

Faculty of Chemistry					
SUBJECT CARD					
Name of subject in Polish	Metody matematyczne w planowaniu i analizie eksperymentu				
Name of subject in English	Mathematical methods in design and analysis of the experiment				
Main field of study (if applicable):					
Specialization (if applicable):					
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	MAC024001				
Group of courses	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				
Number of hours of total student workload (CNPS)	30				
Form of crediting	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	1				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	0.5				
PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES					
1. Completion of Calculus I, Algebra I 2. Ability to use computer.					
SUBJECT OBJECTIVES					
C1 To understand application of statistical modeling in chemical experiment.					
C2 To learn application of numerical implementation of statistical and optimization methods in control of chemical process.					
C3 To understand mathematical apparatus of various problems related with design and analysis of the experiment.					
C4 To learn how to process experimental data using statistical using numerical packages.					
SUBJECT EDUCATIONAL EFFECTS					
Relating to knowledge					
PEK_W01 – is able to process experimental data and empirical observations and understand the role of statistical and mathematical methods in its description,					
PEK_W02 - is able to relate physical and chemical problem with appropriate mathematical problem and method to solve it					
PEK_W03 – has a scope of knowledge of mathematics and computer science to describe and interpret natural phenomena is able to process them using mathematical and statistical methods, is able to calculate a level of correlation between data and fit appropriate model, is able to solve set of linear, nonlinear and differential equations,					
PEK_W04 – using appropriate numerical method and numerical packages MATLAB, Excel and Origin is able to solve given mathematical problem with given accuracy					
Relating to competence skills					
PEK_K01 – understand the need of self-education using appropriate scientific and technical literature.					

PROGRAMME CONTENT		
Lectures		Number of hours
Le1	Solving sets of linear equations, matrix equations, inverse matrix, Gauss algorithm: case studies using MATLAB.	2
Le2	Solving sets of nonlinear equations, solution location, Newton-Raphson method: case study using MATLAB.	2
Le3	Solving sets differentials equations, Euler method, Verlet method, explicit and implicit scheme: case study using MATLAB	2
Le4	Linear regression – least squares method, correlation coefficient, sum of squares, error: case study using MATLAB and Excel	2
Le5	Nonlinear regression, linearization, normal equation, Gauss-Newton method: case study using MATAB and Excel.	2
Le6	Fitting model, chi-square test, Kolmogorov-Smirnov test, Grubb test: case study using Origin and MATLAB.	2
Le7	Statistical hypothesis testing, normal distribution, t-Student distribution, ANOVA: case study using Origin and Excel.	2
TEACHING TOOLS USED		
N1	Presentation.	
N2	Computer presentation.	
N3	Student’s self-study.	
N4	Consultation.	
EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-W04, PEK_K01	Test.
grade	2,0 if P < 25 pnt. 3,0 if P= 25,5– 28 pnt. 3,5 if P = 28,5 – 31 pnt. 4,0 if P = 31,5 – 34 pnt. 4,5 if P = 34,5- 37 pnt. 5,0 if P = 40 - 45 pnt. 5,5 if P = 45,5- 50 pnt.	
PRIMARY AND SECONDARY LITERATURE		
PRIMARY LITERATURE		
[1] Steven C. Chapra, Applied Numerical Methods with MATLAB: for Engineers and Scientists, McGrew 2012		
SECONDARY LITERATURE:		
Internet sources.		
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)		
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