



Faculty of Science

## GEOM20, Geology: Methods in Geoscience, 15 credits

*Geologi: Metoder inom Geovetenskap, 15 högskolepoäng*

Second Cycle / Avancerad nivå

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### Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-11-27. The syllabus comes into effect 2024-11-27 and is valid from the autumn semester 2025.

### General information

The course is an elective second cycle component of a Master of Science degree in Geology.

*Language of instruction:* English

*Main field of study*

*Specialisation*

Geology

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

### Learning outcomes

The overall aim of the course is that the student after completing the course should have acquired in-depth knowledge of methods in geoscience with a focus on data management, statistics, geochemistry and geochronology. The student should have acquired the necessary skills to carry out, evaluate and analyse the results of geoscientific investigations.

### Knowledge and understanding

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

- explain basic concepts in research methodology,
- explain basic mathematical and statistical methods relevant to geosciences,
- explain the principles of stable and radiogenic isotope systems, different types of fractionation, different processes affecting them and give examples of applications,

- describe the main processes governing global elemental cycles, including mixing models, residence time and reactivity on different time scales,
- explain the most common dating methods used in geology and the materials and time periods to which they can be applied.

### **Competence and skills**

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

- plan an appropriate sampling/measurement strategy (including choice of methods) for a given question or hypothesis,
- use computer-based analysis and presentation tools, including basic programming,
- apply basic statistical analysis methods, such as correlation analysis and error propagation,
- describe the principles of important analytical methods in geosciences, such as mass spectrometry, electron microscopy and elemental analysis,
- produce an age model (age-depth) based on dates with different measurement uncertainties.

### **Judgement and approach**

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

- evaluate and apply methods from the course within a project,
- review and evaluate results and interpretations based on geochemical and geochronological investigations.

### **Course content**

The course provides in-depth knowledge of methods in geoscience with a focus on data management, statistics, geochemistry and geochronology. The course is thematically divided into three parts. The first part introduces methods for sampling (including field trips), data management and basic statistical analyses. Analyses and data management are done initially in Excel and then a programming language is used (e.g. Matlab, Python or R). In the second part of the course, fundamental geochemical systems and different geochronological methods are introduced and how they are best applied and/or implemented for different geological problems. Exercises in connection with this part of the course will consist partly of computer-based elements, further development of data management, and partly of practical laboratory elements. The final part of the course consists of an optional project assignment that runs partly in parallel with the other two course elements and concludes with a project seminar at the end of the course. The project tasks are linked to different case studies introduced at the beginning of the course. The case studies are then used throughout the course as examples in lectures and exercises.

## **Course design**

Teaching consists of lectures, excursions, seminars, group exercises, assignments, oral presentations and project work. Compulsory participation is required in field trips, seminars, laboratory sessions, group exercises and project work, and associated elements.

## **Assessment**

Examination takes the form of a written exam during the course, assessment of assignments, assessment of written reports and oral presentations.

For students who have not passed the regular examination, an additional examination in close connection to this is offered.

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 examination, the written report and the oral presentation.

The grading scale for written examination is Fail, Pass and Pass with distinction, while the grading scale for written assignments and other compulsory components is Fail and Pass.

The final grade are determined by the grade of the written exam.

## **Entry requirements**

To be admitted to the course, students must have 90 credits in geology, including knowledge equivalent to GEOB21, GEOB24, GEOB25, GEOB32-GEOB33 or GEOB01-GEOB04. Proficiency in English corresponding to English B/English 6 from Swedish upper secondary school.

## **Further information**

The course is offered at the Department of Geology, Lund University.