



SF2744 Advanced Real Analysis II 7.5 credits

Avancerad reell analys II

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for SF2744 valid from Spring 2015

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mathematics

Specific prerequisites

Advanced Real Analysis I, SF2743.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

To learn advanced methods in real analysis. The first part provides a coverage of measure theory, Lebesgue integrals, Radon-Nikodym theorem, and various decompositions (of measures, spaces). These concepts shall also be considered on metric spaces.

The second part of the course will cover advanced functional analysis, and linear operator theory. Various aspects of dual spaces, weak topologies, compact operators, spectral theory, Fredholm alternative, and bounded and unbounded operators on Hilbert spaces shall be discussed in the course.

Several advanced applications will be considered.

Course contents

Measure theory (5 lectures):

- Signed measures and Hahn-decomposition,
- Metric outer measures,
- Radon-Nikodym derivative,
- Lebesgue decomposition,

Functional Analysis (6 lectures):

- Dual spaces,
- Weak topologies, the Banach-Alaoglu theorem,
- Adjoint operators,
- Compact operators and their spectrum,
- Fredholm alternative,
- Hilbert spaces and operators on Hilbert spaces,
- The spectral theorem for self-adjoint operators on Hilbert spaces,
- Fredholm determinants,
- Riesz representation theorem
- Unbounded operators.

Applications (3 lectures). These may be chosen from:

- Fourier analysis,
- Ergodic theory,
- Probability theory,
- Sobolev spaces,
- Differential equations,
- Geometric measure theory (Hausdorff and other measures)

Mathematical tools:

- Basic analysis, and measure theory,
- Constructive methods,
- Algebraic methods in infinite dimensional spaces.

Disposition

Lectures, and Problem sets.

Course literature

Will be announced at the start of the course.

Examination

- TEN1 - Examination, 7.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Problem Sets, written and oral examination.

Other requirements for final grade

Passed TEN1.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.