(*faculty stamp*)

Z1-PU7	WYDANIE N1	Strona 1 z 2

COURSE DESCRIPTION

1.Course title: Inverse Problems	**2. Course code:** WmII
3. Validity of course description: 2018-19	
4. Level of studies: 1st cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: MATHEMATICS	(RMS)
7. Profile of studies: general academic	
8. Programme: all programmes	
9. Semester: 4	
10. Faculty teaching the course: Institute of Mathematics	
11. Course instructor: dr Iwona Nowak	
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 and programming is required.

16. Course objectives:

Purpose of the course is to familiarize the students with the basic information about the inverse problems and methods to solving this kind of 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.	knows the structure of simple mathematical models and procedures used in the mathematical programming problems.	test	lecture, class	K1A_W01 K1A_W09 K1A_W10
2.	knows the selected methods and procedures of the linear and nonlinear mathematical programming.	test	lecture, class	K1A_W01 K1A_W09 K1A_W10
3.	can create the models of selected phenomena and optimization problems.	test	lecture, class	K1A_U01
4.	can choose the appropriate solution method for the given mathematical programming problem.	test	lecture, class	K1A_U01
5.	can solve the posed problem of optimizing a function under the given restrictions	test	class	K1A_U01
6.	can search, on her/his own, the information concerning the optimization algorithms in literature, also in foreign languages.	test	class	K1A_K06

18. Teaching modes and hours

Lecture	Class	Laboratory	Projekt	Seminar
30		30		

19. Syllabus description:

Lecture: Definitions and fundamental concepts that enable understanding the idea of the inverse problem: mathematical modelling, optimal, suboptimal solution, well-posed and ill-posed problem, etc. Classification of inverse problems. Spectral analysis of the inverse problems (regularization, sensitivity analysis, artificial intelligence). Selected examples of applications (inverse problems formulated in various fields of science).

Class: 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. F. Neto, A.Neto, An introduction to Inverse Problems with Applications, Springer, 2015..

2. A. Tarantola, Inverse Problem Theory and Methods for Model Parameter Estimation, SIAM, 2005

3. L.Rutkowski, Metody i techniki sztucznej inteligencji,. PWN 2010..

22. Secondary sources:

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

2. M. Negnevitsky, *Artificial intelligence : a guide to intelligent systems* - 3rd ed. - Harlow: Addison-Wesley, 2011.

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	/
3	Laboratory	30/50
4	Project	/
5	BA/ MA Seminar	/
6	Other (preparation for tests)	/10
	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):

26. Comments:

The assessment rules: two tests: practical one for 50p. and theoretical/practical one for 40p. Activity during the exercises: 10p.

For passing the course it is required to collect 41 points together 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:

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