



**LUND**  
UNIVERSITY

Faculties of Humanities and Theology

## ÄMAD03, Mathematics with Didactics 3, 15 credits

*Matematik med ämnesdidaktik 3, 15 högskolepoäng*

First Cycle / Grundnivå

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### Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2017-05-29 and was last revised on 2020-06-15. The revised syllabus applies from 2020-06-15, spring semester 2021.

### General Information

The course is a component of the teacher education programme at Lund University.

*Language of instruction:* English and Swedish

All teaching in the course modules Foundations of Algebra and Analysis in Several Variables 2 is in English, while the teaching in Didactics is in Swedish.

*Main field of studies*

Mathematics

*Depth of study relative to the degree requirements*

G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

### Learning outcomes

The general aim of the course is to enable students to acquire a solid theoretical foundation in elementary algebra, advanced knowledge in multivariable analysis with a focus on vector calculus and knowledge of the history of mathematics in schools. Through the didactic content of the course, students obtain insight into how the history of mathematics can be used in the teaching of mathematics in upper secondary schools.

### Knowledge and understanding

On completion of the course, the students shall be able to

- use and account for mathematical concepts and methods in basic algebra and differential and integral calculus for functions of several variables
- provide a general account of the fundamental features of the history of mathematics in schools

- account for parts of the history of mathematics of relevance to the teaching of mathematics in upper secondary school.

### **Competence and skills**

On completion of the course, the students shall be able to

- interpret relevant information and independently identify, formulate and solve problems related to algebra and multivariable analysis
- handle problems in algebra and differential and integral calculus for functions of several variables
- identify the logical structure in mathematical arguments and produce mathematical proof
- present and discuss mathematical arguments in speech and in writing
- plan and carry out pupil activities linked to the history of mathematics

### **Judgement and approach**

On completion of the course, the students shall be able to

- use formal treatment of mathematics and provide arguments for the purpose of mathematical proof.

### **Course content**

The course consists of the following modules:

- Analysis in Several Variables 2 (7.5 credits)
- Foundations of Algebra (6 credits)
- Didactics (1.5 credits)

#### **Analysis in Several Variables 2 (7.5 credits)**

This module is an introduction to vector calculus and a specialisation of differential and integral calculus for functions of several variables. Specific topics covered:

- Line and surface integrals
- Green's formula, Gauss divergence theorem, Stokes' theorem
- Basic potential theory

#### **Foundations of Algebra (6 credits)**

- Elementary logic and set theory
- The structure of number systems from an axiomatic perspective
- Basic properties of the integers: induction, divisibility, prime numbers, Euclid's algorithm, modular arithmetic, representation of numbers in different bases, Diophantine equations
- Rational and irrational numbers Enumerability
- Complex numbers
- Functions and relations Equivalence relations
- Elementary combinatorics
- Polynomials and algebraic equations: factorisation, Euclid algorithm, relationships between coefficients and zeros

#### **Didactics (1.5 credits)**

- The history of the mathematics in schools
- Parts of the history of mathematics

## Course design

The teaching consists of lectures and teaching of smaller student groups in the form of teaching sessions and didactic seminars. An essential feature of the small group sessions is practice in problem-solving and oral communication in mathematics. The didactic seminars are included in the module Didactics and intend to prepare the students for the placement component of the teacher training programme.

## Assessment

The assessment is based on the following components of the different modules:

- Analysis in Several Variables 2: written exam, 7.5 credits
- Foundations of Algebra: written exam, 6 credits
- Didactics: presentation of written assignments, in speech and in writing, 1.5 credits

Students who do not pass an assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

*Subcourses that are part of this course can be found in an appendix at the end of this document.*

## Grades

Marking scale: Fail, Pass, Pass with distinction.

The grades awarded on all assessed components are Pass or Fail. The results of the written exams are awarded as exam credits, of which the total number of credits per exam is proportionate to the number of credits for the relevant module. For a grade of Pass on each written exam, the student must have achieved at least 50% of the total available number of credits.

For a grade of Pass on the whole course, the student must have been awarded this grade on all assessed components. For a grade of Pass with Distinction, the student must have passed all assessed components and achieved at least 75% of the total available number of points.

## Entry requirements

To be admitted to the course, students in courses Mathematics with Didactics 1 and Mathematics with Didactics 2 must have been awarded the grade of Pass on a total of at least 22.5 credits.

## Further information

The course cannot be included in a degree together with MATA23 Mathematics: Foundations of Algebra 7.5 credits, and MATB23 Mathematics: Analysis in Several Variables 2, 7.5 credits.

## Subcourses in ÄMAD03, Mathematics with Didactics 3

Applies from V17

- 1701 Analysis in Several Variables 2, 7,5 hp  
Grading scale: Fail, Pass  
written exam
- 1702 Foundations of Algebra, 6,0 hp  
Grading scale: Fail, Pass  
Written exam
- 1703 Mathematical Didactics, 1,5 hp  
Grading scale: Fail, Pass  
Presentation of written assignments, in speech and in writing