COURSE GUIDE

Subject name	**Operational research**
Course of study	**Quality and Production Management**
The form of study	**Full-time**
Level of qualification	**First**
Year	**II**
Semester	**III**
The implementing entity	**Department of Econometrics and Statistics**
The person responsible for preparing	**dr hab. Marek Szajt, Prof. PCz**
Profile	**General academic**
ECTS points	**3**

TYPE OF TEACHING – NUMBER OF HOURS PER SEMESTER

LECTURE	CLASS	LABORATORY	PROJECT	SEMINAR
15	**15**	**-**	**-**	**-**

COURSE AIMS

C1. To familiarize students with the theoretical foundations of operational research.
C2. Creation of skills to construct mathematical models for production and transportation problems.
C3. Creation of students ability to apply appropriate methods of operations research to search for the optimal solution using specialized computer packages and individual interpretation and verification of the results.
C4. Creation of competencies for individual analysis of economic and social phenomena and processes with the use of operations research.

ENTRY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. A student should know the foundations of mathematical analysis.
2. A student should identify and understand the basic terms in the field of socio-economics.
3. A student should plan the computational procedures and use their new skills to work with different computing packages.
4. A student should be able to organize self work with the principles of logical inference.

LEARNING OUTCOMES

EU1. A student is able to mention the principle of modeling economic phenomena.
EU2. A student is able to identify methods of searching for optimal solutions.
EU3. Student is able to find and interpret the optimal solution for a given problem and a student is able to make sensitivity analysis.
EU4. A student demonstrates competence in active and creative combining knowledge in the field of operational research and management

COURSE CONTENT

Type of teaching – LECTURE	Number of hours
W1. The theoretical foundations of operational research.	2
W2. Linear optimization - modeling decision problems, the primal and the dual program.	2
W3. Linear optimization - the geometric method for determining the optimal solution.	1
W4. Linear optimization - simplex algorithm.	3
W5. Linear optimization - sensitive analysis.	2
W6. Closed and open transportation problem.	1
W7. Transportation algorithm.	1
W8. The theoretical foundations of network programming.	1
W9. Network programming - critical path method and PERT method.	2

Type of teaching - CLASS	Number of hours
C1. The optimal choice of the range of products using the geometric method - the primal problem.	1
C2. The search for the optimal solution for the blending problem.	2
C3. The search for the optimal solution for the dual program.	1
C4. The search for the optimal solution for linear programming problems using the simplex algorithm.	2
C5. The search for the optimal solution for the classical transportation problem.	2
C6. The search for the optimal solution for the production-transportation problem.	2
C7. Double games with a zero sum.	1
C8. Examples of Queueing Theory.	1
C9. Network methods with the determined logical structure: CPM, PERT.	2
C10. Elements of dynamic programming.	1

TEACHING TOOLS

1. Table, chalk.
2. PCs and projector.
3. Microsoft Office Excel.
4. Manuals, yearbooks, databases.

WAYS OF ASSESSMENT (F – FORMATIVE, P – SUMMATIVE)

F1. The current assessment of students activity.
F2. The assessment of students creativity in the team-working.
F3. Tests verifying the effects of teaching at different education levels and skills in the field of use of computer packages.
P1. Comprehensive evaluation of students work including.

STUDENT WORKLOAD

Form of activity		Average number of hours for realization of the activity		
		[h]	ECTS	ECTS
Contact hours with the teacher	Lectures	15	0.66	1,19
Preparation for lectures		12	0.53	
Contact hours with the teacher	Classes	15	0.66	1,8
Preparation for classes		8	0.27	
Getting acquainted with the indicated literature		10	0.28	0.28
Consultation		15	0.6	0.6
TOTAL NUMBER OF HOURS / ECTS POINTS FOR THE COURSE		**75**	**3**	

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

Basic resources

1. Verma A.P. Operations Research. S. K. Kataria & Sons, 2009.
2. Gupta P.K., Hira D.S. Operations Research. S. Chand, 1991.

Supplementary resources:

1. Sharma J.K. Operations Research, Theory and Application. Macmillan India Limited, 2006.
2. Hillier F.S., Lieberman F.J. Introduction To Operations Research. Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2002.
3. Sharma J.K. Operations Research, Theory and Application. Macmillan India Limited, 2006.

TEACHERS (NAME, SURNAME, E-MAIL ADDRESS)

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MATRIX OF LEARNING OUTCOMES REALISATION

Learning outcome	Reference of given outcome to outcomes defined for whole program (PRK)	Course aims	Course content	Teaching tools	Ways of assessment
EU1	K_W01, K_W02, K_U06, K_U07, K_K02	C1	W1,W2,W6, W8	1,2,3,4	F1,F2, F3
EU2	K_W01, K_W02, K_U06, K_U07, K_K02	C1, C3	W3, W4, W7, W9, C1-C10	1,2,3,4	F1,F2, F3, P1
EU3	K_W01, K_W02, K_U02, K_U06, K_U07, K_K02	C1, C2, C3, C4	W3, W4, W5, W7, C1-C10	1,2,3,4	F1,F2, F3, P1
EU4	K_W01, K_W02, K_W05, K_W07, K_U01, K_U02, K_U07, K_K05	C1, C2, C3, C4	W3, W4, W5, W7, W9, C1-C10	1,2,3,4	F1,F2, F3, P1

FORM OF ASSESSMENT - DETAILS

	grade 2	grade 3	grade 4	grade 5
EU1	Student doesn't know the principles of modeling of economic phenomena.	Student is able to mention the principles of modeling of economic phenomena.	Student is able to mention the principles of modeling of economic phenomena and to define the decision problem.	Student is able to mention the principles of modeling of economic phenomena and to define the decision problem and present it in the form of a mathematical model.
EU2	Student doesn't know the method of searching for optimal solutions.	Student is able to mention the method of searching for optimal solutions.	Student is able to mention the method of searching for optimal solutions and assign them to specific cases.	Student is able to mention the method of searching for optimal solutions and assign them to specific cases and critically evaluate the possibilities of obtaining the optimal solution.
EU3	Student can't find and correctly interpret the optimal solution for a given problem.	Student tries to find and interpret optimal solutions and make sensitivity analysis.	Student can find and correctly interpret the optimal solution for a given problem and make sensitivity analysis.	Student can independently propose appropriate methods to optimize solutions for a given problem and make sensitivity analysis.
EU4	The student does not demonstrate competence in combining knowledge in the field of operational research and management.	The student attempts to actively and creatively combine knowledge in the field of operational research and management.	The student demonstrates competence in combining knowledge in the field of operational research and management.	The student demonstrates competence in active and creative combining knowledge in the field of operational research and management.

ADDITIONAL USEFUL INFORMATION ABOUT THE COURSE

1. Information where presentation of classes, instruction, subjects of seminars can be found, etc. - presented to students during first classes, if required by the formula classes are sent electronically to the e-mail addresses of individual dean groups.
2. Information about the place of classes - Information can be found on the website of the Faculty of Management.
3. Information about the timing of classes (day of the week / time) - Information can be found on the website of the Faculty of Management.
4. Information about the consultation (time + place) - Information can be found on the website of the Faculty of Management.