Department of Mathematics
(incl. Math. Statistics)

Stockholm University

Syllabus

for course at advanced level

Advanced Real Analysis II
Avancerad reell analys II

7.5 Higher Education Credits
7.5 ECTS credits

Course code:	MM8039
Valid from:	Autumn 2019
Date of approval:	2014-10-06
Changed:	2014-10-06
Department	Department of Mathematics (incl. Math. Statistics)
Main field:	Mathematics/Applied Mathematics
Specialisation:	A1F - Second cycle, has second-cycle course/s as entry requirements

Decision

This syllabus has been approved by the Board of the Faculty of Science at Stockholm University on 2014-10-06. Technical revision by the Student Office 2019-04-25.

Prerequisites and special admittance requirements

To qualify for the course knowledge equivalent to the course Advanced Real Analysis I (MM8037) is required. Also required is knowledge equivalent to Swedish upper secondary course English B/English 6.

Course structure

Examination code	Name	Higher Education Credits
HELA	Advanced Real Analysis II	7.5

Course content

The course covers signed measure, Hahn decomposition, measures on metric spaces, Radon–Nikodym theorem, Lebesgue decomposition, dual spaces, weak topologies, Banach–Alaoglu theorem, adjoint operators, compact operators and their spectrum, Fredholm alternative, Hilbert spaces and operators on Hilbert spaces, spectral theory of self-adjoint operators in Hilbert space, Fredholm determinant, unlimited operators.
The theory can be applied in Fourier analysis, Ergodic theory, probability theory, Sobolev spaces, differential equations and geometric measure theory (Hausdorff measure and other measures).

Learning outcomes

It is expected that the student after taking the course will be able to
* account for the central notions in advanced real analysis
* formulate and prove theorems in higher measure theory
* account for Hilbert space theory and prove theorems in operator theory, especially spectral theory
* use aqcuired methods in order to solve problems in different applications

Education

Instruction consists of lectures and exercises.

Forms of examination

a. The course is examined as follows: Knowledge assessment takes the form of written assignments as well as written and oral exams.

b. Grades are assigned according to a seven-point goal-related grading scale:
A = Excellent
B = Very Good
C = Good
D = Satisfactory
E = Sufficient
Fx = Fail (more work required before credit can be awarded)
F = Total fail
c. The grading criteria will be distributed at the beginning of the course.
d. A minimum grade of E and approved submitted work are required to pass the course.
e. Students who fail an ordinary examination are entitled to sit additional examinations as long as the course is offered. There is no restriction on the number of examinations. Examinations also include other obligatory elements of the course. Students who have passed an examination may not resit it in order to achieve a higher grade. Students who have failed on two occasions are entitled to request the appointment of a different examiner for the next examination. Any such request must be made to the departmental board. The course has at least two examinations for each academic year in the years in which instruction is provided. Intervening years include at least one examination.
f. A student who receives the grade Fx will be given an opportunity to upgrade to E by successfully completing some extra task(s) assigned by the examiner, who also decides on the criteria to be fulfilled in order to pass. The
completion must take place before the following examination session.

Interim

Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three occasions during a two-year-period after the end of giving the course. A request for such examination must be sent to the departmental board. The provision also applies in the case of revisions to the syllabus.

Limitations

The course may be included in a degree together with at most one of the courses Integration Theory (MM8001), Functional Analysis (MM8009) and Advanced Real Analysis I (MM8037).

Misc

The course is a component of the Master's Programme in Mathematics and in Mathematical Statistics, but it can also be taken as an individual course.

Required reading

Course literature is decided by the departmental board and is described in an appendix to the syllabus.