Course syllabus

Diskret matematik
Discrete Mathematics

FMAB75, 7,5 credits, G1 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED F/Pi
Date of Decision: 2023-04-18

General Information

Elective for: BME4, C4-pv, D4-pv, E4, F1, Pi1
Language of instruction: The course will be given in English on demand

Aim

The aim of the course is to treat some basic parts of discrete mathematics, of importance in computer science, information theory, signal processing, physics and many other subjects in technology and science. The aim is also to develop the students' ability to solve problems and to assimilate mathematical text. The course should also provide general mathematical education.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to understand and in his or her own words clearly define the central concepts in combinatorics, number theory, graph theory, functions and relations, and the theory of finite fields.
- in his or her own words be able to describe the logical connections between the occurring concepts (theorems and proofs).
- with confidence be able to carry out routine calculations within the framework of the course.
- in practical situations, with confidence be able to identify different combinatorial selections: with/without repetition, with/without regard to order.
- understand how results about finite fields and linear algebra may be used for coding.

Competences and skills
For a passing grade the student must

- be able to demonstrate ability to identify problems which can be solved with methods from discrete mathematics and to choose an appropriate method.
- in connection with problem solving be able to demonstrate ability to integrate results from various parts of the course.
- with proper terminology, in a well-structured way and with clear logic be able to explain the solution to a problem.
- be able to use basic theorems of graph theory to draw conclusions about a given graph (of moderate size).

Contents

Number theory: Divisibility. Prime numbers. The Euclidean algorithm. Chinese remainder theorem. Modular arithmetic.

Sets, functions and relations: Injective, surjective and bijective functions. Inverse function. 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: Definition. Applications to coding.

Graph theory: Terminology and basic concepts. Eulerian and Hamiltonian graphs.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written exam followed by an oral exam for those who pass the written exam.

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.

Admission

Assumed prior knowledge: Elementary linear algebra and calculus in one variable.
The number of participants is limited to: No
The course overlaps following course/s: FMAA25, MATB13, FMA091, FMA661, FMAA15, MATB25

Reading list

- Karl-Gustav Andersson: Finite Fields and Error-Correcting Codes. Matematikcentrum, 2015. Available as a pdf-file on the web. 54 pages.
- Sigmundur Gudmundsson: Linear Difference Equations. Matematikcentrum, 2017. Available on the web as a pdf-file. 5 pages.
- Grimaldi, Ralph: Discrete and Combinatorial Mathematics, An Applied Introduction. Pearson, 2014, ISBN: 9781292022796.

Contact and other information

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