

Faculty of Science

# MATA03, Mathematics: Mathematics for Scientists 1, 15 credits

Matematik: Matematik för naturvetare 1, 15 högskolepoäng First Cycle / Grundnivå

## Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-06-03 to be valid from 2022-06-03, spring semester 2023.

## **General Information**

The course is an elective course in the first cycle for a degree of Bachelor's of Science in chemistry, chemistry / molecular biology or biology. The course is also given as a stand-alone course.

Language of instruction: Swedish

Main field of studies	Depth of study relative to the degree requirements
Mathematics	G1N, First cycle, has only upper-secondary level entry requirements

### Learning outcomes

The overall learning outcome of the course is that the student, after completing the course, must have acquired basic mathematical knowledge for further studies in science, mainly in the subject areas of biology and chemistry, as well as economics.

### Knowledge and understanding

On completion of the course, the student shall be able to:

- handle elementary functions of one variable including limit values, derivatives and integrals of such functions,
- explain and illustrate how derivatives and integrals of functions of one variable can be used to set up and investigate mathematical models in relevant applications,
- set up and solve some types of linear and separable differential equations

important for applications,

- give an account of partial derivatives of functions of several variables,
- in connection with problem solving, integrate knowledge from the different parts of the course.

#### Competence and skills

On completion of the course, the student shall be able to:

- demonstrate good algebraic computational skills,
- use computational rules and theorems to determine limits, derivatives and integrals of functions of one variable in order to perform basic calculations on sequences of numbers, elementary functions, differential equations and basic series,
- solve linear systems of equations and show the ability to geometrically interpret solutions to such systems,
- perform basic calculations with geometric objects in three dimensions such as points, vectors, lines and planes and with matrices and determinants,
- in connection with problem solving, use mathematical concepts and methods in analysis in one variable and basic linear algebra, as well as to set up and analyze simpler mathematical models,
- account for a mathematical reasoning in a structured and logically coherent way.

#### Judgement and approach

After completing the course, the student should be able to:

• interpret relevant information in order to formulate and solve problems related to the areas listed under content.

#### Course content

The course treats:

- logic and set theory; the number system; equalities and inequalities; absolute value; powers and logarithms; second degree curves and equations, polynomials; complex numbers; trigonometry;
- number sequences; arithmetic and geometric sums; mathematical induction; the binomial theorem;
- functions, monotone functions, inverse functions; the properties of the elementary functions: graphs, formulas;
- limits, continuous functions, asymptotes;
- derivatives: definition and properties, applications; derivatives of elementary functions; properties of differentiable functions; local extremas, optimization, curve schetching; basic mathematical models;
- primitive functions; basic integration methods: partial integration and substitution of variables; partial fraction decomposition;
- definition of the Riemann integral; Riemann sums; applications; generalized integrals;
- Taylor and Maclaurin expansions: expansions of elementary functions, applications;
- first-order differential equations: linear, separable; second order linear differential equations with constant coefficients, solving homogeneous equations and certain inhomogeneous equations; applications;
- introduction to functions of several variables, partial derivatives;
- linear systems of equations, matrices and determinants;

• vectors and scalar product in three-dimensional space.

### Course design

The teaching consists of lectures, seminars and exercise classes. An essential element in the seminars is the active participation of the students in solving and presenting problems. Several computer-based tests are given during the course. Performing the computer tests and the oral presentations of solutions are mandatory.

### Assessment

Assessment takes the form of computer-based tests and oral presentations of solutions in connection with the seminars during the course, and of a written examination at the end of the course.

Students who do not pass the written examination at the end of the course 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.

For a Pass grade on the whole course, the student must have Pass grades on the computer-based tests, oral presentations and on the written examination.

The grading scale for the computer-based tests and for the oral presentations is Fail, Pass, whereas the written examination is graded according to the scale Fail, Pass, Pass with Distinction. The final grade is determined by the grade on the written examination.

# Entry requirements

General requirements and studies equivalent of courses Mathematics 4/E from Swedish Upper Secondary School.

# Further information

The course replaces MATA01 / MATA02 Mathematics for Scientists, 15 credits and can not be included in the degree together with this course, nor with MATA14 Analysis 1, MATA15 Algebra 1 and MATA21 Analysis in One Variable.

The course can not be included in any bachelor's degree with mathematics or physics as the main area.

The course is offered at the Centre for Mathematical Sciences, Lund University.

Applies from V23

- 2301 Computer based tests, 4,0 hp Grading scale: Fail, Pass
- 2302 Oral presentations, 1,0 hp Grading scale: Fail, Pass
- 2303 Written examination, 10,0 hp Grading scale: Fail, Pass, Pass with distinction