engineering.
B-M & T	Civil Engineering contracts and Construction	SS	C	2	2.5	Basics of civil engineering contracts and regulations, standardization, preparation of work, employment of equipment and workers, calculation of performances.

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<sup>1</sup> B-CE Bachelor programme in Civil Engineering  
 M-CE Master programme in Civil Engineering  
 B-ME Bachelor programme in Mining Engineering  
 M-ME Master programme in Mining Engineering  
 MAS Master of advanced studies

<sup>2</sup> C: compulsory  
 E: elective

<sup>3</sup> Number of teaching hours/week for lectures and exercises

<sup>4</sup> Number of ECTS credit points (1 credit point = 30 hours student workload incl. homework)

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M-M & T	Practice oriented working in Subsurf. Engineering	SS	E	4	6	- studying the practical steps in tunnelling - realizing dangerous situations in Subsurface Engineering - all steps of a round length in tunnelling should be trained by every single student respectively in a team
M-M & T	Master Thesis	SS	C	13	20	Master Thesis
M-M & T	Tutorial for Research Work	SS		2		Discussion and tutorial for writing technical publications and for execution of research projects.
M-M & T	CAD- Constructions in tunnel constructions	SS	E	1	1.5	With help of the software Rhino resp. AutoCAD space objects will be constructed in regard of applications. The fundamental solids are treated and calculation of masses and center of gravity are made by computer.
M-M & T	Excursion	SS	E	3	1.5	field trip to construction sites, companies and buildings in the fields of rock and soil mechanics, tunnelling and underground construction.
B-M & T	Excursion	SS	C	1.5	0.7 5	field trip to construction sites, companies and buildings in the fields of rock and soil mechanics, tunnelling and underground construction
M-M & T	Geotechnical Survey	SS	E	2	3	deepening of the knowlege in geological-geotechnical survey
M-M & T	Testing and Modelling of Geomaterials	SS	E	2	3	- fundamentals of continuum mechanics (stress, strain, spherical/deviatoric stress tensor) - particular stress and strain states - material behaviour of sprayed concrete (shotcrete), soil and rock - constitutive models (time independent and time dependent) - fundamentals of monitoring and sensors used for geotechnical monitoring - geotechnical laboratory and in situ testing methods - design of geotechnical programs
M-M & T	Revision Course to Design Models and Structural Design	SS		2		- Modelling of structures - Structural analysis - Steel structures - Reinforced concrete structures
M-M & T	Mechanised Tunnelling and Shaftboring in Hydropower Projecs	SS	E	1	1,5	Recommendations for Hydropower plants mechnised tunelling for HPP horizontal headings inclined headings vertival headings experiences and trends

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M-M & T	Revision Course to Design of Underground Structures	SS		1		see lecture "DESIGN OF UNDERGROUND STRUCTURES"
B-M & T	Design Models and Structural Design	SS	C	1	1.2 5	Modelling of structures Structural analysis Steel structures - fundamentals - Safety- and design concept - cross section design (tension, compression, bending, shear) - member design (column buckling) - connection methods (rivets and welded connections) Reinforced concrete structures - concrete, reinforced concrete, load bearing behaviour, material laws, constructional aspects - cross section design (tension, compression, bending, shear) - columns
M-M & T	Exercises to CAD-constructions in tunnel constructions	SS	E	1	1	With help of the software Rhino resp. AutoCAD space objects are investigated in practise.
M-M & T	Exercises to Design of Underground Structures	SS	E	3	3	implementation of the learnt knowledge based on practical examples and laboratory tests
B-M & T	Tutorial to Design Models and Structural Design	SS	C	1	1	Application examples to structural analysis, steel and reinforced concrete structures
M-M & T	Exercises to Testing and Modelling of Geomaterials	SS	E	2	2	Application of the theoretical knowledge from the course 'TESTING AND MODELLING OF GEOMATERIALS'
B-M & T	Tutorial to Principles of Soil and Rock Mechanics	SS	C	1.5	1.5	Revision and deepening the contents of the lecture "Principles of Soil and Rock Mechanics" based on simple soil and rock mechanics problems.

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B-M & T	Principles of Soil- and Rock Mechanics	SS	C	2	3	Description and classification of soils and rock. Physical properties of soils: composition of soils, classification tests, ascertaining of soil properties. Water in soil: groundwater flow, hydraulic permeability, buoyancy, hydraulic thrust, hydraulic base failure. Stress in soils: Initial conditions and stress paths: total stress, effective stress, pore water pressure. Stress strain behavior of soils. Laboratory and field tests for stress strain behaviour and shear strength parameters of soils: compression test, triaxial test, shear test, stiffness modulus, shear strength parameters. Consolidation: time-settlement-curve, consolidation ratio, consolidation theory. Settlements: floppy and stiff loading. Active and passive earth pressure: earth-pressure theory, arithmetical and graphical ascertaining of earth pressure, sliding surfaces, earth pressure at rest. Proof of bearing capacity: Tilt over, sliding, base failure, slope failure. Securing obstacle jumps. Structural important rock and rock mass properties: Properties of joint faces, strength properties and stress strain behavior of rock. Relations rock – rock mass. Failure of rock. Initial conditions and tensions around a underground space.
M-M & T	Basics in TBM tunneling	WS	E	1	1.5	The lesson "TBM-Calculations" gives an overview of used calculations for the different machine categories in order to be able to estimate penetration rate and the advance rates of TBMs.
B-M & T	Design and Construction of Underground Structures	WS	C	2	2.5	planning stages, legal procedures, geological-geotechnical survey, guideline for the geomechanical design of conventional tunnels, failure mechanisms, organisation of driving, safty concept, geotechnical monitoring.

