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:	**Operational Research**
Level:	**Bachelor**
Course Status:	**Obligatory**
Year of studies:	**II, Semester IV**
Number of hours per week:	**3**
Value of Credits - ECTS:	**5**
Time / location:	
Course lecturer:	
Contact details:	
Course Description:	*The component will discuss a range of methods used in Operational Research for assisting with the analysis of problems from a wide range of real life settings. Many of the examples given will concern the application of Operational Research to problems related to Applied Informatics.*
Objectives of the course:	*The component will introduce mathematical modelling methods frequently used in Operational Research, including linear programming, integer programming, stochastic analysis, queuing theory and compartmental modelling. Students will also be introduced to the practical problem solving methodology of Operational Research and the processes involved in developing a mathematical modelling structure.*
Expected learning outcomes:	*Upon successful completion of this course, student will be able to:* • *Classify mathematical programs on the basis of the number and types of their solutions* • *Apply linear programming to real-world decision problems with real and integer-valued variables* • *Model adversarial decision problems using linear programming* • *Select an appropriate solution method or synthesise a new method for a given mathematical program* • *Formulate mathematical programs used for decision-making and decision-making under uncertainty* • *Formulate an adversarial decision problem in terms of a game*
Prerequisites:	*Basic knowledge in mathematics and computing, as well as an interest in solving practical problems through mathematical modeling and operational research methods*
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 hours 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 two tests and the Project* *2. Form 2: Evaluation of the final exam.* ***Form 1:*** *In the first form of assessment "Assessment with two tests and project" the student is assessed in four activities that are carried out during the lectures:* *1. Test 1 (30%), individual assessment* *2. Test 2 (30%), individual assessment* *3. Class activity (10%), individual assessment* *4. Project (30%), group assessment.* ***Additional clarification:*** *If the student in each activity above reaches the maximum points, then he will be evaluated with 100 points.* *Students who pass the exam according to Form 1 of the assessment, are released from the obligation to take the final exam. Only if the student is not satisfied with the grade*

	achieved according to form 1, then he can undergo the final exam to obtain a higher grade. ***Form 2:*** *In the second form of evaluation, "Evaluation with the final exam", the student will undergo the exam which will be held after the end of the course lectures and is organized in the exam deadlines, determined by the University Senate.* *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 30% points must be completed through group work on the Project, an activity carried out during the lectures.* *In Test 1, Test 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 objective and subjective questions through which the student's learning outcomes will be evaluated:* • *The objective questions will be of the following types: (1) Multiple choice questions, (2) True/False, (3) Completion, and (4) Composition/Matching; questions that will be used to assess the student's abilities to recall and recognize the concepts and material of the course.* • *The subjective questions will be of the Essay/written task type that will be used to assess the student's understanding and abilities to apply the knowledge gained in the analysis, synthesis, and evaluation of the problem, from the answers prepared by the student to the question of submitting.* *Activity in the class means the student's engagement in dealing with the issues discussed in the class, during the lectures* *Project (30%), group assessment: it is an activity in which students apply the acquired knowledge in a concrete project. It is carried out in groups of 2 or 3 students who are obliged to carry out the activity, document it, and present it to the subject professor.* *For the form of realism and documentation of the activity, all members of the group will be evaluated with the same point (20%), while the evaluation of the presentation skills of the activity is individual and includes 10%.*

	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:	*100% Theory with numerical exercises.*
Literature	
Basic Literature:	1. *Introduction to mathematical programming. Operations research. Volume 1 Winston, Wayne L. 4th ed., Pacific Grove, CA: Thomson/Brooks/Cole* 2. *Linear and nonlinear programming Luenberger, David G., 1937- author. Fourth edition., Cham: Springer*
Additional Literature:	3. *Thoma Mitre & Bashkim Ruseti, Matematika e Zbatuar, Tiranë 2008* 4. *Operations research: an introduction Taha, Hamdy A., Tenth edition, global edition., Pearson Education Limited,*
Designed learning plan	
Week:	**Lectures and exercises to be held**
Week one:	*Presentation of the subject*
Week two:	*Introduction to Operations Research*
Week three:	*Linear Programming. Simplex algorithm*
Week four:	*Graphical Analysis of Linear Programming Problems*
Week five:	*Linear Programming Problems (LPP)*
Week six:	*Transportation Problem*
Week seven:	*Test 1*
Week eight:	*Mathematical Formulation of the Problem. Routing Problem*
Week nine:	*Network optimization*
Week ten:	*Dijkstra's Algorithm, Floyd's Algorithm*
Week eleven:	*Presentation of the problem by means of graphite*
Week twelve:	*The simulation*
Week thirteen:	*Game Theory*
Week fourteen:	*Test 2*
Week fifteen:	*Course summary and exam preparation*
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.	