

# Syllabus

for course at advanced level

**Advanced linear algebra**

**Avancerad linjär algebra**

**7.5 Higher Education**

**Credits**

**7.5 ECTS credits**

<b>Course code:</b>	MM8025
<b>Valid from:</b>	Spring 2012
<b>Date of approval:</b>	2011-09-05
<b>Department</b>	Department of Mathematics (incl. Math. Statistics)
<b>Main field:</b>	Mathematics/Applied Mathematics
<b>Specialisation:</b>	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 2011-09-05.

## Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to 90 credits in mathematics, where Mathematics III - Abstract Algebra (MM5020), or equivalent, is included. English B/English 6 or equivalent.

## Course structure

Examination code	Name	Higher Education Credits
HELA	Advanced linear algebra	7.5

## Course content

The course covers basic properties of modules, module homomorphisms, functors, free and Noetherian modules, modules over principal ideal domains, tensor products, exterior algebra, differential forms, exterior derivative and de Rham cohomology in  $\mathbb{R}^n$ .

## Learning outcomes

After completing the course, the student is expected to be able to:

- \* Describe central concepts in linear and multilinear algebra
- \* State and prove basic theorems in linear and multilinear algebra and about modules over certain types of rings
- \* State and prove basic theorems about exterior algebra and differential forms

## Education

Instruction consists of lectures and exercises.

## Forms of examination

- The course is examined as follows: Knowledge assessment takes the form of written and oral exams.
- 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 course plan.

#### **Limitations**

This course may not be included in a degree alongside the course Algebra IV (MM8004) or equivalent.

#### **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.