(*faculty stamp*)

COURSE DESCRIPTION

1.Course title: Operational research	**2. Course code:** WM2
3. Validity of course description: 2020/21	
4. Level of studies: 1st cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: COMPUTER SCIENCE	(RMS)
7. Profile of studies: general academic	
8. Programme: all programmes	
9. Semester: 5	
10. Faculty teaching the course: Institute of Mathematics	
11. Course instructor: dr hab. inż. Edyta Hetmaniok, prof. PŚ	
12. Course classification: course of limited choice	
13. Course status: monographic	
14. Language of instruction: English	

15. Pre-requisite qualifications:

The basic knowledge of the linear algebra, mathematical analysis and differential calculus, as well as the basic knowledge of English language is required.

16. Course objectives:

Purpose of the course is to familiarize the students with the basic models, methodology and tools of operational research used in formulating and solving the decision problems. The course is given in English.

17. Description of learning outcomes:

Student who has completed the subject:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	W01: has an extended knowledge within the field of operational research - knows the most of classical definitions and theorems presented in the lecture.	test	lecture, class	K1P_U11 K1P_W09
2.	W02: knows how to precisely formulate the problems connected with decision making and how to pose the questions serving to understand the given problem.	test	lecture, class	K1P_U11
3.	U01: can define her/his interests within the field of operational research and develop them.	test, homework project	lecture, class	K1P_U11
4.	U02: can select the proper method for solving the posed problem.	test, homework project	lecture, class	K1P_U11 K1P_U33
5.	U03: can solve the selected problems within the field of linear and nonlinear programming, the theory of games, the queuing theory	test, homework project	lecture, class	K1P_U11
6.	K01: can search, on her/his own, the information concerning the operational research in literature, also in foreign languages.	test, homework project	lecture, class	K1P_U11 K1P_W09 K1P_K02

18. Teaching modes and hours

Lecture	Class	Laboratory	Projekt	Seminar
30	30			

19. Syllabus description:

Lecture: Introduction to the operational research. Linear programming problems. Graphical method and the simplex method. Dual simplex method. The sensibility analysis of solution obtained by applying the qraphical method and the simplex method. The quotient programming problem. The integer programming problem. The transport problem. Dual task to the transport problem, the method of potentials. The assignment problem and the Hungarian algorithm for solving the assignment problem. Selected methods of the game theory. Selected problems of the queuing theory. Elements of nonlinear programming. Selected problems concerning the time series.

Class/laboratory: practical realization of the issues, presented during the lectures, on the way of discussing and solving the tasks illustrating the undertaken problems.

20. Examination: No

21. Primary sources:

1. L.S. Goddard, *Mathematical techniques of operational research*, Oxford, Pergamon Press, 1963.

2. W.E. Duckworth, *A guide to operational research*, London : Methuen & Co Ttd., 1962

3. J. L. Nazareth, *An optimization primer: on models, algorithms, and duality*, New York, Springer, 2004.

4. C. Roos, T. Terlaky, J.-Ph. Vial, *Theory and algorithms for linear optimization: an interior point approach*, Chichester: John Wiley & Sons, Inc., 1997.

5. R. Grzymkowski, E. Hetmaniok, S. Kiełtyka, *Elementy programowania matematycznego,* Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, Gliwice 2010.

6. Praca zbiorowa pod red. E. Majchrzak, *Badania operacyjne: teoria i zastosowania*, Wyd. Pol. Śl., Gliwice 2007.

22. Secondary sources:

1. A. Antoniou, W-S. Lu, *Practical optimization : algorithms and engineering applications*, New York: Springer, cop. 2007.

3. Z. Jędrzejczyk, K. Kukuła, J. Skrzypek, A. Walkosz, *Badania operacyjne w przykładach i zadaniach,*PWN Warszawa 2001.

4. J. Stadnicki, *Teoria i praktyka rozwiązywania zadań optymalizacji: z przykładami zastosowań technicznych*, PWN Warszawa 2006.

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/30
2	Classes	30/60
3	Laboratory	/
4	Project	/
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	**60/90**

24. Total hours: 150

25. Number of ECTS credits: 5

26. Number of ECTS credits allocated for contact hours: 5

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 4

26. Comments:

The assessment rules: two tests: practical one for 40p. and theoretical/practical one for 50p.

Activity during the exercises: 10p.

For passing the course it is required to collect 41 points altogether, including at least 15 points for the theoretical/practical test.

The grade will be given according to the following scale:

41-55 p.: sufficient (3.0)

56-70 p.: plus sufficient (3.5)

71-80 p.: good (4.0)

81-90 p.: plus good (4.5)

91-100 p.: very good (5.0)

Approved:

…… ……

(date, Instructor's signature) (*date , the Director of the Faculty Unit signature)*