Department of Earth and Enironmental Sciences

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 was approved by Study programmes board, Faculty of Science on 2016-09-19 and was last revised on 2016-09-19. The revised syllabus comes into effect 2016-09-19 and is valid from the spring semester 2017.

General information

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

Language of instruction: English

Main field of study	*Specialisation*
Geology	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The general aims of the course are deepened theoretical and practical knowledge and skills to carry out and interpret petrological and structural geological investigations. Together with knowledge obtained in other Master courses in bedrock geology, this knowledge will form the basis for advanced understanding and execution of analyses of igneous, sedimentary and metamorphic bedrock at 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, as well as account thoroughly for how metamorphic facies and reactions are represented in petrogenetic diagrams
- describe various types of metamorphic reactions, as well as explain effects of fluids on metamorphic equilibria and reactions at a general level
- account thoroughly for the equilibrium concept, describe how equilibrium and non-equilibrium are expressed in mineral chemistry and textures, as well as explain at a general level how diffusion, nucleation and growth function during metamorphism
- account for how common petrographic tools such as polarization microscopy, electron microscopy and mineral chemical microanalysis are used in metamorphic petrology, as well as for principles and methods for pressure and temperature determination
- account at a general level for the most important radiometric dating methods for metamorphic bedrock and the applications of the methods
- at a general level describe 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 at the meso-scale as well as at the micro-scale by means of polarization microscopy
- show 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, as well as 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 relationships between metamorphism and deformation in different tectonic environments. Emphasis is placed on recognition and analysis of different metamorphic parageneses, textures and deformation structures, and how to relate these parameters to processes. Emphasis is also placed on the connection between metamorphic and structural geological phenomena at 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 contains several practical learning activities based on polarization microscopy and presentations of scientifically published case studies and review papers, as well as exercises in handling of mineral chemical analyses, phase diagrams and quantitative pressure and temperature calculations.

Course design

The teaching consists of lectures, exercises, seminars, excursions and/or study visits. Participation in exercises, seminars, excursions and study visits as well as associated activities is compulsory.

Assessment

Examination takes place in the form of a written examination at the end of the course, through assessment of submitted project reports, as well as through compulsory activities.

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

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
To pass the entire course, approved examination, passed project report, as well as participation in all compulsory activities are required. The final grade is decided through a joint assessment of the results of the examination and the project report in proportion to their extent (see appendix).

Entry requirements

For admission to the course, general entry requirements are required as well as 90 credits in geology, including GEOB22-GEOB25 or GEOB01-GEOB04 as well as GEOM05 Bedrock Geology: Igneous Petrology, Geochemistry and Geochronology, 15 credits, or the equivalent knowledge. 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.