Basic data of the subject	
University:	**University of Applied Sciences in Ferizaj**
Academic unit:	**Faculty of Engineering and Informatics**
Program:	**Applied Informatics**
Title of the subject:	**Algorithms and Data Structure**
Level:	**Bachelor**
Course Status:	**Obligatory**
Year of studies:	**II, Semester III**
Number of hours per week:	**3**
Value of Credits - ECTS:	**5**
Time / location:	
Course lecturer:	
Contact details:	
Course Description:	*This course provides students with knowledge and skills of complex dynamic data structures, algorithms and their implementation using C/C++ and/or Java programming languages. The course puts an emphasis on practical training on implementation of data structures and algorithms for information saving and retrieval as well as on evaluation of complexity of algorithms applied. The course also provides an introduction into methods of specification and implementation of abstract data types (ADT).*
Objectives of the course:	*In this course student will be able to design and program algorithms and data structures, using the basics of programming. Building on the knowledge obtained in Programming and basic data structures and algorithms are introduced. After the topic of dynamic memory allocation, function calling mechanism is presented. Basic data structures, stack and queue, are presented followed by hashing, binary trees, and heap. Heap sort illustrates priority queue application.*
Expected learning outcomes:	*Upon successful completion of this course, student will be able to:* • *Describe the usage of various data structures* • *Recognize the complexity of operations and algorithms* • *Apply appropriate data structures and algorithms in solving real-life problems* • *Develop computer programs to implement appropriate data structures and algorithms* • *Assess the complexity of algorithms and computer programs* • *Identify appropriate data structures and algorithms in solving real-life problems.*
Prerequisites:	*Knowledge of the basics of C/C++ or Java programming, as well as knowledge of basic data structures and various algorithms.*
Contribution to the student load (which must correspond with learning outcomes)	

Activity	Hour	Day/Week	In total
Lectures with numerical exercises	3	15	45
Internship			
Contacts with teacher / consultations			
Field exercises			
Midterm, seminars and projects.	3	2	6
Homework			
Self-learning time student (at the library or at home)	3	15	45
Final preparation for the exam	7	2	14
Time spent on evaluation (tests, quiz and final exam)			
Projects and presentations.	3	5	15
Total			**125**

Teaching methodology:	*The course takes 15 weeks with 1.5 hours of lectures and 1.5 hour weekly individual and group exercises.* *Exercises will be held in the form of individual and group work in which concrete examples will be discussed.* *Active participation is extremely important so students are encouraged to attend lectures and exercises regularly and contribute to the discussions that take place in lectures. Lectures, exercise, individual work, discussions and group work.*
Assessment methods:	*The student can choose to be assessed one of the two forms of assessment, given below:* *1. Form 1: Evaluation with colloquiums and project* *2. Form 2: Evaluation with the final exam.* ***Form 1:*** *In the first form of assessment "Assessment with colloquiums and project" the student is assessed in four activities that are carried out during the lectures:* *1. Colloquium 1 (35%), individual assessment* *2. Colloquium 2 (35%), individual assessment* *3. Class activity (10%), individual assessment* *4. Project (20%), group assessment.* *If the student is not satisfied with the assessment achieved according to form 1, then he can undergo the assessment according to form 2 to obtain a higher assessment.* ***Form 2:*** *Through the final exam, the student can achieve a maximum of 70% of the points from the total of 100 points.*

	The rest of the 20% points must be completed by group work in the Project, an activity carried out during the lectures. *In Colloquium 1, Colloquium 2 and the final exam, the evaluation of the students will be done through an evaluation form, which must be completed individually by the student. The evaluation form will contain 5 tasks through which the student's learning outcomes will be evaluated.* *Activity in the class means the student's engagement in dealing with the issues discussed in the class, during the lectures.* *Project (20%), group assessment: it is an activity in which students apply the acquired knowledge in a concrete project. It is carried out in groups of 3 or 4 students who are obliged to carry out the activity, document and present it to the subject professor.* ***Rating:*** *91-100 points – graded 10 (ten)* *81-90 points – graded 9 (nine)* *71-80 points – grade 8 (eight)* *61-70 points – grade 7 (seven)* *51-60 points – grade 6 (six)* *0-50 points – The student repeats the exam*
The ratio of theory and practice:	*70% theory with exercises and 30% laboratory work.*
Literature	
Basic Literature:	1. *Granville Barnett, and Luca Del Tongo, (2008), "Data Structures and Algorithms", First Edition*
Additional Literature:	2. *Daniel Liang, (2015), "Introduction to Java Programming", 10th Edition, Armstrong Atlantic State University*
Designed learning plan	
Week:	**Lectures and exercises to be held**
Week one:	*Introduction. Review of basic programming and data structures.*
Week two:	*Memory allocation. Function call mechanisms.*
Week three:	*Definition of algorithm. Complexity of algorithms.*
Week four:	*Searching: sequential, jump-search, binary search.*
Week five:	*Recursion. Recursion examples, exercises.*
Week six:	*Sorting algorithms: selection sort, bubble sort, insertion sort, Shell sort, merge sort, quicksort.*
Week seven:	*Test 1*
Week eight:	*Linear list.*
Week nine:	*Multiple linear lists.*
Week ten:	*Stack.*
Week eleven:	*Queue.*
Week twelve:	*Hashing. Hashing examples.*
Week thirteen:	*Introduction to graphs. Trees.*

Week fourteen:	*Heap. Heap Sort.*
Week fifteen:	*Test 2*
Academic policies and rules of conduct	
Regular attendance of lectures and exercises is necessary, as well as active participation with discussion and solution of tasks. Not impeding the progress required for learning using mobile phones turned off or in silent mode	