

Module Nr.	Credits	Workload	Semester	Frequency	Duration
SE-CO-5	6 CP	180 h	3	Yearly (WS)	1 Semester
<b>Courses</b>			<b>Contact time</b>	<b>Self-study</b>	<b>Group size</b>
a) Facility management of underground transportation infrastructure			2 h/week	60 h	---
b) Pipeline maintenance and network management			2 h/week	60 h	

## Operation and Maintenance of Tunnels and Utility Pipes

### Learning outcomes

This module teaches a wide range of aspects of operation and maintenance of tunnels and underground utility pipelines. Aspects of structural protection and the necessary methods and techniques of building maintenance are presented, the equipment and techniques of operating concepts (normal and emergency operation) of underground infrastructure are shown and management concepts and evaluation mechanisms for economic and financial efficiency studies are discussed. The students should thus be put in a position to select appropriate measures for the maintenance of tunnels and lines, or to carry out profitability analyses of buildings - for example on the basis of internalised principles for the operation and maintenance of tunnels and lines. For a professional activity as operators of pipeline networks or tunnel constructions are such basic knowledge indispensable. Basic skills for operation and maintenance of underground infrastructure are presented. These are – in reference to a declining new construction activity and increasing maintenance requirements of the enormously large existing infrastructure stock – of high importance for the future occupational profile of civil and environmental engineers.

### Content

a) Facility management of underground Transportation infrastructure

The courses of this module deal with the extended basic knowledge of operation and Maintenance of tunnels. This includes:

- Regulations and boundary conditions in reference to transport modes
- Operating equipment in tunnels
- Operation of tunnels (concepts, features and structure of control center operation, surveillance and inspection)
- Safety and security
- Rehabilitation and maintenance (points of maintenance, upgrade under operation, rehabilitation techniques, rehabilitation under operation)
- Building management / Tunnel Facility Management (collecting and processing of operation data, operating concept e.g. PPP, Lifecycle-Management)

b) Pipeline Maintenance and Network management

The courses of this module deal with the extended basic knowledge of operation and Maintenance of lines. This includes:

- Introduction: underground sewer and pipeline engineering
- Open cut method – practical use
- Structural safety of pipes in open-cut construction
- New sewers and pipelines using trenchless methods including pipe jacking

<ul style="list-style-type: none"> <li>• Rehabilitation – objectives and tasks</li> <li>• Rehabilitation – Replacement</li> <li>• Rehabilitation – Repair</li> <li>• Rehabilitation - Renovation</li> <li>• Service-life of sewers and pipelines including tightness, root resistance, heavy rainfall events</li> </ul>
<b>Teaching Methods / Language</b> Lectures / English
<b>Modes of assessment</b> Module examination: 120 min
<b>Requirements for the award of credit points</b> Passed module examination 100% (6CP)
<b>Module applicability</b> (in other study programs) Master Geosciences
<b>Weight of the mark for the final score</b> 5 %
<b>Module coordinator and lecturer(s)</b> Prof. Dr. M. Thewes (coordinator), Prof. Dr.-Ing. R. Leuker, Prof. Dr.-Ing. B. Bosseler
<b>Other information</b>