Faculty of Science

MATM34, Mathematics: Infinite Groups, 7.5 credits

Matematik: Oändliga grupper, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-12-03. The syllabus comes into effect 2024-12-03 and is valid from the autumn semester 2025.

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 study	*Specialisation*
Mathematics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The course aims to provide a deeper understanding of infinite groups from a combinatorial group theory perspective.

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 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
- explain in speech and in writing, logically coherent and with adequate terminology, the solution to a mathematical problem within the course framework.

Judgement and approach

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

- argue for the importance of infinite groups as a significant part of group theory.

Course content

The course treats:

- Finitely generated groups: free groups, Nielsen-Schreier Theorem, group presentations, finitely presented groups.
- Free products: free products with amalgamation, HNN extensions.
- Solvable groups: polycyclic groups, nilpotent groups.
- Subgroups: finite-index subgroups, virtual properties, maximal subgroups.
- Residually finite groups: Hopfian groups, Malcev's Theorem, Baumslag-Solitar groups.
- The Generalised Burnside Problem: variants of the Burnside Problem and groups acting on rooted trees.

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.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
To pass the course it is required to pass the written and the oral examination.

The grading scale for all examining components is Fail, Pass.

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 number 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 mathematics including the course MATC31 Algebraic Structures, 7.5 credits or equivalent.

Further information

The course is given at the Centre for Mathematical Sciences, Lund University.