Faculty of Science

MATP45, Mathematics: Specialised Course in Linear Functional Analysis, 7.5 credits

Matematik: Fördjupningskurs till lineär funktionalanalys, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2019-12-04 to be valid from 2019-12-04, autumn semester 2020.

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 main goal of the course is to give a presentation of relevant applications of the abstract principles of functional analysis to a large variety of problems in mathematical analysis.

Knowledge and understanding

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

- analyse problems in mathematical analysis using methods from functional analysis,
- give examples of important applications of the abstract methods and principles of functional analysis,

- give a detailed account of the theory behind methods described in the course,
- give an account for research aspects within the subject and relate it to relevant problems within an independent work.

Competence and skills

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

- critically and systematically integrate knowledge from different areas of mathematical analysis to analyze and solve complex problems using the principles of functional analysis,
- independently identify, formulate and solve relevant problems, as well as to plan and execute qualified tasks within a given time frame.

Judgement and approach

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

- argue for the important role of the principles of functional analysis in different areas of research in mathematics and physics,
- identify their own need for further knowledge and take responsibility for developing their own knowledge.

Course content

The course treats applications of

- the Hahn-Banach theorem, weak convergence and compactness,
- the Riesz representation theorem,
- the use of orthonormal bases,
- boundedness, compactness and spectra of integral operators,
- the spectral theorem for compact, self-adjoint operators.

Course design

The teaching consists of lectures and seminars. The seminars are dedicated to problem solving and presentations of certain relevant results. Active participation in the seminars is part of the examination.

Assessment

The examination consists of oral presentations of solutions of problems or proofs of relevant results during the course and a problem-solving project at the end of the course.

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 problem-solving project and at least an oral presentation. Points are given for each oral presentation. To obtain the grade Pass with distinction it is required that the total number of points obtained in the problem-solving project and oral presentations is not less than 75% of the maximal number of points. The maximal number of points that can be obtained in the problem-solving project and the oral presentations are weighted six to one.

Entry requirements

For admission to the course, English 6 is required as well as at least 90 credits in mathematics. In addition it is required that the student has either completed a course in Linear functional analysis or is taking the course MATP35 Linear functional analysis, 7.5 credits, in parallel to the present course.

Further information

The course may not be included in degree together with MATP25 Specialised course in Linear functional analysis 7.5 p.

Subcourses in MATP45, Mathematics: Specialised Course in Linear Functional Analysis

Applies from H20

2001 Oral presentation, 0,5 hp
Grading scale: Fail, Pass
2002 Project, 7,0 hp
Grading scale: Fail, Pass