



*Course syllabus*

# Grundvattenteknik Groundwater Engineering

**VTGN10, 7,5 credits, A (Second Cycle)**

**Valid for:** 2023/24

**Faculty:** Faculty of Engineering, LTH

**Decided by:** PLED V

**Date of Decision:** 2023-03-21

## General Information

**Main field:** Water Resources Engineering.

**Compulsory for:** MWLU1

**Elective for:** V4-vr, V4-at, W4-vr

**Language of instruction:** The course will be given in English

## Aim

The aim of the course is to deepen the student's knowledge and skills within the field of hydrogeology as a tool to manage and solve problems concerning civil and foundation engineering, water supply, waste treatment and urban/rural planning and construction in a way, which takes into account the needs of the inhabitants and the general goals for development of a sustainable society.

## Learning outcomes

### *Knowledge and understanding*

For a passing grade the student must

- be able to define, calculate and thoroughly describe the occurrence, behaviour, origin and movement as well as the chemical and physical characteristics of groundwater and soil water.
- be able to relate contamination of soil and groundwater to different sources of pollutants.
- show basic knowledge about drilling engineering and well design.

### *Competences and skills*

For a passing grade the student must

- be able to execute engineering calculations and evaluations regarding problems related to hydrogeology, groundwater hydraulics, groundwater chemistry and contaminant transport in groundwater.

#### *Judgement and approach*

For a passing grade the student must

- show an insight into the need for a multidisciplinary attitude and simultaneous evaluation of geological, hydrological, hydraulic, chemical, ecological, anthropogenic and other conditions when dealing with civil and foundation engineering, water supply and urban/rural planning and construction.

## Contents

Hydrogeology. Groundwater occurrence, behaviour and flow in various kinds of aquifers. Soil water and soil water movement. The influence of geology on the aquifer properties. Fluctuations in groundwater level on various time-scales and in various formations. Groundwater flow and properties governing the flow characteristics. Temperature and age of groundwater. Groundwater quality and quality characteristics. Groundwater sampling, water analyses, chemical composition, equilibrium and chemical processes. Contamination processes and contaminant transport. External additions including acidification. Drilling and well technology. Hydraulic properties of aquifers and wells including storativity and transmissivity. Groundwater withdrawal and test pumpings. Analysis of data from aquifer tests by analytical and graphical methods as well as computer software. Hydraulic and hydrogeological boundaries.

General descriptions of different sources of pollutants. Description and calculation of leaching of contaminants. One computer software exercise, four exercises based on geological and hydrogeological maps and one field demonstration of hydraulic tests.

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** Written examination for five hours. The performance on the written examination forms the basis for the final mark of the course. Compulsory field demonstration with related assignment in groups of two-three persons.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

## Admission

#### **Admission requirements:**

- VVRA05 Water OR VVRA01 Hydrology and Aquatic Ecology + VVRF10 Fluid Mechanics
- VTGA01 Engineering Geology or VTGA05 Engineering Geology

**Assumed prior knowledge:** FMIF50 Environmental Science, Especially Environmental Chemistry AND FMAA05 Calculus on One Dimension.

**The number of participants is limited to:** No

**The course overlaps following course/s:** VTG021

## Reading list

- Fetter, C W: Applied Hydrogeology, Fourth edition. Prentice Hall , 2001, ISBN: 0130882399 or 0131226878.

- Svensson, C: Groundwater chemistry, Compendium. Teknisk geologi, LTH , 2016. Distributed by Teknisk Geology, LTH.
- Exercises.

## Contact and other information

**Course coordinator:** Jan-Erik Rosberg, Jan-Erik.Rosberg@tg.lth.se

**Course coordinator:** Gerhard Barmen, Gerhard.Barmen@tg.lth.se

**Teacher:** Joakim Robygd, joakim.robbygd@tg.lth.se

**Course homepage:** <http://www.tg.lth.se/grundutbildning/kurser/>

**Further information:** The course is given in English.