Faculty of Science

GEOP07, Geology: Hydrogeology, 15 credits

Geologi: Hydrogeologi, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-05-27. The syllabus comes into effect 2024-05-27 and is valid from the spring semester 2025.

General information

The course is an elective second cycle component of a degree of Bachelor or Master of Science (120 credits) in Geology or Environmental Science.

Language of instruction: English

Main field of study	*Specialisation*
Environmental Science	A1N, Second cycle, has only first-cycle course/s as entry requirements
Geology	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is to provide students with hydrogeological knowledge for advanced professional work in a societal perspective or in research. Clean water is our most important resource and a prerequisite for life. Our water resources, especially groundwater, in loose deposits and bedrock, are threatened by overexploitation and contamination from human activities. The course focuses on theoretical and practical analyses of groundwater resources, groundwater quality and groundwater protection.

Knowledge and understanding

On completion of the course, the students shall be able to:

- account for the need for groundwater system understanding and consequences when it is lacking.

- account for the most common methods of well drilling and different types of well design
- account for the environmental quality objective "Good-Quality Groundwater"
- account for the laws and ordinances regulating water activities in Sweden and the EU, and monitoring actions performed within the EU member states
- account for common groundwater quality problems
- account for different methods of trace element analysis for dating of groundwater
- exemplify managed aquifer recharge systems (MAR)

Competence and skills

On completion of the course, the students shall be able to:

- plan and execute a hydrogeological investigation
- establish a conceptual hydrogeological site model and discuss scale perspectives
- evaluate and analyse the hydrogeological properties of a groundwater aquifer based on data from hydraulic testing or other basic investigation methods
- perform simple computer modelling of human impact on groundwater
- execute groundwater sampling
- discuss groundwater protection needs

Judgement and approach

On completion of the course, the students shall be able to:

- make assessments of the quality status of water samples based on analysed chemical, physical and microbial parameters
- make assessments of the type of analyses required to ensure good groundwater quality
- evaluate information from different analyses of trace elements to groundwater dating
- evaluate results of hydrogeological investigations and modelling from the perspective of environmental impact
- evaluate groundwater protection needs
- reflect on one's own knowledge needs for further studies and professional activities in the field of hydrogeology

Course content

The course consists of five modules with the following focus areas, scopes and contents:

Module 1: Hydraulic testing and aquifer analysis, 4 credits

- Different types of investigation and evaluation methods
- Conceptual models
- Choice of investigation method

- Choice of evaluation method
- Calculation of hydrogeological parameters from survey data
- Evaluation of results against method

Module 2: Groundwater modelling, 2 credits

- Different types of modelling tools and modelling software
- Simple computer modelling of human groundwater impact
- Evaluation of modelling results, sources of error and accuracy

Module 3: Groundwater quality, 2 credits

- The environmental quality objective "Groundwater of good quality"
- Commonly occurring groundwater quality problems, both natural and anthropogenic
- Methodology for groundwater dating and possible sources of errors
- The influence of well design on water quality problems

Module 4: Legislation and water protection, 2 credits

- Laws and ordinances that regulate water activities in Sweden and the EU
- Design and regulation of water protection areas
- The process of legalizing a water protection area
- Environmental court applications for water operations permits

Module 5: Field survey, analysis and assessment, 5 credits

- Theory and practice of the most common hydrogeological field investigation methods and site conceptual models.
- Planning of hydrogeological field work
- Handling of common instruments for field investigations
- Occupational health and safety during fieldwork
- Evaluation of field survey results in conjunction with already existing background data

Course design

The teaching consists of lectures, calculation exercises, computer exercises, field exercises, excursions, seminars and project work. Participation in computer exercises, field exercises, excursions, seminars and project work and associated elements are compulsory.

Assessment

The assessment is based on a written exam during the course, oral seminar performance and written project reports, as well as written and oral presentations, and participation in mandatory exercises. Students who failed the first exam opportunity will be offered an additional exam opportunity soon thereafter.

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.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
For a grade of pass on the whole course, the student must have passed the written exam, attendance on all compulsory components, passed written and oral assignments and project work as well as seminar attendance. Grades for the written exam are Fail, Pass and Pass with distinction. Grades on exercises and written assignments are Fail and Pass. Grades for seminar presentations and project work are Fail, Pass and Pass with distinction. The final grade is determined by the aggregated results of the assessed components in proportion to their extent.

Entry requirements

To be admitted to the course, students must have obtained general entry requirements and 75 credits in geology, earth sciences, physical geography or environmental sciences, including GEOB25 or equivalent course including a minimum of 7 credits of basic hydrogeology or hydrology. Proficiency in English corresponding to English B/English 6 from Swedish upper secondary school.

Further information

The course replaces GEOP06 Hydrogeology, 15 credits, and may not be included in a degree together with GEOP06 Hydrogeology, 15 credits or GEOP05 Hydrogeology, 15 credits.

The course is given at the Department of Geology, Lund University