



## SYLLABUS

<b>Basic information of the course</b>	
<b>University:</b>	<b>University “Ukshin Hoti” - Prizren</b>
<b>Academic unit:</b>	<b>Faculty of Computer Science</b>
<b>Study program:</b>	<b>Information and Telecommunication Technologies</b>
<b>Course:</b>	<b>Algorithms and data structures</b>
<b>Study level:</b>	<b>Bachelor</b>
<b>Course status:</b>	<b>Mandatory</b>
<b>Study year:</b>	<b>1</b>
<b>Number of hours per week:</b>	<b>2+2</b>
<b>Credit value - ECTS:</b>	<b>6</b>
<b>Time / location:</b>	<b>It will be published in the university web site!</b>
<b>Lecturers:</b>	<b>Assoc. Prof. Dr. Ercan Canhasi Ass. Arta Misini, Ph. D. c.</b>
<b>Contact details:</b>	<b>ercan.canhasi@uni-prizren.com arta.misini@uni-prizren.com</b>
<b>Course description:</b>	This course introduces basic search algorithms and data structures such as arrays, linked lists, stacks, queues, binary trees, and graphs.
<b>Course objectives:</b>	<p>The aim of this course is to provide students with a full introduction to data structure and algorithms and their implementation in Java.</p> <p>Upon completion of this course, students will be able to create and use classes in Java to implement basic data structures (array lists, linked lists, stacks, queues, and trees).</p> <p>This course will also cover the basic topics of algorithms and their application. Students will also be introduced to graph structures, and their algorithmic analysis.</p>
<b>Learning outcomes:</b>	<p>After the course, each student is expected to be able to:</p> <ul style="list-style-type: none"> <li>- Have on overview on fundamental data structures and algorithms; use linear lists, queues, sort algorithms, search algorithms, tree, graphs to implement programs with</li> </ul>

	<p>efficient algorithms.</p> <ul style="list-style-type: none"> <li>- Students will be able to explain the application of data structures.</li> <li>- Students will understand and compare the benefits and cost of dynamic and static structures.</li> <li>- Students will be able to properly select the data structures for modeling a problem.</li> <li>- Students will be able to calculate which algorithm will be more efficient from the aspect of time and quantum (aspect of memory) for a problem, by a set of algorithms.</li> <li>- Students will be able to analyze the complexity of an algorithm for a given implementation.</li> </ul>		
<b>Contribution on student load (must correspond with learning outcomes)</b>			
<b>Activity</b>	<b>Hours</b>	<b>Days/week</b>	<b>Total/hours</b>
Lectures	2	15	30
Exercise theoretical/laboratory	2	15	30
Practice work	1	2	2
Contact with lecturer/consultations	1	5	5
Field exercises	1	1	1
Midterms	2	2	4
Laboratory exercises	2	2	4
Individual time spent studying (at the library or home)	3	10	30
Final preparation for the exam	5	6	30
Time spent in evaluation (tests, quiz, final exam)	2	3	6
Projects, presentations, etc.	4	2	8
<b>Total</b>			<b>150</b>
Notice: 1 ECTS credits = 25 hours commitment, e.g. if the course has 6 ECTS credits student must have 150 hours during the semester.			
<b>Teaching methods:</b>	The course is a combination of lectures, discussions, numerical and laboratory exercises, while the assignments are presented by the laboratory course lecturers!		
<b>Assessment methods:</b>	<ul style="list-style-type: none"> <li>- Attendance in lectures and exercises: 5% + 5%.</li> <li>- Exercises: 10%.</li> <li>- Midterm 1: 40%.</li> </ul>		

