Study programme(s): Computer Science

Level: bachelor

Course title: Discrete Structures 1

Lecturer: Dragan Mašulović, Maja Pech

Status: obligatory

ECTS: 6

Requirements: ---

Learning objectives

In this course students shall acquire fundamental mathematical literacy and will understand the notions such as sets (informally), relations and functions; propositional logic and logical inference; mathematical proofs; and will be able to demonstrate and apply those skills in case of finite graphs.

Learning outcomes

At the end of the course a successful student will be able to perform simple computations with finite sets, identify equivalence relations and partial orders, identify surjective/injective/bijective functions, compute function composition and inverses of bijective functions, perform basic calculations in the propositional logic, be able to prove mathematical facts directly, using contraposition or mathematical induction, understand basic facts about finite graphs and apply the knowledge acquired above to reason about finite graphs.

Syllabus

- Sets (Venn diagrams; Union, intersection, complement; Cartesian product; Power sets; Cardinality of finite sets)
- Relations (Reflexivity, symmetry, transitivity; Equivalence relations, partial orders)
- Functions (Surjections, injections, bijections; Inverses; Composition)
- Propositional logic (Logical connectives; Truth tables; Normal forms (conjunctive and disjunctive); Validity of well-formed formula; Propositional inference rules (concepts of modus ponens and modus tollens))
- Limitations of propositional logic (e.g., expressiveness issues)
- The structure of mathematical proofs (Direct proofs; Disproving by counterexample; Proof by contradiction)
- Induction over natural numbers
- Undirected graphs, Directed graphs, Weighted graphs
- Trees, Spanning trees/forests
- Graph isomorphism

Literature

R. Garnier, J. Taylor: "Discrete Mathematics: Proofs, Structures and Applications", 3rd Ed, CRC Press, Chapman and Hal 2009

S. G. Krantz: "Discrete Mathematics Demystified", McGraw-Hill, 2009

Weekly teaching load				
Lectures: 3	Exercises: 2	Practical Exercises: 0	Student research: 0	Other: **0**

Teaching methodology

Blackboard lectures, Blackboard exercises

Grading method (maximal number of points 100)

Pre-exam obligations	**points**	**Final exam**	**points**
Colloquium 1	**30**	*Oral exam*	*40*
Colloquium 2	**30**		