FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

SUBJECT CARD

Name in Polish: Badania operacyjne
Name in English: Operations Research
Main field of study (if applicable): Management
Specialization (if applicable): Business Information Systems
Level and form of studies: 2-nd level, full-time
Kind of subject: obligatory
Subject code MAZ1201
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30		
60	60		60		
Form of crediting	examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	0.5		1		

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Basic knowledge on mathematics and logic
2. Basic skills in computer programming.
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SUBJECT OBJECTIVES
C1. Presenting various types of optimization problems such as linear programming problems, integer linear programming problems and network flow problems; showing practical applications of these problems.
C2. Presenting the most important methods of solving the problems listed in point C1.
C3. Teaching students how to identify decision variables, input data and objectives in practical decision situations and how to use them to build a mathematical model.
C4. Teaching students how to interpret and present solutions obtained for the models constructed.
C5. Presenting some computer software for building and solving mathematical programming models.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - Knows the principles of construction of econometric and simulation models. Specialized knowledge concerning quantitative modeling and forecasting of states and processes in a organizations.

relating to skills:

PEK_U01 – Is able to use operations research methods as a tool supporting advanced decision-making analyses.

PEK_U02 – Is able to use quantitative methods, including advanced econometric and simulation methods to describe and predict the processes and outcomes of the organization.

relating to social competences:

PEK_K01 – Is aware of the need for an independent, critical evaluation of the scope and level of his knowledge and skills in both the management sciences and the interdisciplinary sciences. Is able to inspire and organize the learning process of others.

PEK_K02 - Shows courage in communicating and defending his opinions. Is prepared to persuade and negotiate in the name of achieving common goals.

PROGRAMME CONTENT	
Form of classes - lecture	**Number of hours**
Lec 1 Methodology of operations research, linear programming problem and its applications	1
Lec 2 The graphical and simplex methods solving linear programming problems.	2
Lec 3 The simplex algorithm and sensitivity analysis for linear programming problems	2
Lec 4 Integer linear programming problem and its applications	2
Lec 5 The branch and bound and cutting plane methods for solving integer linear programming problems	2
Lec 6 Basic network flow problems, part I (the shortest path problem, the maximum flow problem)	2
Lec 7 Basic network flow problems, part II (transportation problems)	2
Lec 8 Multiobjective linear programming problem, its applications and methods of solving.	2
Total hours	**15**
Form of classes - laboratory	**Number of hours**
Lab 1 Introduction; presenting computer software for solving linear programming problems; the graphical method for solving linear programming problems	2
Lab 2 Building and solving linear programming models for practical problems.	2
Lab 3 Building and solving linear programming models for practical problems.	2
Lab 4 Building and solving linear programming models for practical	2

	problems.	
Lab 5	Building and solving linear programming models for practical problems.	2
Lab 6	Solving linear programming problems by using the simplex algorithm and the sensitivity analysis.	2
Lab 7	Building and solving integer linear programming models for practical problems.	2
Lab 8	Building and solving integer linear programming models for practical problems.	2
Lab 9	Building and solving integer linear programming models for practical problems.	2
Lab10	Solving integer linear programming problems by using the branch and bound method	2
Lab 11	Building and solving network flow models for practical problems	2
Lab 12	Building and solving network flow models for practical problems	2
Lab 13	Solving the travelling salesperson problem	2
Lab 14	Repetition and preparation for the test	2
Lab 15	Written test	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Presentation
N2. Case study
N3. Solving exercises
N4. Using computer software

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01	Exam
P	PEK_U01 PEK_U02	Written test
P=1		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE:
[1]   H. Wagner. Badania operacyjne. PWE, Warszawa 1980
[2]   H. Taha. Operations research. An introduction. Prentice Hall 2011
[3]   F. S. Hiller, G. J. Liberman. Introduction to operations research. Mc Graw Hill 2003
[4]   W. L. Winston. Operations Research: applications and algorithms. PWS-KENT Publishing Company 1987
SECONDARY LITERATURE:

[1]   I. L. Kalichman. Algebra liniowa i programowanie. PWN, 1971
[2]   H. P. Williams. Model building in mathematical programming. Wiley 1990.
[3]   T. Trzaskalik. Wprowadzenie do badań operacyjnych z komputerem. PWE, 2008
[4]   R.K. Ahuja, T. L. Magnanti, J. B. Orlin. Network flows: theory, algorithms and applications. Prentcice Hall, Inc., 1993
[5]   R.S. Garfinkel, G. L. Nemhauser. Programowanie całkowitoliczbowe. PWN, 1978.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Operations Research
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Management.
AND SPECIALIZATION **Business Information Systems**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)**	Subject objectives***	Programme content***	Teaching tool number***
PEK_W01	K2_ZARZ_W13	C1,C2, C3, C4	Lec1 – Lec8	N1, N2, N3
PEK_U01 **PEK_U02**	K2_ZARZ_U10 K2_ZARZ_U12	C2, C3, C4, C5	Lab1 – Lab14	N2, N3, N4
PEK_K01 **PEK_K02**	K2_ZARZ_K01 K2_ZARZ_K08	C4	Lab1- Lab14	N2, N3, N4