



DEPARTMENT OF EARTH SCIENCES

GVG460 Applied Hydrogeology, 7.5 higher education credits

Tillämpad hydrogeologi, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Earth Sciences on 2012-09-27 and was last revised on 2016-04-08 to be valid from 2016-04-08, autumn semester of 2016.

Field of education: Science 100%

Department: Department of Earth Sciences

Position in the educational system

The course can be part of the following programmes: 1) Master's Programme in Earth Sciences (N2GVS) and 2) Atmospheric Science, Master's Programme (N2ATM)

Main field of studies

Earth Sciences

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

120 hec in the main field of Earth Sciences with the grade at least Pass or the equivalent. Knowledge in Hydrogeology GVG340 with the grade at least Pass or equivalent knowledge. Students with comparable qualifications may, after evaluation, attend the course.

Learning outcomes

The aim of the course is to provide students with the basic knowledge needed to plan and carry out hydrogeological investigations. The course can, however, not cover the entire, very broad field of applied hydrogeology in all its complexity. Students who want to pursue a career in hydrogeology will have to take specialized courses (e.g. in groundwater modelling) and strive to obtain practical training.

After completion of the course the student is expected to be able to:

Knowledge and understanding:

- understand the governing principles of flow and transport process in the saturated and unsaturated zone
- know the most important methods (field, laboratory, and computer based methods) used in applied hydrogeology
- know which data and tools are needed to apply those methods
- decide with methods are suitable and required to solve a certain type of hydrogeological problem
- design a basic plan for an hydrogeological investigation

Skills and Abilities

- perform calculations in quantitative hydrogeology and decide which approaches are suitable for a given hydrogeological problem.
- set up a simple groundwater model
- plan and perform field tests and decide which approaches are suitable for a given hydrogeological problem

Judgment and approach

- understand the relevance and implications of a hydrogeological problem, and how to approach a hydrogeological problem in a wider context of planning.

Course content

This course bases on the introduction in general hydrogeology provided in the course GVG340 (or equivalent). Some of the topics covered in the introductory level course will be discussed in more detail and at a higher level of complexity; other new topics will be added. A main focus will be on hydrogeological field tests and their evaluation, including computer based calculations and modelling on an introductory level.

Subcourses

1. Theory (Theory)

- Repetition of the main concepts of general hydrology and hydrogeology presented in GVG340 (or equivalent)
- Extended introduction to the theory of groundwater flow, in particular with respect to groundwater flow towards wells and in relation to numerical groundwater flow modelling
- Introduction to transport processes in groundwater and introduction to the use of tracer methods in hydrogeology
- Introduction to flow and transport processes in the unsaturated zone with a focus on methods to determine groundwater recharge
- Introduction to groundwater-surface water interaction (relevance, methods for quantification)

- Introduction to modeling of groundwater flow and transport
 - Hydrogeology of typical hydrogeological settings (hydrogeological systems)
 - Case studies: Typical problems and applications in hydrogeology, e.g. delineation of water protection zones, including an introduction to planning of hydrogeological investigations and practical groundwater resources management
2. Exercises (Exercises)
- Computer based exercises using GIS, Excel to demonstrate the application of the methods introduced in the theory part
 - exercises are done in groups
3. Group project (Group project)
- project work is done in groups
 - A final report has to be submitted, summarizing all field and laboratory activities including an evaluation of all the measurements carried out

Activities include:

- mandatory field trips to selected locations or activities of hydrogeological interest,
- a 2 day field course in hydraulic testing, hydrochemistry, trace tests, discharge measurements and unsaturated zone measurements,
- laboratory measurements

Form of teaching

Lectures, exercises and field work.

Language of instruction: English

Assessment

Theory, written exam, 4,0 hp grading scale: Fail (U), Pass (G), Pass with Distinction (VG).

Exercises, 1,5 hp grading scale: Fail (U), Pass (G).

Group project, 2 hp grading scale: Fail (U), Pass (G).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

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The computer-based exercises and group project are compulsory and must be passed (G) to obtain a course grade.

Course evaluation

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Additional information

Students enrolled in the Masters Programme in Earth Sciences, N2GVS, have priority to the course

A main element of the course is a 2 or 2,5 day trip to a field site where we will perform field experiments in groups. These field experiments and the data obtained form the basis for the compulsory group project. The field trip will take place in the second or third week of the course. Costs will arise for students for overnight stays, transport and meals. Details will be announced before course start. Students who can't participate in the field course will still have to participate in the group project but will be assigned additional tasks.