



LUND
UNIVERSITY

Faculty of Science

MATM46, Mathematics: Representation Theory, 7.5 credits *Matematik: Representationsteori, 7,5 högskolepoäng* Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-12-12 to be valid from 2022-12-12, spring semester 2024.

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

Mathematics

Depth of study relative to the degree requirements

A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The main goal of this course is to give the students an introduction to representations of finite groups over the complex numbers and to character theory. The purpose is further to prepare the students for specialised studies in the subject.

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 explain the main features in 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 of 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 representation theory as a tool for solving problems concerning groups and within other areas of mathematics, and discuss their limitations.

Course content

The course treats:

- Group representations: linear representations, equivalent representations, regular representation, induced and restricted representations, irreducible representations, Maschke's Theorem, dual representations and tensor product of representations
- Character theory: characters of representations, induced characters, irreducible characters, orthogonality relations, integrality, character tables, the Mackey formula, Frobenius reciprocity
- Applications to groups: Burnside's Theorem, Frobenius' Theorem, Frobenius divisibility

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. The grading scale for both the written examination and the oral examination is Fail, Pass.

In addition, the grade Pass with distinction requires that the total number of marks obtained in the written and the oral examination is not less than 75% of the

accumulated maximal number of points. The maximal number of marks 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 knowledge equivalent to the courses MATM31 Algebraic Structures, 7.5 credits and MATP33 Group and Ring Theory, 7.5 credits.

Further information

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

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

Subcourses in MATM46, Mathematics: Representation Theory

Applies from V24

- 2401 Written examination, 5,0 hp
Grading scale: Fail, Pass
- 2402 Oral Examination, 2,5 hp
Grading scale: Fail, Pass