Attachment No. 5 to Rector's ordinance No. 22/2020

DESCRIPTION OF THE COURSE OF STUDY

Course code	**0719-2ID-C27-MNwZF**	
Name of the course in	Polish	**Metody numeryczne w zastosowaniach fizycznych**
	English	**Numerical methods in physical applications**

1. LOCATION OF THE COURSE OF STUDY within the system of studies

1.1. Field of study	Data Engineering
1.2. Mode of study	full-time studies
1.3. Level of study	1st cycle degree
1.4. Profile of study	general academic
1.5. Person/s preparing the course description	dr Janusz Krywult
1.6. Contact	krywult@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE course of study

2.1. Language of instruction	English
2.2. Prerequisites	basics of physics, algebra and calculus

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		lecture, laboratory
3.2. Place of classes		courses in the teaching rooms of UJK
3.3. Form of assessment		lecture - credit of grade laboratory - credit of grade
3.4. Teaching methods		lecture – informative lecture laboratory – practical classes
3.5. Bibliography	**Required reading**	1) Z. Fortuna, B. Maucker, J. Wąsowaski, Metody numeryczne, PWN 1999
	Further reading	1) G. Dahlquist, A. Bjorck, Metody numeryczne, PWN, 1983 2) I.W.H. Press, Numerical recipes in C, Cambridge University Press 2002

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. **Course objectives** ***(including form of classes)***

Lecture:

C1. Ability to unaided apply numerical methods to solve physical problems.
C2. Ability to select the best computational method for solving a specific problem.
C3. Increased competence in using basic numerical algorithms.

Laboratory:

C1. Acquisition of skills for the unaided implementation of a computational algorithm solving a given numerical problem.

4.2. Detailed syllabus ***(including form of classes)***

Lecture and laboratory:

Introduction to numerical errors. Finite and iterative methods for solving equations and systems of linear and nonlinear equations. Least squares nonparametric approximation of physical measurement data, algebraic and orthogonal polynomials. Function minimization methods. Fitting parameters of a mathematical model of physical phenomena to experimental data. Integration of ordinary and partial differential equations. Numerical solving of models of selected physical phenomena. Application of the Monte Carlo method in modeling physical processes.

4.3 Intended learning outcomes

Code	**A student, who passed the course**	**Relation to learning outcomes**
within the scope of **KNOWLEDGE:**		
W01	knows the basic methods and concepts of numerical analysis	ID1A_W01

		ID1A_W03 ID1A_W04
W02	gives equations and algorithms of numerical analysis	ID1A_W04 ID1A_W11
W03	knows the limits of applications of individual methods in solving computational problems	ID1A_W04 ID1A_W12
W04	knows the methods of numerical modelling of selected physical phenomena	ID1A_W04 ID1A_W12
within the scope of **ABILITIES:**		
U01	can perform numerical calculations and estimate the accuracy of the obtained results	ID1A_U01 ID1A_U02 ID1A_U05
U02	can select the optimal method for solving a specific computational problem	ID1A_U01 ID1A_U05 ID1A_U11
within the scope of **SOCIAL COMPETENCE:**		
K01	is aware of the engineer's role in providing society with competent information regarding computational methods and numerical modelling of physical phenomena	ID1A_K01 ID1A_K03

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	Method of assessment (+/-)							
	Test		Effort in class		Self-study		Group work	
	Form of classes		Form of classes		Form of classes		Form of classes	
	L	*C*	*L*	*C*	*L*	*C*	*L*	*C*
W01	+		+		+		+	
W02	+		+		+		+	
W03	+		+		+		+	
W04	+		+		+		+	
U01		+		+		+		+
U02		+		+		+		
K01				+				

4.5. Criteria of assessment of the intended learning outcomes

Form of classes	Grade	Criterion of assessment
lecture (L) (including e-learning)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points
classes (C)* (including e-learning)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	Student's workload	
	Full-time studies	Extramural studies
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER / CONTACT HOURS/	***30***	
Participation in lectures	15	

Participation in classes, seminars, laboratories	15	
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***20***	
Preparation for the lecture	6	
Preparation for the classes, seminars, laboratories	7	
Preparation for the exam/test	7	
TOTAL NUMBER OF HOURS	***50***	
ECTS credits for the course of study	**2**	

Accepted for execution *(date and legible signatures of the teachers running the course in the given academic year)*

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