

Faculty of Chemistry					
SUBJECT CARD					
Name of subject in Polish	Zaawansowane programowanie i metody numeryczne				
Name of subject in English	Advanced programming and numerical methods				
Main field of study (if applicable):	Biotechnology				
Specialization (if applicable):	Bioinformatics				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code					
Group of courses	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			45		
Number of hours of total student workload (CNPS)			90		
Form of crediting			crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points			3		
including number of ECTS points for practical (P) classes			3		
including number of ECTS points for direct teacher-student contact (BU) classes			2,1		
PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES					
1. Knowledge of basics of any programming language					
SUBJECT OBJECTIVES					
C1 Familiarizing students with good practices in programming					
C2 Teaching students the construction of algorithms					
C3 Familiarizing students with numerical recipes					
SUBJECT LEARNING OUTCOMES					
relating to knowledge:					
PEK_W01 Student is familiar with efficient code development					
PEK_W02 Student knows the common sorting algorithms					
PEK_W03 Student knows the basics of code optimization					
PEK_W04					
relating to skills:					
PEK_U01 Student is able to use a random number generator in Monte Carlo algorithms					
PEK_U02 Student is able to design and implement an algorithm for different sorting algorithms					
PEK_U03 Student is able to develop the code for numerical integration of Newton equations of motion					
PROGRAMME CONTENT					
Laboratory					Number of hours
Lab 1	Organization of course and conditions for passing the course. Programming environment.				3
Lab 2	Random number generators.				3
Lab 3	Numerical integration of functions.				3
Lab 4	Interpolation and extrapolation.				9
Lab 5	Numerical analysis of functions.				12

Lab 6	Monte Carlo methods.	12
Lab 7	End credit	3
	Total hours	45
TEACHING TOOLS USED		
N1. Multimedia presentation N2. Specialized computer software N3. Gamification		
EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
P1 (final assignment)	PEK_W01-PEK_W03 PEK_U01-PEK_U03	Final assignment (max 100 pts)
P (P1) 2,0, when (F1+F2) < 50% points 3,0, when (F1+F2) = 51-59% points 3,5, when (F1+F2) = 60-69% points 4,0, when (F1+F2) = 70-79% points 4,5, when (F1+F2) = 80-89% points 5,0, when (F1+F2) = 90-99% points 5,5, when (F1+F2) = 100% points		
PRIMARY AND SECONDARY LITERATURE		
<u>PRIMARY LITERATURE:</u> [1] “Numerical Recipes in C: The art of scientific computing” W. Press, S. Teukolsky, W. Vetterling, B. Flannery, Cambridge University Press, 1988-1992, ISBN 0521 431085		
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)		
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