

GEOB22, 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 2016-09-19 and was last revised on 2016-09-19. The revised syllabus applies from 2016-09-19, spring semester 2017.

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

Geology

Depth of study relative to the degree requirements

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 six compulsory courses, which aims at providing basic knowledge within a broad range of geological disciplines.

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 and tectonic contexts

- 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
- perform fundamental statistical calculations to describe geological sample materials
- communicate results by means of images, particularly diagrams and graphs, specifically in 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 four integrated parts:

Part 1: Mineralogy:

- 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 radius for the elemental composition of specific minerals
- The path of light and the properties of the polarization microscope
- 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

Part 2: Igneous Petrology:

- Commonly occurring igneous minerals, their properties and classification, as well as macroscopic and polarization microscopy based identification
- Why rocks melt with a focus on latent heat, geothermal gradients and effects of fluids
- Cryoscopic effects during melting and how these effects can be studied and calculated in phase diagrams
- Basic definitions and concepts, such as melt and magma
- Calculation of solid solution series in igneous processes, as well as the effect of ambient pressure on the mineral composition
- Phase diagrams and melting processes in a plate-tectonic context

- Properties of magmas, such as viscosity and density, and how magma is transported in Earth's crust
- How plutonism and volcanism are coupled to petrographic properties and how crystallization processes can be calculated in phase diagrams
- Tectonic environments and classification of commonly occurring igneous rocks

Part 3: Sedimentary Petrology:

- Commonly occurring sedimentary minerals and their properties
- Classification of sedimentary minerals, as well as their identification macroscopically and through polarization microscopy
- Sedimentary processes in different geological environments

Part 4: Metamorphic Petrology:

- Commonly occurring metamorphic minerals, their properties and classification, as well as their identification macroscopically and through polarization microscopy
- 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
- Changes in metamorphic pressure and temperature over geological time
- Metamorphic provinces in Sweden

Course design

The teaching consists of lectures, field trips, seminars, group work and project work. Participation in field trips, seminars, group work and project work, as well as thereby integrated other teaching, is compulsory.

Assessment

Examination takes place in writing in the form of a final examination, through oral examination in the form of microscopy-based identification of minerals and rock samples, through assessment of project reports, as well as through participation in compulsory modules. Students who failed the first exam opportunity will be offered an additional exam opportunity shortly thereafter.

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.

To pass the entire course, passed examinations, passed microscopy-based oral examination, passed project report 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 (written examination, 12 credits, microscopy-based oral examination, 3 credits) in proportion to their extent.

Entry requirements

For admission to the course, general entry requirements are required, as well as GEOA01 Planet Earth ? an Introduction, 15 credits, GEOA81 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 GEOB03 The Lithosphere, 15 credits, GEOB04 Sedimentology, 15 credits, GEL304 The Lithosphere, 10 credits, or GEL305 Sedimentology, 10 credits.

Subcourses in GEOB22, Geology: Mineralogy and Petrology

Applies from V17

- 1601 Mineralogy & Petrology, written examination, 12,0 hp
Grading scale: Fail, Pass, Pass with distinction
- 1602 Identification of Minerals and Rocks, practical examination, 3,0 hp
Grading scale: Fail, Pass
- 1603 Mandatory Learning Activities, 0,0 hp
Grading scale: Fail, Pass