

# Syllabus

for course at first level

**Mathematics III - Abstract algebra**  
**Matematik III - Abstrakt algebra**

**7.5 Higher Education  
Credits**  
**7.5 ECTS credits**

<b>Course code:</b>	MM5020
<b>Valid from:</b>	Autumn 2019
<b>Date of approval:</b>	2014-10-06
<b>Changed:</b>	2014-10-06
<b>Department</b>	Department of Mathematics (incl. Math. Statistics)
<b>Main field:</b>	Mathematics/Applied Mathematics
<b>Specialisation:</b>	G2F - First cycle, has at least 60 credits in first-cycle course/s as entry requirements

## Decision

This syllabus was approved by the Board of the Faculty of Science at Stockholm University on 6 October 2014. Technical revision by the Student Office 2019-04-25.

## Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to 60 credits in mathematics, where Mathematics II - Linear Algebra, 7.5 credits (MM5012) and Mathematics II - Algebra and Combinatorics, 7.5 credits (MM5013), or equivalent, are included.

## Course structure

Examination code	Name	Higher Education Credits
HELA	Mathematics III - Abstract Algebra	7.5

## Course content

The course covers:

Group theory: sub groups, cosets, Lagrange's theorem, homomorphisms, normal subgroups and quotient groups, permutation groups, simple groups.

Rings and fields: matrix rings, quaternions, ideals and homomorphisms, quotient rings, polynomial rings, principal ideal rings, Euclidean rings and unique factorization.

Fields and vector spaces: finite-dimensional vector spaces, algebraic field extensions, finite fields.

## Learning outcomes

It is expected that the student after taking the course will be able to:

- \* define the basic concepts in abstract algebra and derive their fundamental properties
- \* account for and prove the basic theorems on groups, rings and fields
- \* explain and use methods in abstract algebra to solve mathematical and applied problems.

## Education

Instruction is given in the form of lectures and exercises.

## Forms of examination

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

examination.

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, the minimum 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. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next 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**

The course may not be included in a degree together with the course Algebra III (MM7003).

### **Misc**

The course is a component of the Bachelor's programme in Mathematics, but it can also be taken as an individual course.

### **Required reading**

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