

Study programmes: Bachelor studies - Informatics				
Course name: R210 - Design and analysis of algorithms				
Lecturers: Miodrag Živković, Vesna Marinković and other teachers of the CS department				
Status: Compulsory				
ECTS: 6				
Attendance prerequisites: P100, P103				
Course aims: To deepen knowledge of algorithm design and analysis techniques, data structures and fundamental algorithms. To acquire basic knowledge of geometric and algebraic algorithms. Introduction to NP-completeness proofs, as well as the solving approach to NP-complete problems.				
Course outcome: Upon completion of the course, the student has deeper knowledge of data structures, algorithm design techniques and algorithm analysis. Understands what are NP-complete problems and how one can solve them.				
Course content:				
<ul style="list-style-type: none"> - Overview of formal proof techniques - Analysis of algorithms - Basic algorithm design techniques: use of mathematical induction, exhaustive search, greedy algorithms, divide-and-conquer algorithms; backtracking; branch-and-bound; heuristics. - Exact and approximate pattern matching. Comparison of two strings. - Basic data structures; efficiency issue. - Graphs: Euler cycle, depth-first-search, breadth-first-search, topological sort; the shortest paths, transitive closure; minimum spanning tree. - Algebraic algorithms: Euclidean algorithm, polynomial multiplication, matrix multiplication; fast Fourier transform and multiplication of polynomials. - NP-completeness: reductions of polynomial complexity, the classes P and NP, Cook's theorem, NP-completeness proofs; approaches to solve NP-complete problems; Approximate algorithms with provable guarantees. 				
Literature:				
1. Miodrag Živković, Algoritmi, Matematički fakultet, Beograd, 2000.				
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, Introduction to Algorithms, The MIT Press, Cambridge, 2009.				
(the teacher can choose another relevant current literature)				
Number of hours: 5	Lectures: 3	Tutorials: 2	Laboratory: -	Research: -
Teaching and learning methods: Frontal, group and practical.				
Assessment (maximal 100 points)				
Course assignments	points	Final exam		points
Lectures	-	Written exam		-
Exercises / Tutorials	-	Oral exam		-
Colloquia	30	Written-oral exam		70
Essay / Project	-			