

## **GEOP06, Geology: Hydrogeology, 15 credits**

*Geologi: Hydrogeologi, 15 högskolepoäng*

Second Cycle / Avancerad nivå

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### **Details of approval**

The syllabus was approved by Study programmes board, Faculty of Science on 2017-09-06 and was last revised on 2018-10-12. The revised syllabus applies from 2018-10-12, spring semester 2019.

### **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:* Swedish

*Main field of studies*

Geology

Environmental Science

*Depth of study relative to the degree requirements*

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

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### **Learning outcomes**

Water is our most important resource and a prerequisite for life. Our water resources, not least the water that resides in loose deposits and bedrock, are threatened by over-exploitation and contamination by different types of human activities. The course focuses on theoretical and practical analyses of groundwater resources, groundwater quality and groundwater protection from a geological perspective. The general aim of the course is to provide students with hydrogeological knowledge for advanced professional work in a societal perspective or for research. The course requires prior knowledge in the form of basic hydrogeology.

### **Knowledge and understanding**

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

- account for the most common methods of well drilling and for 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
- account for common problems of groundwater quality
- account for different methods of trace element analysis for dating of groundwater

### **Competence and skills**

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

- plan and execute a hydrogeological investigation
- establish a conceptual hydrogeological model
- evaluate and analyse the hydrogeological properties of a groundwater aquifer based on test-pumping data or other basic investigation methods
- perform simple computer modellings 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 bacteriological parameters
- make assessments of the type of analyses required to ensure a good groundwater quality
- assess information from different analyses of trace elements to date groundwater
- assess results of hydrogeological investigations and modelling from the perspective of environmental impact
- assess groundwater protection needs

### **Course content**

The course consists of five modules including the following focus areas, scopes and components:

#### **Module 1: Aquifer Analysis, 4 credits**

- Different types of investigation methods
- Choice of investigation method
- Choice of evaluation method
- Calculation of hydrogeological parameters based on investigation data
- Assessment of results in relation to method

#### **Module 2: Groundwater Modelling, 2 credits**

- Different types of modelling tools and programs
- Basic computer modelling of human impact on groundwater

- Assessment of modelling results, sources of error and precision

### **Module 3: Groundwater Quality, 2 credits**

- The environmental quality objective "Good-Quality Groundwater"
- Common groundwater quality problems
- Methodology for dating groundwater and possible sources of error
- The impact of well design on water quality problems

### **Module 4: Legislation and Water Protection, 2 credits**

- Laws and ordinances regulating water activities in Sweden and the EU
- Design and regulation of water protection areas
- The process of legally designating a water protection area
- Environment judgment applications

### **Module 5: Field Study, 5 credits**

- Theory and practice with regard to the most common methods of hydrogeological field investigations
- Planning of a hydrogeological field investigation
- Management of common instruments for field investigations
- Work environment and personal protection during field work
- Evaluation of field investigation results together with background data provided and sought

## **Course design**

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

## **Assessment**

The assessment is based on a written exam and the student's seminar performance and project reports, as well as written and oral presentations. 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.

*Subcourses that are part of this course can be found in an appendix at the end of this document.*

## **Grades**

Marking scale: Fail, Pass, Pass with distinction.

For a grade of Pass on the whole course, the student must have passed the project report, the written and oral presentations, as well as participated in all compulsory components. The final grade is determined by the aggregated results of the assessed components in proportion to their extent (see appendix).

## **Entry requirements**

To be admitted to the course, the student must meet the general admission requirements and have 75 credits in geology, earth sciences, physical geography or basic environmental science or the equivalent, including GEOB25 Geology in Society, 15 credits, or an equivalent course including at least 7 credits of basic hydrogeology.

## **Further information**

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

## Subcourses in GEOP06, Geology: Hydrogeology

### Applies from V19

- 1901 Aquifer Testing, Written Examination, 4,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1902 Groundwater Modelling, Project Report, 2,0 hp  
Grading scale: Fail, Pass
- 1903 Groundwater Quality, Seminar, 2,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1904 Legislation and Water Protection, Seminar, 2,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1905 Field Investigation, Project Report, 5,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1906 Mandatory Learning Activities, 0,0 hp  
Grading scale: Fail, Pass

### Applies from V18

- 1701 Aquifer Testing, Written Examination, 3,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1702 Groundwater Modelling, Project Report, 3,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1703 Groundwater quality, seminar, 2,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1704 Legislation and Water Protection, Seminar, 2,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1705 Field Investigation, Project Report, 5,0 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1706 Mandatory Learning Activities, 0,0 hp  
Grading scale: Fail, Pass