Faculty of Science

MATB35, Mathematics: Discrete Mathematics, 7.5 credits

Matematik: Diskret matematik, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-12-03. The syllabus comes into effect 2024-12-03 and is valid from the autumn semester 2025.

General information

The course is an alternative-compulsory course for first-cycle studies for a Bachelor of Science degree in Mathematics. The course can also be taken as a stand-alone course or as part of a course package.

Language of instruction: English

Main field of study	*Specialisation*
Mathematics	G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The overarching aim of the course is for the student to aquire knowledge on fundamental parts of discrete mathematics that are of importance in mathematics, mathematical statistics, computer science and other subject areas in science and technology. Furthermore, the aim is also to develop the students' ability to solve problems and to assimilate mathematical texts.

Knowledge and understanding

After completing the course the student should be able to:

- give an account of the central concepts in combinatorics, coding theory and graph theory in a clear and concise manner,
- identify different combinatorial selection methods: with/without repetition, with/without regard to order

- describe various logical relationships between concepts, theorems and proofs included in the course
- perform calculations and solve various problems within the course
- formulate and prove theorems included in the course.

Competence and skills

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

- identify problems that can be solved with methods from discrete mathematics and choose appropriate solution methods
- integrate results from various parts of the course and from previous courses (such as linear algebra) in connection with problem solving
- apply methods from linear algebra to coding theory
- explain the solution to a problem with proper terminology in a well-structured way
- implement the solution to a problem in discrete mathematics through a computer program in cooperation with others
- complete a task within a given time frame.

Judgement and approach

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

- argue for the importance of discrete mathematics as a tool within other areas, e.g. computer science and mathematical statistics
- make assessments with regard to relevant social and ethical aspects linked to coding theory.

Course content

The course treats:

- Number theory: divisibility, prime numbers, the Euclidean algorithm, Chinese remainder theorem, modular arithmetic
- Sets, functions and relations, equivalence relations
- Combinatorics: the four cases of counting with or without repetition and with or without regard to order, binomial coefficients, the principle of inclusion and exclusion, the method of generating functions
- Recursion: recursion formulae and difference equations
- Rings and fields: definitions and applications to coding theory
- Graph theory: terminology and basic concepts, Eulerian and Hamiltonian graphs.

Course design

The teaching consists of lectures and seminars. An essential feature of the seminars is training in problem-solving. A compulsory programming assignment carried out in groups is part of the course.

Assessment

The course is assessed through a written examination and an oral examination at the end of the course and a group assignment during the course. The oral examination may only be taken by those students who have passed the written examination.

Students who fail the regular examination are offered a re-examination shortly 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.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
To pass the course it is required to pass the written examination, the oral examination and the group assignment.

The grading scale for all examining components is Fail, Pass.

In addition, the grade Pass with distinction requires that the total number of points obtained in the written and the oral examination is at least 75 % of the total maximal number of points. The maximal number of points that can be obtained in the written and the oral examination are weighted three to one.

Entry requirements

Admission to the course requires knowledge corresponding to the courses MATA31 Analysis in One Variable, 15 credits, MATA32 Algebra and Vector Geometry, 7.5 credits, MATB32 Linear Algebra, 7.5 credits, and NUMA01 Computational Programming with Python , 7.5 credits.

Further information

The course may not be included in a higher education qualification together with MATB13 Discrete Mathematics, 7.5 credits.

The course is to be studied together with FMAB75 Discrete Mathematics, 7.5 credits, which is coordinated by LTH.

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