Course syllabus

Funktionalanalys och harmonisk analys
Functional Analysis and Harmonic Analysis

FMA260, 7,5 credits, A (Second Cycle)

Valid for: 2016/17
Decided by: Education Board B
Date of Decision: 2016-03-29

General Information

Elective for: F5, F5-tf, F5-bs, F5-ss, Pi4-bs, Pi4-ssr
Language of instruction: The course will be given in English on demand

Aim

Functional analysis and harmonic analysis are fundamental tools in many mathematical applications (e.g., in field theory, solid mechanics, control theory, signal processing) and in mathematical statistics and numerical analysis. The aim of the course is to convey knowledge about basic concepts and methods, and to give the ability, both to follow discussions where these are used and to independently solve mathematical problems which arise in the applications. An important goal of the course is also to develop a power of abstraction which makes it easier to see analogies between problems from apparently different fields.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- have knowledge of different common norms and their usefulness in different applications.
- be familiar with the meaning of the concepts of completeness and compactness, and be aware that the choice of norm has an impact on these properties of a space. In particular, the student should have a good understanding of the difference between the infinite and the finite dimensional case.
- be familiar with the basic properties of the dual space of a normed space.
be familiar with the most common classes of linear and bounded operators, and have an understanding of how spectral theory provides information on the properties of a linear operator.

be familiar with how the properties of a function are reflected in its Fourier transform.

be able to explain the basic theory in an oral examination.

Competences and skills
For a passing grade the student must

• with access to literature independently be able to integrate methods and approaches from different parts of the course in order to solve problems and answer questions within the framework of the course.
• in writing and orally, with proper terminology and clear logic be able to explain the solution to a mathematical problem within the course.
• be able to translate concrete mathematical problems into the abstract language of the course.

Contents


Harmonic analysis: the Fourier transform and Sobolev spaces. Uncertainty relations, the sampling theorem, Fourier transforms and analytic functions, the Hilbert transform.

Examination details
Grading scale: TH
Assessment: Written and/or oral test, to be decided by the examiner.

Admission
Required prior knowledge: FMA021 Applied Mathematics and FMA120 Matrix Theory.
The number of participants is limited to: No

Reading list
• Material produced at the department.

Contact and other information
Course coordinator: Studierektor Anders Holst, Studierektor@math.lth.se
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Course homepage: http://www.ctr.maths.lu.se/course/funkharm/