

Operations research II Course

<i>Name of the subject:</i> Operations research 2 - BSc	<i>SUBJECT code:</i>	<i>Weekly hours:</i> 2 lectures + 2 practical work	<i>Credit:</i> 6
<i>Subject leader:</i> Ivan Jovanović (Sanela Arsić)	<i>Academic Degree:</i> Associate Professor (Teaching assistant)	<i>Prerequisites:</i> The acquired knowledge from the Operations Research 1, Business statistics and Production Management.	

Purpose: <i>The aim of the subject:</i> Overcoming basic concepts, methods, tools and techniques in the field of operations research. <i>Outcome:</i> Training students to use theoretical models and quantitative methods to solve practical problems of management problems.	
Course description: The subject deals with the issues in the field of contemporary operations research (science of management) as follows: game theory, network planning technique, queuing theory, simulation of the production system and inventory models. Learning this course acquire the required knowledge necessary to use theoretical models and quantitative methods to solve practical problems of management. Also, acquire the knowledge for practical usage of software solutions in the field of operations research, and the application of planning techniques to specific project tasks.	
Schedule	
LECTURE	
Weeks	Topics
1.	The aim, task and the area of interest of game theory; The division games; Basic concepts in game theory.
2.	Criteria for selection of the optimal strategy; Wald's principles of game theory; Rules of the game; Game theory in tabular and matrix form; The matrix game with Zero-Sum game; The process of quantification in games with qualitative resultant games.
3.	Simple matrix games: the game value, lower and upper limits for simple matrix games, saddle-point; The properties that facilitate the solution of the mixed matrix game; Matrix games with mixed strategies: the value of the game, the lower and upper limit for mixed matrix games, strategic saddle; Analytical method for solving mixed matrix games.
4.	Matrix games with mixed strategies: graphic method, method of linear programming.
5.	Network planning technique (NPT): methods NPT, phases NPT; The main elements of the network diagram (ND); Rules for the construction ND; Numbering ND.
6.	CPM method: Timing analysis; Critical path; Time reserve.
7.	PERT method: Estimated time; Variance time activities; Timing analysis; The probability of completing the planned deadlines.
8.	Resource Analysis: Homogeneous and heterogeneous workforce; Optimize workforce.
9.	Cost analysis; Cost optimization.
10.	PDM method: Types of connections; Transformation ND; Timing analysis.
11.	Queuing theory: Basic concepts; The arrival time distribution and services in the queuing system; Labeling by Kandall and Lee; Symbols by Kandall.
12.	Model M/M/1; M/M/1/N; M/M/C; M/M/C /K; M/M/1/N/N; M/Ek/1.
13.	Simulation work: Basic concepts; The software program SIMPROCESS.

14.	Inventory Management: Inventory model with constant procurement; Inventory model with intervention procurement.
PRACTICAL CLASSES	
Weeks	Topics
1.	Simple matrix games (matrix games with pure strategy). Mixed matrix games dimensions 2×2 : analytical method.
2.	Mixed matrix games dimensions 2×2 : analytical and graphical methods; Mixed matrix games dimensions $m \times 2$ and $2 \times n$: reduction, graphical method.
3.	Solving matrix games using linear programming.
4.	Network planning technique (NPT): constructing a network diagram (ND), numbering ND.
5.	CPM method: timing analysis, determining critical path, determining for time reserves.
6.	PERT method: timing analysis, the probability of occurrence of events.
7.	Resource Analysis; Optimize workforce.
8.	PERT/COST method: Cost analysis; Cost optimization.
9.	PDM method: constructing a network diagram, timing analysis
10.	Queuing theory: single-channel models M/M/1; M/M/1/N; multi-channel model M/M/C.
11.	Queuing theory: model M/M/1/N/N; model M/Ek/1.
12.	Simulation work - The software program SIMPROCESS.
13.	Inventory Management: inventory model with constant procurement.
14.	Inventory Management: Inventory model with inte intervention rventvom procurement.
Final grade:	
<p>On the pre-exam obligations students can conquer 40 points. Structure points are: 5 - presence at the classes; 5 - presence in practical work; 20 - colloquiums; 10 - defended seminar paper. At the exam students can conquer another 60 points (40 tasks and 20 - theory). Method of knowledge testing can be: a written examination, oral examination, the test exam, project presentations, seminars, etc.</p> <p>The evaluations, based on the results are as follows: 0-50 fail (5); 51-60 pass (6); 61-70 good (7); 71-80 very good (8); 81-90 excellent (9); 91-100 exceptional (10).</p>	
Compulsory literature:	
<ol style="list-style-type: none"> 1. Chase, Operations management for competitive advance, Data Status, Belgrade, 2005. 2. W. Winston, Operations Research (Applications and Algorithms), Indiana University, 2004. 	
Supplemental literature:	
<ol style="list-style-type: none"> 1. M.W. Carter, C.C. Price, Operations Research - a practical introduction, CRC Press, New York, 2001. 	