Level: bachelor

Course title: Discrete Mathematics 1

Status: obligatory

ECTS: 7

Requirements: none

Learning objectives

Acquiring basic knowledge and skills in combinatorics, graph theory, and basic algorithms that are characteristic for these two areas.

Learning outcomes

Successful students will be able to apply counting techniques to the problems that arise in practice, to analyse in detail the combinatorial configurations that describe connections between the elements of a system, and to understand and implement the basic algorithms of these two areas.

Syllabus

Theoretical instruction

Basic combinatorial principles. Words over a finite alphabet. Subsets of a finite set. Binomial numbers and Newton's binomial theorem. Monomials and multinomial theorem. Multisets. Inclusion-exclusion principle. Recurrence relations. Fibonacci numbers. Notion of a graph. Basic graph properties. Notion of a digraph. Basic digraph properties. Connectivity and metrics. Trees. Graph and digraph representation in computer science.

Practical instruction

Elementary counting techniques for words and finite sets. Application of Newton's binomial theorem. Counting words on multisets and submultisets of certain multisets. Application of the multinomial theorem. Algorithms for generating basic combinatorial configurations. Application of advanced combinatorial techniques. Graphs as system models. Distance in graph, BFS and applications. Graph tours, DFS and applications. Algorithm for testing graph connectivity, and for determining cut-vertices and cut-edges. Properties and representations of trees. Algorithm that determines whether a given graph is a tree.

Weekly teaching load				Other:
Lectures: 3	Exercises: 2	Other forms of teaching: 0	Student research: 0	0