

Training Organisation	Delft University of Technology
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Courses offered

Programme ¹	Course	Semester	Type ²	Hrs ³	CP ⁴	Syllabus
B-CE, other: (B-AES, B-AR, M-AR)	Use of Underground Space	Q3 (Feb-Apr)	E	4	4	<p>Students obtain basic knowledge of the multidisciplinary aspects of the use of underground space.</p> <p>Topics: Introduction to Underground Space Decision making process Introduction to the subsoil Subsurface planning Legal aspects Basics of various kinds of tunnels Small infrastructure & trenchless technologies Basements Tunnel cross sections & modalities Safety and risk management Mixed use of land, layered use of land Underground storage New developments in construction techniques Case studies</p>
M-CE, M-AES	Trending Topics in Geo-engineering	Q1 (Sep-Nov)	E	4	4	<p>The course is a follow up of the course "Use of Underground Space". It deals in depth with a number of topics related to the realisation and use of underground constructions. New developments</p>

¹ 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

² C: compulsory
 E: elective

³ Number of teaching hours/week for lectures and exercises

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

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						<p>in construction technologies, integral design of underground solutions and operational & social safety will be addressed as well as a number of case studies.</p> <p>Topics: Bored Tunnels: new developments; Immersed tunnels: new developments; Deep building pits; Engineering aspects of bored tunnels: excavation and separation Integral design Operational Safety; Social Safety; Tunnel safety for road tunnels Recent research in diaphragm walls & shield soil interaction Renovation of immersed tunnels Soil treatment: overview with focus on smart soils & compensation grouting Communication: case North/South metro Amsterdam Case studies</p>
M-CE, M-AES	Trenchless Technologies	Q2 (Nov-Jan)	E	4	4	<p>The course covers the use of trenchless technologies, which is a versatile installation method for small infrastructure (gas, water, sewers, etc). It is meant as an addition to other specialistic courses and the topics studied here can also be applied in other courses. Next to the installation process and the design of the linings, the organisation of a TT project will be discussed.</p> <p>The course deals with basic aspects of:</p> <ul style="list-style-type: none"> - Cables and ducts - Geology and geotechnics in relation to boring techniques and bore fluids - The technique of Horizontal Directional Drilling (HDD) - The technique of Micro-tunnelling - Boring equipment - Measuring equipment - Steering equipment - Technical calculations for HDD and Micro-tunnelling - Technical calulations for stresses in pipelines - Renovation of existing pipelines - Research on trenchless

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						<p>technology and innovative applications</p> <ul style="list-style-type: none"> - Influence of contract types on project execution - Role of the contractor and engineering office - Risks and risk management - Case discussions
M-CE	Bored and Immersed Tunnels	Q1 (Sep-Nov)	E	8	4	<p>The course extensively treats tunneling methods. A distinction is made between the New Austrian Tunnel Method (NATM), bored tunnels and immersed tunnels. General issues related to tunnel structures. Functional and operational requirements, the longitudinal profile, the cross section and the starting/finishing shaft and/or access and exit road. NATM tunnels and the immersed tunnels.</p> <p>Different types of bored tunnel construction; NATM-method, slurry shield and earth pressure balance shield. Stability during construction; frontal support, settlements during construction. Loads on a tunnel and force distribution in the lining. Start and reception shaft and construction procedures.</p> <p>Requirements concerning the longitudinal and transverse profiles. For immersed tunnels, construction in the dock, transport and immersion. Stability during floating and after the tunnel has been sunk. Special aspects such as ventilation, fire, permeability and explosions.</p>

Remarks:

The course use of underground space is an elective for students following
 B-AES Bsc Applied Earth Sciences
 B-AR Bsc Architecture
 M-AR Msc Architecture

The MSc track Geo-engineering in Delft is part of both the Msc CE and the Msc AES (Applied Earth Sciences). The track is open and MSc courses are offered to students with CE and AES BSc.