Faculty of Science

GEOB32, Geology: Mineralogy and Petrology, 15 credits

Geologi: Mineral och bergarter, 15 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2021-05-19 to be valid from 2021-05-19, spring semester 2022.

General Information

The course is a compulsory course at first cycle level for a Degree of Bachelor of Science in geology.

Language of instruction: Swedish

Main field of studies	*Depth of study relative to the degree requirements*
Geology	G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The course forms part of a series of compulsory courses, which aims at providing basic knowledge of professional relevance within a broad range of geological disciplines. Theoretical knowledge and practical skills in mineralogy and petrology will form the basis for understanding of formation processes as well as compostion and documentation of different types of bedrock.

Knowledge and understanding

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

- account at a general level for the foundations of mineralogy with regard to crystallography, crystal chemistry and crystal physics
- account at a general level for, and apply the foundations of crystal optics
- account for the systematics of minerals, particularly the systematics and structures of silicate minerals
- describe and explain the fundamental concepts of petrology, such as classification of minerals and rocks and understand their tectonic contexts

- account at a general level for quantification of igneous and metamorphic processes based on phase diagrams
- account for the formation processes of igneous, sedimentary and metamorphic rocks

Competence and skills

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

- perform fundamental macroscopic and polarization-microscopic identification of minerals and rocks
- apply fundamental classification systems for minerals and rocks
- explain melting and crystallization of magmas based on petrological tools such phase diagrams
- perform fundamental statistical calculations to describe geological sample materials
- communicate results by means of images, particularly diagrams and graphs, specifically within the subject area but also generally

Judgement and approach

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

- assess the component minerals in rocks and their significance for petrogenesis
- discuss, from a mineralogical perspective, the processes that lead to formation of igneous, sedimentary and metamorphic rocks

Course content

The course consists of three parts with the following content.

Part 1, Mineralogy, Igneous Petrology and Metamorphic Petrology (7.5 credits):

- The solid materials of Earth: minerals and rocks
- Physical properties of minerals
- Crystal chemistry - how atoms and ions form minerals, as well as the importance of valence and ionic radii for the elemental composition of specific minerals
- Important rock-forming minerals and how they are classified
- Basic crystallography with a focus on symmetry, such as Miller index, rotation and reflection, twin formation and polymorphism
- Commonly occurring igneous minerals, their properties and classification
- Why rocks melt, with a focus on latent heat, geothermal gradients and effects of fluids
- Calculation of solid solution series in igneous processes, as well as the effect of ambient pressure on the mineral composition
- Phase diagrams from the perspective melting and crystallization processes
- Properties of magmas, such as viscosity and density, and how magma is transported in Earth's crust
- Tectonic environments and classification of commonly occurring igneous rocks
- Commonly occurring metamorphic minerals, their properties and classification
- Fundamental metamorphic concepts, variables and driving forces, such as pressure, temperature, as well as the Gibb's phase rule
- Metamorphic rocks and their links to plate-tectonic environments
- Metamorphic facies and index metamorphic minerals in basic and pelitic rocks

Part 2, Sedimentary Petrology and Geology (5 credits):

- Weathering processes and their role in sediment production
- Commonly occurring sedimentary minerals
- The primary properties of sediments
- Sedimentary diagenesis
- The microscopic and macroscopic structure of sedimentary rocks
- The main groups of sedimentary rocks, their genesis and distribution in time and space
- Identification and classification of sedimentary minerals and rocks
- Provenance analysis of sandstones and conglomerates

Part 3, Practical Identification of Minerals and Rocks (2.5 credits):

- The path of light and the properties of the polarization microscope
- Microscopic identification of minerals and rocks
- Macroscopic identification of minerals and rocks
- Classification of minerals and rocks

Course design

The teaching consists of lectures, laboratory exercises, seminars, group work and project work. Participation in laboratory exercises, seminars, group work and project work, as well as associated learning activities, is compulsory.

Assessment

The assessment is based on the written performance of students in examinations during the course, their oral performance in the form of microscopy-based identification of minerals and rock samples, as well as through participation in compulsory components. Students who do not pass an assessment will be offered another opportunity for assessment 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.
The marking scale for the mandatory learning activities is Fail, Pass.

For a grade of Pass on the whole course, approved examinations,
approved microscopy-based oral examination, as well as passed compulsory components are required. The final grade is decided through a joint assessment of the results of the examinations of the included modules in proportion to their extent.

Entry requirements

For admission to the course, general entry requirements are required, as well as GEOA02 Planet Earth - an Introduction, 15 credits, GEOA82 Geology: Earth, Water and the Environment, 15 credits, or the equivalent knowledge.

Further information

The course may not be included in a degree together with GEOB22 Mineralogy and Petrology, 15 credits,

Subcourses in GEOB32, Geology: Mineralogy and Petrology

Applies from V22

2201 Mineralogy and Petrology, written examination, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
2202 Sedimentary Petrology and Geology, written examination, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
2203 Mineralogy and Petrology, practical examination, 2,5 hp
Grading scale: Fail, Pass, Pass with distinction
2204 Mandatory learning activities, 0,0 hp
Grading scale: Fail, Pass