

Module Nr.	Credits	Workload	Semester	Frequency	Duration
SE-CO-9	10 CP	300 h	2, 3	Yearly (WS + SS)	2 Semesters
Courses			Contact time	Self-study	Group size
a) Geotechnical and Near-Surface Drilling (SS)			5 h/week	75 h	---
b) Deep Drilling Engineering and Technologies (WS)			5 h/week	75 h	---

Drilling Engineering

Learning outcomes

a) The students after completion of the module will have the following competencies:

- Basics of shallow drilling
- Coring and cuttings
- Geotechnical exploration, probing and analysis (DIN 4021 / EN ISO 22475)
- Foundation work and drilling
- Water well drilling and completion
- Shallow geothermal drilling, completion and applications including standard W120
- Quality assurance and control of shallow geothermal BHE systems
- Fundamentals of deep drilling systems
- Drilling tooling
- Well and casing stability
- Site management skills
- Mud circulation
- LWD / MWD techniques
- Explain the main methods and parameters of drilling technology – Describe potential drilling problems
- Define the composition of the cost structure of a drilling project – Calculate casing designs
- Development of deep drilling concepts

Content

a) Geotechnical and Near-Surface Drilling

The course presents an introduction to drilling technologies, focusing on shallow, near-surface applications like geothermal borehole heat exchangers, water and monitoring wells, geotechnical as well as environmental investigation. Dry, augering and mud drilling techniques will be compared and discussed, as well as sampling and coring for different applications.

- Introduction to geotechnical investigations and selected standards
- Rotary drilling with direct circulation including tooling
- Rotary drilling with indirect circulation including tooling, applications, airlifting
- Mud losses, artesian conditions while drilling, cementing
- Water and monitoring wells, well testing, sampling
- Shallow geothermal, borehole heat exchanger systems
- Environmental Direct Push sampling, coring, onsite analysis
- Differentiate shallow and deep drilling
- Learn all the various shallow drilling methods from rotary, augering to Direct Push
- Know drilling, sampling, coring and their applications

- Monitoring and water well planning and drilling
- Geotechnical and foundation work
- Environmental investigation schemes
- Basic mud rotary drilling
- Dry, augering type drilling methods
- Coring
- Sampling
- DirectPush
- Water well systems
- Shallow geothermal wells

b) Deep Drilling Engineering and Technologies

The course gives an introduction to the principles of conventional and advanced deep drilling technologies. Students learn how to plan a drilling project including wellbore planning and selection of toolings and devices.

- Deep drilling basics; mechanical rock destruction process
- Drilling techniques and process
- Rotarydrilling
- Percussiondrilling
- Directionaldrilling
- Innovative and unconventional drilling techniques (thermal, hydraulic, coiled tubing)
- Drilling specific laboratory analysis
- Mudlogging
- Health, safety issues and environmental impacts of drilling projects

Teaching Methods / Language

Classroom and hands on lectures, field work on the rig and its auxiliary equipment, laboratory experiments, practical case studies. / English

Class room work, exercises, field work and site visit / English

Modes of assessment

Module written examination (120 min)

Requirements for the award of credit points

Passed module examination

Participation in at least 70 % of the exercises

Module applicability (in other study programs)

Master Geosciences

Weight of the mark for the final score

8.33 %

Module coordinator and lecturer(s)

Prof. Dr. R. Bracke

Other information