Faculty of Science

MATM41, Mathematics: Galois Theory, 7.5 credits

Matematik: Galoisteori, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2021-12-06 to be valid from 2021-12-06, autumn semester 2022.

General Information

The course is an elective course for second-cycle studies for a Degree of Master of Science 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 a deeper understanding of field extensions, and a connection between the theory of polynomial equations and group theory.

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 present their proofs.

Competence and skills

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

- in connection with problem solving, integrate knowledge from 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 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 Galois theory as a tool for solving problems in other areas of mathematics, such as the theory of polynomial equations.

Course content

The course treats:

- Field extensions: splitting fields, normal extensions and separable extensions, field automorphisms, normal closures.
- Galois groups: Galois extensions, the Galois Correspondence, the Fundamental Theorem of Galois Theory.
- Polynomial equations: solvability by radicals, insolvable quintics, symmetric polynomials, cyclotomic extension.

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 number of points. The maximum 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.

The course MATP33 Group and Ring Theory, 7.5 credits is recommended but it is not required.

Further information

The course may not be included in a higher education qualification together with MATM21 Specialised Course on Algebraic Structures 7.5 credits.

Subcourses in MATM41, Mathematics: Galois Theory

Applies from H22

2201 Written Examination, 5,0 hp
Grading scale: Fail, Pass
2202 Oral Examination, 2,5 hp
Grading scale: Fail, Pass