Faculty of Science

MATA04, Mathematics: Mathematics for Scientists 2, 15 credits
Matematik: Matematik för naturvetare 2, 15 högskolepoäng
First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-12-09 to be valid from 2022-12-09, autumn semester 2023.

General Information

The course is a compulsory mathematics course in the first cycle level for a degree of Master of Science in Applied Computational Science with specialization in Biology, Chemistry, Geology, Environmental Science and Physical Geography. The course can aslo be studied as a stand-alone course.

Language of instruction: English

Main field of studies	Depth of study relative to the degree requirements
Mathematics	G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The overall goal of the course is that the students acquire basic knowledge in the analysis of functions of several variables and linear algebra of relevance for future studies in natural sciences and applied computational science.

Knowledge and understanding
On completion of the course, the student should be able to:

- give an outline of relevant concepts and methods in basic multivariable analysis and linear algebra
- explain basic applications of differential and integral calculus for functions in several variables in the natural sciences
- explain basic applications of linear algebra in the natural sciences
- outline and illustrate the meaning of such mathematical concepts in multivariable

analysis and linear algebra that are used to set up and examine mathematical models in relevant applications.

Competence and skills

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

- formulate and solve problems in differential and integral calculus of functions of several variables and basic linear algebra
- in connection with problem solving, use mathematical concepts and methods within the scope of the course and set up and analyse basic mathematical models
- independently select appropriate methods for solving or analyzing different differential equations
- present solutions to mathematical problems within the framework of the course in speech and in writing, logically coherent and with adequate terminology.

Judgement and approach

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

- argue by giving examples for the importance of mathematical tools in the natural sciences.

Course content

The course treats:

- Functions of several variables: basic topology in R^3, continuity,
- Differential calculus of functions of several variables: partial derivatives, differentiability, the chain rule, gradient and directional derivatives, extreme values, applications of differential calculus,
- Integral calculus of functions of several variables: multiple integrals, variable substitution, applications,
- Ordinary differential equations, systems of ordinary differential equations,
- The vector space R^n, linear maps on R^n and matrix representation of linear maps,
- Matrices and determinants, matrix rank,
- Eigenvalues and eigenvectors.

Course design

Teaching consists of lectures and seminars. Mandatory computer laboratory exercises dealing with visualization of the mathematical concepts introduced in the course are included.

Assessment

Examination takes place in the form of a written examination (12 credits) at the end of the course and through computer laboratory exercises (3 credits) during the course.

For students who have not passed the regular examination, an additional examination opportunity is offered in close connection with this.

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.
In order to obtain the grade of Pass on the entire course, a passed written examination and passed computer laboratory exercises are required.

The grading scale for the written examination is Fail, Pass, Pass with distinction. The grading scale for the computer laboratory exercises is Fail, Pass.

The final grade is determined by the grade on the written examination. The grade Pass with distinction on the entire course requires in addition the grade Pass with distinction on the written examination.

Entry requirements

To be admitted to the course, students must have 15 credits in mathematics, or knowledge equivalent to the course MATA03 Mathematics for scientists 1, 15 credits, as well as English 6/B.

Further information

The course cannot be included in a Bachelor or Master of Science degree in mathematics, physics or computational science and cannot be included in the degree together with MATB21 Analysis in Several Variables 1, 7.5 credits, and MATB22 Linear algebra 2, 7.5 credits, or corresponding courses.

The course is given at the Centre for Mathematical Sciences, Lund university.

Subcourses in MATA04, Mathematics: Mathematics for Scientists 2

Applies from H23

2301   Written Examination, 12,0 hp
        Grading scale: Fail, Pass, Pass with distinction
2302   Computer Laboratory Exercises, 3,0 hp
        Grading scale: Fail, Pass