LUND
UNIVERSITY

Faculty of Science

MATM38, Mathematics: Fourier Analysis, 7.5 credits

Matematik: Fourieranalys, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2020-06-08 to be valid from 2020-06-08, 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. The course is also given as a free-standing course.

Language of instruction: English
The course can be given in English when necessary.

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 main goal of the course is to introduce students to the techniques of modern Fourier analysis, and to enable them to use these techniques in different areas of mathematics and its applications.

Knowledge and understanding
After completing the course, the student should be able to:

- give a detailed account of the concepts and methods within Fourier analysis included in the course,
- identify the most important theorems in the course and present their proofs,
- explain the theory behind the methods used in Fourier analysis within the framework of the course,
- give examples of important applications of Fourier analysis in different settings both within and outside mathematics.

Competence and skills

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

- critically and systematically integrate knowledge from different areas of mathematics to analyse and solve complex problems by means of Fourier analysis,
- independently and creatively identify, formulate and solve relevant problems within the framework of the course,
- present solutions to mathematical problems within the framework of the course 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 important role of Fourier analysis in mathematics and theoretical physics.

Course content

The course treats:

- Fourier series, Fourier transform and finite Fourier transform,
- L^2 convergence of Fourier series, pointwise convergence,
- Cesàro means and Fejer's theorem, Weyl's criterion,
- The Fourier inversion theorem, Parseval's and Plancherel's theorem, Poisson summation formula, and the Heisenberg inequality,
- Examples of applications in physics and in other areas of mathematics, such as dynamical systems, number theory, and partial differential equations.

Course design

The teaching consists of lectures and seminars. Homework assignments are included in the course.

Assessment

The examination consists of a written examination and a corresponding oral examination at the end of the course. The oral examination is only given to those students who have passed the written examination. Completed homework assignments can give a certain amount of bonus points that can be counted towards the written examination; this will be specified at the start of the course.

Students who fail the regular written respectively oral 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.

This is a translation of the course
syllabus approved in Swedish

Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass the course it is required to pass the written examination and the oral examination. To obtain the grade Pass with distinction it is required in addition that the total number of points obtained in the written and the oral examination is at least 75% of the maximum total number of points. The maximum numbers of points that can be obtained in the written and the oral examinations are weighted three to one.

Entry requirements

For admission to the course, English 6/B is required as well as at least 90 credits, of which 75 credits in mathematics, including knowledge corresponding to the courses MATB21 Analysis in Several Variables 1, 7,5 credits, MATB23 Analysis in Several Variables 2, 7,5 credits, MATB24 Linear Analysis, 7.5 credits and MATM12 Analytic Functions, 15 credits.

Further information

The course may not be included in a degree together with MATM18 Fourier Analysis, 7.5 credits.

Subcourses in MATM38, Mathematics: Fourier Analysis

Applies from V21

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