Department of Mathematics
(incl. Math. Statistics)

Stockholm University

Syllabus

for course at advanced level

Spectral Theory - An introduction to Mathematical Methods of Quantum Mechanics — **7.5 Higher Education Credits**

Spektralteori - Introduktion till matematiska metoder i kvantmekanik — **7.5 ECTS credits**

Course code:	MM8029
Valid from:	Autumn 2012
Date of approval:	2012-10-08
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 was approved by the Board of the Faculty of Science at Stockholm University 2012-10-08.

Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to at least 90 credits in mathematics, including the courses Ordinary Differential Equations 7.5 credits (MM7004) and Functional Analysis 7.5 credits (MM8009). English B/English 6 or equivalent.

Course structure

Examination code	Name	Higher Education Credits
HELA	Spectral Theory	7.5

Course content

The course covers linear operators in Hilbert space in relation to quantum mechanics: Hilbert space geometry, compact operators, integral operators and the Fredholm Alternative, unbounded operators, adjoint operators, extension theory for symmetric operators, spectral theory for Schrödinger operators, elementary perturbation theory.

Learning outcomes

After taking the course, the student is expected to be able to:
* Account for the basic principles of linear mappings and Hilbert space geometry
* Prove the central theorems of spectral geometry for self-adjoint operators
* Use the theory to solve problems primarily on differential operators in quantum mechanics

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. To be awarded a pass, a minimum of grade E is required.

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 be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the syllabus.

Misc

This course is offered as part of the Master's Programme in Mathematics and as a separate course.

Required reading

Course literature is decided by the departmental board and described thereafter in an appendix to the course plan.