Operation and Maintenance of Tunnels and Utility Pipes

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Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-WP26/SE-CO-5	6 CP	180 h	3. Sem.	1 Semester[s]	20

Courses	Contact hours	Self-study	Frequency
a) Facility management of under-ground transportation infrastructure b) Pipeline maintenance and network management	a) 2 WLH (30 h) b) 2 WLH (30 h)	a) 60 h b) 60 h	a) each winter b) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Markus Thewes

a) Dr.-Ing. Roland Leuker, Prof. Dr.-Ing. Markus Thewes

b) Prof. Dr.-Ing. Markus Thewes, Dr.-Ing. habil. Bert Bosseler

Admission requirements

Recommended previous knowledge:

Knowledge in "construction operation and construction process engineering" as well as constructional knowledge

Learning outcome, core skills

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 utility pipes, or to carry out profitability analyses of such structures - for example based on principles for the operation and maintenance of tunnels and lines. For a professional activity as operators of pipeline networks or tunnel constructions such basic knowledge is 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.

Contents

a)

The courses of this part-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)
The courses of this part-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
- Rehabilitation – objectives and tasks
- Rehabilitation – Replacement
- Rehabilitation – Repair
- Rehabilitation - Renovation
- Service-life of sewers and pipelines including tightness, root resistance, heavy rainfall events

Educational form / Language
a) Lecture (2 WLH) / English
b) Lecture (2 WLH) / English

Examination methods
• Written exam 'Operation and Maintenance of Tunnels and Utility pipes' (120 min., Part of modul grade 100 %, optinally Englisch or German)

Requirements for the award of credit points
- Passed module examination: Written exam

Module applicability
- M.Sc. Civil Engineering
- M.Sc. Subsurface Engineering
- M.Sc. Geosciences

Weight of the mark for the final score
Percentage of total grade [%] = 6 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information
b) Digital teaching within the meaning of the HDVO