

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Communications and Information Technologies		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Data Structures and Algorithms		
Lecturer (for lectures)		Stoimenov V. Leonid		
Lecturer/associate (for exercises)		Davidović P. Nikola		
Lecturer/associate (for OFE)		Davidović P. Nikola		
Number of ECTS	6	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	Obtaining knowledge on basic concepts of fundamental data structures, as well as the knowledge needed for designing, implementing and using data structures in order to design effective algorithms for solving specific problems.			
Course outcomes	Theoretical and practical knowledge on concepts, internal design and implementation of fundamental data structures in programming language C. Knowing algorithm paradigms and how to choose the best data structure and the best algorithm for optimal problem solving.			
Course outline				
Theoretical teaching	Definition and overview of data structures, their use in programming and software engineering and pseudocode definition. Algorithm complexity and evaluation of algorithms. Paradigms for algorithm generation. Classification of algorithms. Arrays: array definition, array operations, string data types. Linked lists: structure definition, linked lists' types - single linked, double linked, cyclical; operations (traversal, addition, deletion), static and dynamical linked lists' implementation. Queue, Stack, Deck: structure definition, static and dynamical implementation of queue, stack and deck, basic operations (traversal, addition, deletion). Hash tables: structure definition, term definitions (hash function, collision, synonyms), collision resolution (open addressing, linking synonyms), hash table implementation, basic operations. Trees: basic terms, general and binary trees, basic operations (traversal, addition, deletion), ordered binary trees, static and dynamical implementation. Graphs: term definitions, static (adjacency matrix and incidence matrix) and dynamical graph representation (linked structures), operations for static and dynamical implementation, graph traversals: depth-first search and breadth-first search, shortest path in graph. Dynamic programming. FFT and FFT similar algorithms.			
Practical teaching (exercises, OFE, study and research work)	<ol style="list-style-type: none"> 1. Introduction: Overview of the development framework and preparation for practical tasks. Refreshing knowledge on user types, pointers and dynamic memory allocation. 2. Arrays: implementation of arrays using one of proposed programming languages, sorting. 3. Linked lists: Linked lists implementation, static and dynamical implementation 4. Queue, Stack, Deck: Queue, stack and deck implementation 5. Hash tables: Hash tables implementation 6. Trees: Tree implementation, implementation of special types of trees (Heap) 7. Graphs: Graph implementation, static and dynamical implementation, graph operations, shortest path in graph 			
Textbooks/references				
1	M.T.Goodrich, R.Tamassia, D. Mount, Data Structures and Algorithms in C++, John Wiley, 2004, ISBN 0-471-42924-4			
2	A. Drozdek, Data Structures and Algorithms in Java, Brooks Cole, 2001, ISBN 0-534-37668-1			
3	S. Djordjevic-Kajan, L. Stoimenov, A. Dimitrijević, Labwork preparation for Data Structures and Databases, I part: DATA STRUCTURES: C/C++, ISBN 86-85195-02-0, 2005, Electronic Faculty in Nis			
4	M. Tomasević, Algorithms and Data Structures, Akademska Misao, 2008, ISBN 978-86-7466-328-8			
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0
Teaching methods	Lectures, laboratory exercises, laboratory sessions, students work on assignments and projects, student seminars.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam	Points	

Activity during lectures	5	Written exam	30
Exercises	15	Oral exam	30
Colloquia	20		
Projects			