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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 | | | | **Design and Analysis of Algorithms** | | |
| Level of study | | | | Bachelor  Master’s  Doctoral | | |
| Type of course | | | | Obligatory  Elective | | |
| Semester | | | | Autumn Spring | | |
| Year of study | | | | second | | |
| Number of ECTS allocated | | | | 8.00 | | |
| Name of lecturer/lecturers | | | | **Miroslav Ćirić** | | |
| Teaching mode | | | | Lectures Group tutorials  Individual tutorials  Laboratory work  Project work  Seminar  Distance learning  Blended learning  Other | | |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** | | | | | | |
| The main purpose is to give the introduction to the most important algorithms and algorithmic strategies being used to solve practical problems in computer science, and a comparison of various algorithms in terms of their effectiveness in various specific situations. At the end of the course students should be able to understand the basic mathematical con-cepts used in the design and analysis of algorithms, to be able to choose and use algorithms that are more appropriate in a given concrete situation, and to implement these algorithms. | | | | | | |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** | | | | | | |
| * **Introduction to algorithms** - algorithms and complexity * **Algorithms with numbers** – basic arithmetic, modular arithmetic, primality testing, applications to cryptography; * **Divide-and-conquer strategy** – the basic ideas, multiplication, subproblems tree, the Master theorem, binary search, mergesort, medians, the selection problem, matrix multiplication, the fast Fourier transform; * **Graph algorithms** - depth-first search in undirected graphs, depth-first search in directed graphs, strongly connected components, shortest paths in graphs, breadth-first search, Dijkstra's algorithm, shortest paths in the presence of negative edges, the Bellman-Ford algorithm, shortest paths in dags * **Greedy algorithms** - minimum spanning trees, Kruskal's algorithm, disjoint sets, Prim's algorithm, Huffman encoding, Horn formulas, set cover; * **Dynamic programming** - the basic ideas, longest increasing subsequences, edit distance, knapsack problem, chain matrix multiplication, all-pairs shortest paths, the Floyd-Warshall algorithm, the traveling salesman problem, independent sets in trees; * **Linear programming** - the basic ideas, examples: product maximization, production planning, optimum bandwidth allocation, variants of linear programming, flows in networks, bipartite matching, duality, zero-sum games, the simplex algorithm. | | | | | | |
| **LANGUAGE OF INSTRUCTION** | | | | | | |
| 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** | | | **25** |
| **Practical teaching** | **–** | | **Oral examination** | | | **40** |
| **Teaching colloquia** | **25** | | **OVERALL SUM** | | | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** | | | | | | |