Study program: Information Technology	
Course title: OPERATIONS RESEARCH	
Teacher(s): Jasmina J. Vesić Vasović	
Course status: elective	
Number of ECTS credits: 6	
Prerequisite courses: none	

Course objectives

The aim of the course is to acquaint students with the basic terms and methods of operational research, and train them to apply quantitative approaches in finding optimal solutions to organizational problems in production and business systems. Train students to analyze and synthesize solutions to real business problems with the help of modeling, quantitative analysis and optimization techniques and provide support for the improvement of the management function in organizational systems.

Learning outcomes

The student acquires the ability to solve specific business problems with the use of specific methods of operational research, procedures and techniques in problem analysis, synthesis of solutions and prediction of the consequences of those solutions. By mastering the methods of operational research, the student is able to use quantitative scientific methods to create a basis for making optimal decisions.

Content of the course

Theoretical teaching

Introduction to optimization, models and methods of operations research; Basic types of models, objective function and limiting conditions; Modeling of standard problems in management (optimization of production program, problem of optimal use of resources...); Linear programming - general formulation and model of linear programming, general, symmetric, standard and canonical form of linear programming problems, simplex algorithms, dual problems, sensitivity analysis; Nonlinear programming - definition of convex function and set, one and multi-dimensional unconditional and conditional optimization; Network planning, structure analysis, time analysis (CPM, PERT method) and cost analysis (PERT/COST method); Standard problems of combinatory optimization and their solution by exact and approximate methods; Models of replacement of basic assets, with and without discount factor; Simulation, simulation models and application, simulation of business-production processes; Multi-criteria decision-making, methods, techniques and their application.

Practical teaching

It includes the application of the material provided by the program to solve practical problems (tasks) with appropriate software support. Application of the grapho-analytical method of solving linear programming problems; Simplex methods - basic steps, simplex table, advanced techniques, specific applications in management; software packages for linear programming; Solving nonlinear programming problems using analytical and numerical methods; Solving some standard of compromise optimization problems using exact and approximate methods; Examples of specific application of network planning techniques - structure analysis, time analysis using the CPM and PERT methods, optimization of resources in the network diagram, areas of application; Specific applications of multi-criteria decision-making methods in business with software support.

Examples of modeling real business decision-making problems and distribution of student projects. The topics of the tasks are focused on the application and verification of the knowledge gained from lectures, and through solving real problems.

Literature

[1] Krčevinac, S., Čangalović, M., Kovačević-Vujčić, V., Matrić, M., Vujošević, M. (2006) Operaciona istraživanja 2, FON, Beograd

[2] Triantaphyllou E. (2000). Multi-criteria decision making methods: a comparative study. Netherland: Kluwer Academic Publication Evangelos

[3] Letić, D., Davidović, B. (2011). Operacioni i projektni menadžment, Kompjuter biblioteka, Beograd.

[4] Stanimirović, Z. (2014) Nelinarno programiranje, Matematički fakultet, Beograd, 2014.

[5] Richard Armand DeFusco, & Association for Investment Management. (2004). Quantitative methods for investment analysis. CFA Institute

[6] Hillier, F. S. Lieberman, G.J. (2010). Introduction to operations research-9th ed. The McGraw-Hill Companie

[7] Hamdy A.T. (2017). Operations Research An Introduction, Tenth Edition Global Edition, Pearson Education Limited

Number of active teaching classes: 6	Theoretical teaching: 3	Practical teaching: 3

Teaching methods

Lectures are conducted according to the model of interactive teaching with the presentation of teaching content, discussion and analysis of case studies. Practices are performed using a combination of the classical method and interactive participation of students through the analysis of cases from practice, solving of specifically structured task, exchange of ideas and knowledge through group discussion, mentoring and team work on the preparation of a seminar paper on a defined topic within framework of the content of the course. The exam is taken in writing and/or orally.

Evaluation of knowledge (maximum number of points 100)

Pre-exam obligations	Points	Final exam	Points
Activity during lectures	5	Written exam	20
Practical lecturing	5	Oral exam	10
Colloquiums	50		
Seminar paper	10		