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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | **Faculty of Sciences and Mathematics** |
| **GENERAL INFORMATION** |
| Study program  | **Computer Science** |
| Study Module (if applicable) |  |
| Course title | **Algebraic Theory of Automata and Formal Languages** |
| Level of study | [ ] Bachelor [ ]  Master’s [x]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  |  [ ]  Autumn [ ] Spring |
| Year of study  |  |
| Number of ECTS allocated | 12.00 |
| Name of lecturer/lecturers | **Miroslav Ćirić** |
| Teaching mode |  [x] Lectures [ ] Group tutorials [ ]  Individual tutorials [ ] Laboratory work [ ]  Project work [ ]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| The purpose of course is to provide an introduction to basic algebraic and combinatorial concepts and methods that are used in the presentation, processing, storage and transmission of information. Upon completion of the course, students should learn basic algebraic and combinatorial ideas, concepts and methods that are used in the information presentation, processing, storage and transmission. Students should be able for practical application of aforementioned ideas, concepts and methods in their own scientific research. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| Semigroups, semigroups of relations, semigroups of transformations, free semigroups and free monoids, languages and codes, language recognition, the syntactic semigroup of a language, the transition semigroup of an automaton. Myhill and Nerode relations, derivatives (quotients) and Myhill-Nerode theory, the minimal automaton of a language, minimization of automata, recognizable subsets of semigroups, quasi-relations and rewriting systems. Pseudovarieties of semigroups, varieties of languages, Eilenberg’s theorem on the correspondence, star-free languages, local testable and part-by-part testable languages, theorem of Eilenberg-type for semigroups and automata. Application of semigroups and graphs in symbolic dynamics, symbolic dynamic systems, sofic shifts and finite-type shifts, automata and graphs in symbolic dynamics, entropy, application of spectral graph theory in computing the entropy. Semirings, formal power series and the matrix representation of languages, weighted automata, application of weighted automata. Algebras of languages, relational algebras and Kleene algebras, algorithmic problems in the algebra of languages.  |
| **LANGUAGE OF INSTRUCTION** |
| [x] Serbian (complete course) [ ]  English (complete course) [ ]  Other \_\_\_\_\_\_\_\_\_\_\_\_\_ (complete course)[ ] Serbian with English mentoring [ ] Serbian with other mentoring \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **ASSESSMENT METHODS AND CRITERIA** |
| **Pre exam duties** | **Points** | **Final exam** | **Points** |
| **Activity during lectures** | **10** | **Written examination** | **–** |
| **Practical teaching** | **20** | **Oral examination** | **70** |
| **Teaching colloquia** | **–** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |