Study programme: Mathematics (MA), Master in Mathematics Teaching(MP)	
Level: master	
Course title: Theory of Algorithms	
Lecturer: Boris B. Šobot	
Status: elective	
ECTS: 5	
Requirements: none	

Learning objectives

Understanding the basic notions of the theory of recursive functions and Turing machines, as two equivalent formalizations of the notion of algorithm; introduction to some important algorithms and the analysis of their complexity.

Learning outcomes

Understanding recursiveness and connected notions with the capability of proving it; understanding the principles of Turing machines and ability to construct machines solving some simple problems; knowledge of some important algorithms and estimating their complexity.

Syllabus

Theoretical instruction

The notions of primitive recursive and recursive functions. Methods for proving recursiveness. The Ackermann function. Recursive and recursively enumerable sets. Turing machines and some modifications. RAM machines. Calculating time and space complexity of an algorithm. Nondeterministic Turing machines. NP-completeness. Some important algorithms: Euclid's algorithm, sorting algorithms, SAT problem and its restrictions.

Practical instruction

Checking primitive recursiveness of functions and sets. Applications to some important arithmetic functions. Some other connections between recursive and recursively enumerable sets. Constructing Turing machines in one element alphabet. Simulating composition, primitive recursion, sums and products and the search operator.

Literature

1. I. Dolinka, *Kratak uvod u analizu algoritama* (Serbian), Faculty of Sciences, Novi Sad, 2008.
2. R. Tošić, S. Crvenković, *Zbirka zadataka iz teorije algoritama* (Serbian), Department of mathematics, Novi Sad, 1980.

Weekly teaching load				Other: -
Lectures: 3	Exercises: 1	Other forms of teaching: -	Student research: -	

Teaching methodology

Lectures are presented using classical teaching methods. Exercises are used to practise and analyse typical problems and their solutions. The ability of application of theoretical knowledge is checked through independent solving of exercises on two colloquia. The final exam is oral and a student is supposed to demonstrate general understanding of the presented theoretical material.

Grading (maximum number of points 100)			
Pre-exam obligations	**points**	**Final exam**	**points**
Colloquia	50	Oral exam	50