

Study program: Artificial Intelligence			
Name of the subject: Graph and Tree Algorithms			
Teacher(s): Miloš Radovanović, Doni Pracner			
Status of the subject: Elective			
Number of ECTS credits: 5			
Conditions: none			
Subject goal			
Students learn to understand and use data structures graph and tree, and related algorithms.			
Outcome of the subject			
<i>Minimum:</i> At the end, students are expected to implement different types of graph and tree data structures and algorithms.			
<i>Desirable:</i> At the end, students are expected to implement different types of graph and tree data structures and algorithms, and to recognize desirable structures for problem solving. Also, it is expected that a student is able to modify those structures and adjust them for practical applications.			
Subject content			
<i>Theory</i>			
Abstract data type graph and its variants: undirected, directed, weighted. Basic graph implementations. Graph traversals (depth-first search, breath-first search). Connected components. Topological sorting. Minimum spanning trees: greedy, Kruskal's, Prim's algorithms. Shortest paths: Dijkstra's, topological-sort, Bellman-Ford algorithms. Applications.			
Abstract data type symbol table and its basic implementations. Abstract data type tree and its implementations. Binary search tree. Balanced tree and its analysis. Different types of balanced tree (2-3-tree, red-black tree, B-tree, etc.) Other kinds of trees. Applications.			
<i>Practical learning</i>			
Implementations of data structures and algorithms for graphs and trees, and their different applications and modifications.			
Literature			
<i>Recomended</i>			
1. Robert Sedgewick and Kevin Wayne. Algorithms, Fourth edition. Addison-Wesley. 2011.			
2. Đura Paunić. Data Structures and Algorithms, University of Novi Sad, Faculty of Sciences, Novi Sad, 1997, University book			
3. Michael T. Goodrich, Roberto Tamassia and Michael H. Goldwasser. Data structures & algorithms in Java, Sixth edition. Wiley. 2014.			
Number of active teaching classes		Theoretical teaching: 2	Practical teaching: 2
Method of carrying out the teaching			
Theoretical classes are based on the classical teaching model involving a projector. Implementations of data structures graph and tree are explained and illustrated with appropriate examples. At the exercises, Java programming language is used to implement graphs and trees and their applications. During the exercises, student knowledge is tested with two colloquia that use different data types. Student knowledge is also checked through one small project. At the oral exam, the student shows understanding of data structures and algorithms with those structures.			
Evaluation of knowledge (maximum number of points 100)			
Pre-exam obligations	points	Final exam	points
Colloquia	25	Oral exam	50
Project	25		