



## Course syllabus

Faculty of Technology

Department of Mathematics

1MA902 Diskret matematik, 7,5 högskolepoäng

1MA902 Discrete Mathematics, 7.5 credits

### **Main field of study**

Mathematics

### **Subject Group**

Mathematics

### **Level of classification**

First Level

### **Progression**

G1N

### **Date of Ratification**

Approved 2019-12-06

Revised 2021-03-10 by Faculty of Technology. Content is revised and Objectives and Objectives achievement are adjusted.

The course syllabus is valid from autumn semester 2021

### **Prerequisites**

General entry requirements and Chemistry 1, Mathematics 4, Physics 2 or Chemistry A, Mathematics E, Physics B (Field-specific entry requirements 9/A9).

## Objectives

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

### *A. Knowledge and understanding*

- A.1 Demonstrate knowledge and understanding of key concepts, methods and theoretical results of discrete mathematics like greatest common divisor, Euclid's algorithm, the fundamental theorem of arithmetic, mathematical induction, permutation, combination, binomial theorem, conditional probability, independent Bernoulli trials, Bayes' theorem, equivalence relation, bipartit graph, matching.

### *B. Ability and skills*

- B.1 Demonstrate skill and ability to use, and integrate, knowledge of different concepts, methods and theoretical results of discrete mathematics in calculations

and problem solving,

- B.2 use models, methods, and theoretical results of discrete mathematics to analyze, structure and solve problems,
- B.3 present and explain computations and mathematical reasoning in writing in a correct, structured and logically coherent way, and problem solving based on a given problem.

### C. Judgment and approach

- C.1 Demonstrate the ability to assess the reasonableness of results of computations and problem solving based on a given problem.

## Content

The course provides an introduction to discrete mathematics and discrete models, mathematical thinking and communication. Examples of applications are introduced during the course.

The following topics are addressed:

- Logic: predicate logical formalism, logical reasoning and proof.
- Sets: set operations, laws for set identities, Venn diagrams and membership tables.
- Functions: domain, target, range, injectivity, surjectivity, bijectivity, composition of functions.
- Number theory: divisibility and modular arithmetic, representation of integers, prime numbers and greatest common divisors.
- Induction: the well-ordering principle, mathematical induction, strong induction, sequences and summation, arithmetic and geometric sum.
- Analyze, structure and solve problems: Polya's four steps in problem solving. This includes understanding the problem, introduce convenient notation and variables, re-formulate a problem as a mathematical problem, devise a plan, carry out the plan, looking back.
- Combinatorics: the multiplication principle, Dirichlet's box principle,  $r$ -permutation,  $r$ -combination and binomial coefficient, the binomial theorem, generalized permutations and combinations.
- Discrete Probability Theory: Laplace's definition of uniform probability, Kolmogorov's axioms for probability, disjoint events, conditional probability, independent events, sequences of independent Bernoulli trials, the law of total probability, Bayes' rule and Bayes' theorem.
- Relations: properties, matrix and graph representation of relations, equivalence relations, order relations, Hasse diagrams.
- Graph theory: basic concepts and notation, simple graphs, bipartite graphs, matching, adjacency matrix, incidence matrix, connectivity, the number of paths of a certain length between two nodes.

## Type of Instruction

Lectures, exercise sessions and tutoring of assignments.

## Examination

The examination of the course is divided as follows:

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Code	Designation	Grade	Credits
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2151	Written exam	AF	5,00
2152	Assignment	U/G	2,50

The course is assessed with the grades A, B, C, D, E, Fx or F.

To pass the course it is required to get at least E on the written exam, and to pass the assignment. The final grade is determined by the grade on the written exam.

Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.

If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

### Objectives achievement

The examination elements are linked to the course objectives in the following ways:

Goal	2151	2152
A.1	<input checked="" type="checkbox"/>	
B.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### Course Evaluation

During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are to be promptly presented as feedback to the students who have completed the course. Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

### Credit Overlap

The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course: 1MA912 Discrete mathematics and communication, 1MA405 Discrete mathematics and mathematical thinking, 7.5 credits and 1MA462 Discrete mathematics, 7.5 credits

### Other

The course will be performed in way that the experience and knowledge of the students becomes visible and develops. For example, this means that we have an including approach and that no one should feel excluded. This can be manifest in various ways, for example the teacher is supposed to use examples that are neutral with respect to gender.

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

## Required Reading and Additional Study Material

### **Required reading**

Rosen, Kenneth H, Discrete mathematics and its applications, McGraw-Hill, 9th Edition, ISBN 978-1-260-09199-1. Antal sidor: 450 av 942.