	<ul style="list-style-type: none"> <li>- Midterm 2: 40%.</li> <li>- Or final exam: 100%.</li> </ul>	
<b>Assessment and grading:</b>	<b>Vlerësimi në %</b>	<b>Nota përfundimtare</b>
	91% - 100%	10
	81% - 90%	9
	71% - 80%	8
	61% - 70%	7
	51% - 60%	6
	0% - 50%	5
<b>Literature</b>		
<b>Basic literature:</b>	<ol style="list-style-type: none"> <li>1. Introduction to Algorithms; Book by Charles E. Leiserson, Clifford Stein, Ronald Rivest, and Thomas H. Cormen.</li> <li>2. Data Structures and Algorithm Analysis in Java, Book by Mark Allen Weiss.</li> </ol>	
<b>Additional literature:</b>	<ol style="list-style-type: none"> <li>1. Robert Lafore. Data Structures &amp; Algorithms in Java (2nd edition). Sams Publishing.</li> </ol>	
<b>Study plan</b>		
<b>Week</b>	<b>Lectures</b>	
<i>First week:</i>	<ul style="list-style-type: none"> <li>• Introduction to Algorithms and data structures</li> </ul>	
<i>Second week:</i>	<ul style="list-style-type: none"> <li>• What are the algorithms and data structures, the relation among</li> </ul>	
<i>Third week:</i>	<ul style="list-style-type: none"> <li>• Arrays and Linked Lists</li> </ul>	
<i>Fourth week:</i>	<ul style="list-style-type: none"> <li>• Stack, its implementation with arrays and linked lists</li> </ul>	
<i>Fifth week:</i>	<ul style="list-style-type: none"> <li>• Queue, its implementation with arrays and linked lists</li> </ul>	
<i>Sixth week:</i>	<ul style="list-style-type: none"> <li>• Tree, its implementation with arrays and linked lists</li> </ul>	
<i>Seventh week:</i>	<ul style="list-style-type: none"> <li>• Graph, its implementation with arrays and linked lists</li> </ul>	
<i>Eighth week:</i>	<ul style="list-style-type: none"> <li>• Midterm 1</li> </ul>	
<i>Ninth week:</i>	<ul style="list-style-type: none"> <li>• Algorithms, complexity</li> </ul>	
<i>Tenth week:</i>	<ul style="list-style-type: none"> <li>• Complexity calculation, comparison of different algorithms, methods and techniques of their design</li> </ul>	
<i>Eleventh week:</i>	<ul style="list-style-type: none"> <li>• Search Algorithms, sequential and binary search (recursive)</li> </ul>	
<i>Twelfth week:</i>	<ul style="list-style-type: none"> <li>• Sort Algorithms, BubbleSort, InsertionSort, SelectionSort</li> </ul>	
<i>Thirteenth week:</i>	<ul style="list-style-type: none"> <li>• Sort Algorithms, QuickSort, MergeSort</li> </ul>	
<i>Fourteenth week:</i>	<ul style="list-style-type: none"> <li>• Tree and Graph Algorithms</li> </ul>	
<i>Fifteenth week:</i>	<ul style="list-style-type: none"> <li>• Midterm 2</li> </ul>	

## Exercises

<b>Study plan</b>	
<b>Java</b>	<b>Exercises</b>
<i>First week:</i>	<ul style="list-style-type: none"> <li>• Introduction to Algorithms and data structures</li> </ul>
<i>Second week:</i>	<ul style="list-style-type: none"> <li>• Algorithms complexity</li> </ul>
<i>Third week:</i>	<ul style="list-style-type: none"> <li>• Basic Search Algorithms Sequential search</li> <li>• Binary search</li> </ul>
<i>Fourth week:</i>	<ul style="list-style-type: none"> <li>• Array Lists</li> </ul>
<i>Fifth week:</i>	<ul style="list-style-type: none"> <li>• Linked Lists</li> </ul>
<i>Sixth week:</i>	<ul style="list-style-type: none"> <li>• Linked Lists</li> </ul>
<i>Seventh week:</i>	<ul style="list-style-type: none"> <li>• Queue</li> <li>• (Array List, Linked List)</li> </ul>
<i>Eighth week:</i>	<ul style="list-style-type: none"> <li>• Exercises - Midterm 1</li> </ul>
<i>Ninth week:</i>	<ul style="list-style-type: none"> <li>• Queue</li> <li>• (Array List, Linked List)</li> </ul>
<i>Tenth week:</i>	<ul style="list-style-type: none"> <li>• Binary Search Tree</li> </ul>
<i>Eleventh week:</i>	<ul style="list-style-type: none"> <li>• Binary Search Tree</li> </ul>
<i>Twelfth week:</i>	<ul style="list-style-type: none"> <li>• Basic Sort Algorithms Selection sort Bubble sort</li> <li>• Insertion sort</li> </ul>
<i>Thirteenth week:</i>	<ul style="list-style-type: none"> <li>• Advanced Sort Algorithms Merge sort</li> <li>• Quick sort</li> </ul>
<i>Fourteenth week:</i>	<ul style="list-style-type: none"> <li>• Graphs BFS</li> <li>• DFS</li> </ul>
<i>Fifteenth week:</i>	<ul style="list-style-type: none"> <li>• Exercises - Midterm 2</li> </ul>

<b>Academic policies and rules of conduct</b>
<ul style="list-style-type: none"> <li>• Generally lecture presentations will be made through MS PowerPoint, tables, material usage, computer programs and numeric exercises.</li> <li>• Additional resources (scientific papers, publications, national bulletins, as well as recent discoveries and research) will be provided by professors.</li> <li>• In the absence of the opportunity for practical work to be organized weekly, in cooperation with the management of the university, this activity will be organized on certain days in: organizations, companies, etc.</li> <li>• During each session will be organized the conversation and co-participation with the students!</li> <li>• Students are required to be regular in lectures and exercises!</li> <li>• It will be evaluated when the students collaborate and participate in the lectures and course exercises!</li> <li>• Timely arrival in lectures and exercises is mandatory!</li> </ul>

