Course Unit Descriptor

Study Programme: Information Technologies

Course Unit Title: Automata and Algorithms

Course Unit Code: IT251

Name of Lecturer(s): Mirjana Mikalački

Type and Level of Studies: Bachelor Academic Studies

Course Status (compulsory/elective): Compulsory

Semester (winter/summer): Summer

Language of instruction: Serbian (primary), English (secondary)

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 7

Prerequisites: Discrete Structures 1, Discrete Structures 2

Course Aims:

Teaching students to understand basics of theoretical computer science and their use in algorithm design, as well as developing the students' ability to think algorithmically.

Learning Outcomes:

Minimal: At the end of the course, it is expected that students know all basic concepts of finite automata and formal languages theory, master standard principles of decidability and complexity theory and are able to differentiate between complexity classes.

Desirable: At the end of the course, it is expected that successful students can classify some standard algorithms into complexity classes and apply their knowledge in solving more complex algorithmic problems.

Syllabus:

Alphabets, words, languages and the algorithmic way of representing problems. Deterministic and nondeterministic finite automata. Regular and context-free languages. Turing machines and computability. Decidability. Algorithm analysis. Complexity theory: time and space complexity, the most important classes of problems. Polynomial algorithms, examples. NP-hard problems with reductions. NP-complete problems and the most important algorithms. Examples of algorithms.

Required Reading:

- R. S. Madaras, S. Crvenković, *Uvod u teoriju automata i formalnih jezika*, Univerzitet u Novom Sadu, Novi Sad, 1995.
- Dolinka, *Kratak uvod u analizu algoritama*, Prirodno-matematički fakultet, Novi Sad, 2008.
- M. Sipser, *Introduction to the Theory of Computation*, Third Edition, Cengage Learning, 2013.
- J. Hromkovič, *Theoretical Computer Science, Introduction to Automata, Computability, Complexity, Algorithmics, Randomization, Communication, and Cryptography*, Springer, 2011.

Weekly Contact Hours: 5	**Lectures:** 3	**Practical work:** 2

Teaching Methods:

Frontal lectures, using classical methods. Blackboard exercises.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Colloquia	**50**	*Oral exam*	**50**

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.