**Study programme(s):** Information Technologies

**Level:** Bachelor

**Course title:** Automata and Algorithms

**Lecturer:** Mirjana D. Mikalački

**Status:** obligatory

**ECTS:** 7

**Requirements:** Discrete Structures 1, Discrete Structures 2

**Learning objectives**

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.

**Literature**


- R. S. Madaras, S. Crvenković, *Uvod u teoriju automata i formalnih jezika*, Univerzitet u Novom Sadu, Novi Sad, 1995.
- I. 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 teaching load** | | | | |
|---|---|---|---|---|
| Lectures: 3 | Exercises: 2 | Practical Exercises: 0 | Student research: 0 | Other: **0** |

**Teaching methodology**

Frontal lectures, using classical methods. Blackboard exercises.

**Grading method (maximal number of points 100)**

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