Faculty of Science

MATP33, Mathematics: Group- and Ring Theory, 7.5 credits

Matematik: Grupp- och ringteori, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2020-05-28 to be valid from 2020-05-28, spring semester 2021.

General Information

The course is an elective course for second-cycle studies for a Degree of Master of Science (120 credits) in mathematics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Mathematics	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The course aims to provide, in comparison with the course Algebraic structures, a deeper understanding of group theory and ring theory as a basis for further studies in algebraic subject areas, and to provide general mathematical knowledge.

Knowledge and understanding

After completing the course the student should be able to:

- explain in detail the concepts, theorems and methods included in the course,
- identify the most important theorems in the course and present their proofs.

Competence and skills

After completing the course, the student should be able to:

- in connection with problem solving demonstrate the ability to integrate knowledge from the different parts of the course,

- independently identify problems that can be solved by methods that are part of the course and use appropriate solution methods,
- be able to explain the solution to a mathematical problem within the course framework, in speech and in writing, logically coherent and with adequate terminology.

Judgement and approach

After completing the course, the student should be able to:

- argue for the importance of group theory and ring theory as tools in other areas such as algebraic geometry and algebraic number theory, and discuss their limitations.

Course content

The course treats:

- Groups: Permutation groups. Burnside's lemma with application to Pólya arithmetic. Sylow's theorems. Symmetric and alternating groups. The structure of finitely generated Abelian groups.
- Rings: Noetherian and Artinian rings and modules. Artin-Wedderburn's theorem. Finitely generated modules over a principal ideal domain with application to the Jordan's normal form of matrices.
- Linear algebra: Multilinear mappings. Tensor products.

Course design

The teaching consists of lectures and seminars.

Assessment

The examination consists of a written examination followed by an oral examination at the end of the course. The oral examination may only be taken by those students who passed the written examination. Students who fail the ordinary written examination are offered a resit examination shortly 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.
To pass the course it is required to pass the written and the oral examination. In addition, the grade Pass with distinction requires that the total number of points obtained in the written and the oral examination is not less than 75% of the

accumulated maximal numbers of points. The maximal number of points that can be obtained in the written and the oral examination are weighted three to one.

Entry requirements

For admission to the course, English 6 / B is required as well as at least 90 credits in pure mathematics including the course MATM31 Algebraic structures, 7.5 credits or equivalent.

Further information

The course may not be included in degree together with MATP13 Group and ring theory, 7.5 credits.

Subcourses in MATP33, Mathematics: Group- and Ring Theory

Applies from V21

2101 Written Examination, 5,0 hp
Grading scale: Fail, Pass
2102 Oral Examination, 2,5 hp
Grading scale: Fail, Pass