Course Unit Descriptor

Study Programme: Applied Mathematics – Data Science	
Course Unit Title: Data Structures and Algorithms	
Course Unit Code: MDS30	
Name of Lecturer(s): Vladimir Kurbalija	
Type and Level of Studies: Master Academic Degree	
Course Status (compulsory/elective): elective	
Semester (winter/summer): Winter	
Language of instruction: English	
Mode of course unit delivery (face-to-face/distance learning): Face-to-face	
Number of ECTS Allocated:5	
Prerequisites: Mathematical Modeling and Software	

Course Aims:

Enabling the student to understand and use dynamic data structures and to apply advanced algorithms on these structures.

Learning Outcomes:

Minimum: At the end of the course, it is expected that a successful student is able to realize a given data structure and to implement corresponding algorithms.

Desirable: At the end of the course, it is expected that a successful student is able to identify a suitable data structure for a particular problem and implement it using pointers where applicable together with necessary algorithms.

Syllabus:

Theory

Basic concepts of programming languages needed for efficient programming of data structures and algorithms. The definition of abstract data types. Various criteria for implementing data types. Algorithm efficiency and complexity score. Abstract data type LIST. Implementation of a list and basic operations with a list. Circular lists, use of headers and limiters. Multiply linked lists. Abstract data types stack and queue and their implementation. Sorting algorithms. Advanced data structures: hash tables, priority queues, trees and graphs.

Practice

Implementation of various data structures (list, stack, queue, tree, graph...), and various ways of their practical application.

Required Reading:

1. Đura Paunić, *Data Structures and Algorithms,* University of Novi Sad, Faculty of Sciences, University book, Novi Sad, 1997.
2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, *Data Structures and Algorithms in Python*, Wiley; 1 edition (March 18, 2013)

Weekly Contact Hours:	**Lectures:** 2	**Practical work:** 2	**Other**: 1

Teaching Methods:

At lectures, classical methodology is applied. Mentioned dynamic data structures are explained and illustrated by examples. During theoretical and practical exercises explained data structures and practical examples of their use are practiced. The knowledge of students is tested during the exercises through four practical tests, which cover the materials that were presented. At the oral part of examination students demonstrates their understanding of data structures and algorithms on them.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation		written exam	

Practical work		oral exam	40
Preliminary exam(s)		…….	
Four tests	15+15+15+15		
Seminar(s)			
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			