



LUND
UNIVERSITY

Faculty of Science

MATM31, Mathematics: Algebraic Structures, 7.5 credits

Matematik: Algebraiska strukturer, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2020-05-17 to be valid from 2020-05-17, spring semester 2021.

General Information

The course is an elective course for second-cycle studies for a Master of Science degree in mathematics.

Language of instruction: English

Main field of studies

Mathematics

Depth of study relative to the degree requirements

A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The course aims to provide an introduction to groups, rings and fields as a basis for further studies in mathematics.

Knowledge and understanding

After completing the course the student should be able to:

- give a detailed account of the concepts, theorems and methods included in the course,
- identify the most important theorems in the course and give an account of their proofs.

Competence and skills

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

- integrate knowledge from the different parts of the course in connection with problem solving,
- independently identify problems that can be solved by methods that are part of the course and use appropriate solution methods,
- plan and carry out assignments relevant to the course using appropriate methods within a given time frame,
- explain the solution to a mathematical problem within the framework of the course, in speech and in writing, logically coherently 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 Galois theory and algebraic number theory and discuss their limitations.

Course content

The course treats:

- Number theory: the fundamental theorem of arithmetic, modular arithmetic.
- Groups: definition, basic examples of groups, subgroups, normal subgroups, factor groups, isomorphisms and homomorphisms, Lagrange's theorem, permutation groups, symmetric and alternating groups, finitely generated Abelian groups.
- Rings: definition, basic examples of rings, isomorphisms and homomorphisms, ideals, factor rings, polynomial rings, factorisation of polynomials as products of irreducible polynomials.
- Fields: characteristic, simple field extensions, finite fields.

Course design

The teaching consists of lectures and seminars. A compulsory written assignment is part of the course.

Assessment

The examination consists of a written examination followed by an oral examination at the end of the course, as well as a written presentation of a problem assignment during the course. The oral examination may only be taken by those students who pass the written examination. Students who fail the regular examination are offered a re-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 examination, the oral examination and the written problem assignment. In addition, the grade Pass with distinction requires that the total number of points obtained in the written and the oral examination is at least 75% of the total 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 is required and at least 90 credits in Natural Science or Engineering studies, with at least 60 credits in mathematics including MATA23 Foundations of Algebra, 7.5 credits, MATB25 Discrete Mathematics, 7.5 credits or equivalent courses.

Further information

The course may not be included in a higher education qualification together with the course MATM11 Algebraic structures, 7.5 credits.

The course is to be studied together with FMNN10 Algebraic Structures, which is coordinated by LTH.

Subcourses in MATM31, Mathematics: Algebraic Structures

Applies from V21

- 2101 Assignment, 0,5 hp
Grading scale: Fail, Pass
- 2102 Written Examination, 5,0 hp
Grading scale: Fail, Pass
- 2103 Oral Examination, 2,0 hp
Grading scale: Fail, Pass