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M-M & T	Specialized Construction Methods in Rock and Soil	WS	E	2	3	To find the limits for using conventional construction methods in rock and soil mechanics Special methods in loose ground Special methods in deep tunnels Special methods for building under groundwater Geotechnical calculations
B-M & T	Tunneling Methods	WS	C	2	2.2 5	Introduction in tunnelling, definitions, historical development of tunnelling, cut and cover methods, top-down methods, underground works with cyclic and continuous driving, no-dig methods, shafts
B-M & T	Bachelorthesis in the area of Geomechanics	WS	C	1	4.5	Methodology of preparation of project reports (Data collection, data Processing, data analysis, structure of report, documentation) in the area of Subsurface Engineering.
M-M & T	Construction Contract Models	WS	E	1	1.5	Presentation and discussion of different construction contract models.
B-M & T	Preparation of a bachelor thesis in the area of Subsurface Engineering	WS	C	0.5	6.2 5	Methodology of preparation of project reports (Data collection, data Processing, data analysis, structure of report, documentation) in the area of Subsurface Engineering.
M-M & T	Tutorial for Research Work	WS		2		Discussion and tutorial for writing technical publications and for execution of research projects.
M-M & T	Selected Chapters of Soil and Rock Mechanics	WS	E	1	1.5	This lecture builds on the lecture "Principles of Soil and Rock Mechanics" and gives an overview about the basic approaches of calculations in following subject areas: Building excavations, slab foundations, pile foundations, retaining structures, Protection and sealing of foundation structures and endangered buildings.
M-M & T	Construction and Risk Management	WS	E	1	1.5	Introduction to construction and risk management
M-M & T	Geotechnical Monitoring and Instrumentation	WS	E	1	1.5	deepening in the fields of geotechnical monitoring and the used equipment
M-M & T	Tutorial to Selected Chapters of Soil and Rock Mechanics	WS	E	1	1	Revision and deepening the contents of the lecture "Selected Chapters of Soil and Rock Mechanics" based on simple problems of foundation engineering.

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M-M & T	Exercises to Construction and Risk Management	WS	E	1	1.5	Examples in the field of construction and Risk analysis implementation of the learnt knowledge based on examples
M-M & T	Exercises to Numerical Methods in Geotechnics	WS	E	2	2	Introduction to the use of numerical methods, in particular the finite element method, for solving problems in geotechnical engineering. First simple examples (such as strip footings, excavations) will be solved whereas guidance is provided. Finally students have to analyse a simple geotechnical problem on their own and write a small report.
M-M & T	Excursion	WS	E	3	1.5	field trip to construction sites, companies and buildings in the fields of rock and soil mechanics, tunnelling and underground construction.
M-M & T	Numerical Methods in Geotechnics	WS	E	4	2	Available material laws in numerical simulation in geotechnics Basics of the numerical code Plaxis Preprocessing with Plaxis How to write an input-file? Using the numerical code Plaxis Postprocessing with Plaxis Interpretation of results gained by numerical calculations

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M-M & T	Conventional and mechanical excavation techniques including basics in TBM-Tunnelling	WS	C	4	6	<ul style="list-style-type: none"> <li>* Explosives chemistry</li> <li>* Explosives production (plant mixing / site mixing)</li> <li>* The properties of explosives</li> <li>* Firing methods</li> <li>* Tunnelling blast design</li> <li>* Blasting emissions prognosis and measurements</li> <li>* Geotechnical definitions, laboratory tests and site investigations for road headers</li> <li>* Rock testing in detail and operating data assessment for road headers</li> <li>* Cutting tests done on test rigs and cutting simulations done on computer</li> <li>* Machine prototype testing and machine optimization</li> <li>* Laboratory visit in Zeltweg</li> <li>* Rock mass cuttability rating in detail</li> <li>* Today's cutting limits referring to roadheader application</li> <li>* Detailed tunneling project study</li> <li>* Tunnelling roadheaders - product overview and details</li> <li>* Infrastructure and job site layout for roadheader application</li> <li>* Exemplary excavation cost calculation for roadheader operation</li> <li>* Operational reports of roadheader applications</li> <li>* Tunnel boring machines - an overview</li> <li>* penetration models for TBMs</li> <li>* cutter wear prognosis</li> <li>* basics in segmental lining design</li> </ul>
M-M & T	Tunnel Operating Installations	WS	E	1	1.5	<ul style="list-style-type: none"> <li>Installations for aerodynamics</li> <li>Installations for tunnel safety</li> <li>Installations for dewatering</li> <li>Installations for data processing</li> <li>Tunnel operation machines</li> <li>Installations for electricity</li> <li>How to define a tunnel side?</li> </ul>