



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Grundvattenmodellering och föroreningstransport Groundwater Modelling and Contaminant Transport

VTGN05, 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, W4-vr

Language of instruction: The course will be given in English

Aim

The aim of the course is to deepen and develop the student's knowledge, skills and approach within the field of hydrogeology as a tool to manage and solve complex problems concerning 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. Groundwater Modelling and Contaminant Transport is one of the core courses within an advanced specialization or a Master's Programme in Water Resources Engineering.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to thoroughly make use of his/her knowledge on the occurrence, behaviour, origin and movement as well as the chemical and physical characteristics of groundwater and soil water when analyzing complex hydrogeological problems and situations.
- know the principles of a couple of common softwares for modelling and simulation of

groundwater flow, aquifer properties, hydrogeochemical processes and contaminant transport.

Competences and skills

For a passing grade the student must

- be able to execute technical investigations and evaluations regarding problems related to hydrogeology, groundwater hydraulics, groundwater chemistry, contaminant transport in soil and groundwater and also aquifer protection.
- be able to use a number of computer programmes for evaluation and simulation of groundwater flow, aquifer properties, hydrogeochemical processes and contaminant transport.
- be able to estimate and present hydrogeologically and hydrogeochemically related investigations as written technical reports and orally for engineers, politicians and the public.
- show an ability to seek and value information with relevance for problems concerning groundwater and the environment in a self-governed and independent way.

Judgement and approach

For a passing grade the student must

- demonstrate to have adopted an attitude, which emphasize and value co-operation between different professionals and experts when planning and executing projects dealing with groundwater and contamination of soil and groundwater.
- demonstrate to have adopted an attitude, which encourage collaboration between people with different backgrounds and competences within a project group.
- show evidence of realizing the need for a multidisciplinary attitude and simultaneous evaluation of geological, hydrological, hydraulic, chemical, ecological, anthropogenic and other conditions when dealing with problems related to groundwater and environment.

Contents

Hydrogeology. Groundwater occurrence, behaviour and flow in various kinds of aquifers. Groundwater flow and properties governing the flow characteristics. Groundwater quality and quality characteristics. Hydrochemical composition, equilibrium and chemical processes. Contamination processes and contaminant transport. External additions including acidification.

Two minor and two major compulsory assignments resembling of qualified consultant commissions. In the assignments the students are expected to use their theoretical and practical knowledge and skills to solve a complex groundwater-engineering problem emphasizing sustainability of groundwater resources and risk of contamination. By means of modelling tools like MODFLOW, SEEP2D and MT3DMS within GMS and PHREEQC, the students will simulate and describe for example environmental effects of changing groundwater exploitation patterns at municipal water works or of lowering the groundwater table at civil engineering construction works and also groundwater chemical effects of leakage from deposits of mining waste or infiltration of acid rain.

The assignments are tackled in small groups of two students with frequent possibilities to consult a teacher, at least four hours per group of two in addition to eight hours scheduled advising in a bigger group. Every student shall work with at least three different

students during the four assignments. Peer review of two assignments. All assignments are presented as written technical reports and at least one assignment shall be presented orally at seminars and every student shall act as opponent and take active part in discussions at least once. Detailed written and oral feedback from the teachers to each group of two students .

Examination details

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

Assessment: Two minor and two major compulsory project commissions/assignments with written and oral presentation of the results and conclusions. The assessment of the assignments concerns structure and presentation as well as content and treatment, evaluation and valuation of information related to hydrogeology, hydrogeochemistry, groundwater modelling and contaminant transport. The performance of the assignments are weighted based on their scope and size to obtain the final mark of the course.

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.

Parts

Code: 0115. **Name:** Assignments on Groundwater Flow.

Credits: 4. **Grading scale:** TH. **Assessment:** Assessment of written report and oral presentation and opposition at seminar.

Code: 0215. **Name:** Assignments on Groundwater Transport and Chemistry.

Credits: 3,5. **Grading scale:** TH. **Assessment:** Assessment of written report and oral presentation and opposition at seminar.

Admission

Admission requirements:

- VTGN10 Groundwater Engineering (or documented active participation in at least 80% of the exercises in VTGN10 Groundwater Engineering)

The number of participants is limited to: No

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.
- Assignments and commissions. Excerpts from publications and off-prints.

Contact and other information

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

Teacher: Universitetslektor Jan-Erik Rosberg, Jan-Erik.Rosberg@tg.lth.se

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

Further information: The course is given in English.