



Faculty of Science

GEOM08, Bedrock Geology: Metamorphic Petrology and Structural Geology, 15 credits

Berggrundsgeologi: Metamorf petrologi och strukturgeologi, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus is an old version, approved by Study programmes board, Faculty of Science on 2016-09-19 and was valid from 2017-01-01, spring semester 2017.

General Information

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

Main field of studies

Geology

Depth of study relative to the degree requirements

A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The overall aim of the course is to provide students with specialised theoretical and practical knowledge and skills to execute and interpret investigations in petrology and structural geology. Together with knowledge obtained from other second cycle courses in bedrock geology, this knowledge will form the basis for specialised understanding and execution of analyses of igneous, sedimentary and metamorphic bedrock on different spatial and temporal scales.

Knowledge and understanding

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

- describe how tectonic processes govern metamorphism and how these are represented in the pressure-temperature-time development of the bedrock
- account thoroughly for how different metamorphic parageneses, textures and deformation structures can be connected to large-scale tectonics
- account thoroughly for different metamorphic facies and characteristic metamorphic parageneses in different protoliths, and account in detail for how facies and reactions are represented in petrogenetic diagrams
- describe different types of metamorphic reactions, and provide a general explanation of the effects of fluids on metamorphic equilibria and reactions
- account thoroughly for the equilibrium concept, describe how equilibrium and non-equilibrium are manifested in mineral chemistry and textures, and provide a general explanation of how diffusion, nucleation and growth function during metamorphism
- account for how common petrographic tools such as polarisation microscopy, electron microscopy and mineral chemical microanalysis are used in metamorphic petrology, and for principles and methods for pressure and temperature determination
- provide a general account of the most important radiometric dating methods for metamorphic bedrock and the applications of the methods
- provide a general description of the effects of metamorphism and deformation on the material properties and practical use of bedrock materials

Competence and skills

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

- independently identify, describe and interpret metamorphic parageneses, metamorphic textures and deformation structures on the meso-scale and on the micro-scale using polarisation microscopy
- demonstrate familiarity with the use of metamorphic phase diagrams
- use simple methods for calculation of pressure and temperature based on mineral chemical data

Judgement and approach

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

- analyse the evolution of metamorphic rocks based on parageneses and textures, and critically evaluate interpretations based on this type of data
- apply a tectonic perspective based on metamorphic data
- apply knowledge of deformation structures and deformation textures for general assessment of material properties

Course content

The course focuses on metamorphic petrology and the links between metamorphism and deformation in different tectonic environments. Emphasis is placed on the recognition and analysis of different metamorphic parageneses, textures and deformation structures, and how to relate these parameters to processes. Major emphasis is placed on the links between metamorphic and structural geological phenomena on different scales from large-scale dynamic systems to the micro scale. Processes that include interaction between metamorphism, deformation and fluids are discussed, as well as effects of metamorphism and deformation on the material properties and practical use of bedrock materials. The course also provides an orientation on methods for semi-quantitative and quantitative pressure and temperature determination as well as radiometric dating of metamorphism and deformation.

The course includes several practical learning activities based on polarisation microscopy and presentations of case studies and review articles published in scientific publications, and exercises in the management of mineral chemical analyses, phase diagrams and quantitative pressure and temperature calculations.

Course design

The teaching consists of lectures, exercises, seminars, field studies and/or study visits. Compulsory participation is required in exercises, seminars, field studies and study visits, and associated elements.

Assessment

The assessment is based on a written exam at the end of the course and a project report.

Students who failed the first exam opportunity will be offered an additional exam opportunity soon 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.

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

Entry requirements

To be admitted to the course, students must have 90 credits in geology, including knowledge equivalent to GEOB21-GEOB25 or GEOB01-GEOB04 and GEOM05 Magmatic Petrology, Geochemistry and Geochronology, 15 credits or the equivalent. Proficiency in English corresponding to English B/English 6 from Swedish upper secondary school.

Further information

The course may not be included in a degree together with GEOM06 Bedrock Geology: Metamorphic Petrology and Structural Geology 15 credits, or MIP536 Mineralogy and Petrology: Metamorphic Petrology and Structural Geology, 10 credits.

Subcourses in GEOM08, Bedrock Geology: Metamorphic Petrology and Structural Geology

Applies from V17

- 1601 Written Examination, 13,5 hp
Grading scale: Fail, Pass, Pass with distinction
- 1602 Project Report, 1,5 hp
Grading scale: Fail, Pass, Pass with distinction
- 1603 Mandatory Learning Activities, 0,0 hp
Grading scale: Fail, Pass