



## DEPARTMENT OF MATHEMATICAL SCIENCES

### **MMA140 Spectral Theory and Operator Algebras, 7.5 credits**

Spektralteori och operatoralgebror, 7,5 högskolepoäng

*Second Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Mathematical Sciences on 2018-08-13 to be valid from 2019-01-20, spring semester of 2019.

*Field of education:* Science 100%

*Department:* Department of Mathematical Sciences

#### **Position in the educational system**

The course can be part of the following programme: 1) Mathematical Sciences, Master's Programme (N2MAT)

*Main field of studies*

Mathematics

*Specialization*

A1F, Second cycle, has second-cycle course/s as entry requirements

#### **Entry requirements**

General entry requirements and the equivalent of the course *MMA120 Functional Analysis*.

#### **Learning outcomes**

On successful completion of the course the student will be able to:

- describe and use the basic theory of linear operators on Banach and Hilbert spaces,
- define the spectrum of an operator, describe its properties, and calculate it in some cases,
- describe and use the basic theory of (commutative) Banach and  $C^*$ -algebras,
- describe and use the spectral theorem for normal operators on Hilbert spaces, especially for compact operators,

- describe and use the theory of compact operators and the Fredholm alternative.

**Course content**

Linear operators on normed spaces. Banach algebras and the spectrum of their elements. Operators on Hilbert spaces and their  $C^*$ -algebras. Hilbert-Schmidt operators. The spectral theorem and diagonalization for normal operators on Hilbert spaces. Spectral measures and functional calculus. Compact operators on Banach spaces and the Fredholm alternative. Commutative Banach and  $C^*$ -algebras and their structure. Applications.

**Form of teaching**

*Language of instruction:* English

**Assessment**

The examination consists of written assignments and a written or oral examination at the end of the course. During the course, there may be optional assignments that give bonus points on the exam. Examples of such assignments are small written tests, labs, and oral or written presentations. Information about this is found on the course home page.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

**Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

**Course evaluation**

The course is evaluated with an anonymous questionnaire and/or a discussion with the student representatives. The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

**Additional information**

For a list of course literature, see:

<https://www.chalmers.se/sv/institutioner/math/utbildning/grundutbildning-goteborgs-universitet/kurslitteratur/Sidor/Kurslitteratur-i-matematik.aspx>