FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

SUBJECT CARD

Name in English	**MATHEMATICAL ANALYSIS II**
Name in Polish	**ANALIZA MATEMATYCZNA II**
Main field of study (if applicable)	***Computer Science***
Specialization (if applicable):	
Level and form of studies:	**I level, full time**
Kind of subject:	**obligatory**
Subject code:	**MAT001687**
Group of courses:	**YES**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			
Number of hours of total student workload (CNPS)					
Form of crediting	exam	crediting with grade			
For group of courses mark (X) final course	X				
Number of ECTS points	5				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
Student must have basic knowledge in one-variable differential and integral calculus, confirmed by completing the *Mathematical Analysis I* course with a positive grade.

SUBJECT OBJECTIVES
C1 Provide training in basics of infinite series and power series theories. C2 Presentation of rudiments of multivariable differential calculus. C3 Exposition of basics of multiple integrals. C4 Introduction to the idea of the Laplace and Fourier transformations.

PRZEDMIOTOWE EFEKTY KSZTAŁCENIA
Relating to knowledge a student PEK_W1 knows basic convergence tests for infinite series, PEK_W2 knows rudiments of multivariable differential and integral calculus, PEK_W3 knows the notions of the Laplace and Fourier transformations. **Relating to skills a student** PEK_U1 is able to find power series representation of a function and knows how to use it for

approximations,
PEK_U2 can calculate and interpret partial derivatives, directional derivatives and gradients of multivariable functions, is able to find local and global extrema of two-variable functions,
PEK_U3 can calculate double integrals and apply double-integral calculus to solve engineering problems,
PEK_U4 can find the Laplace transforms of basic functions.

PROGRAM CONTENT		
Form of classes - lectures		**Hours**
Lec1	Improper integrals. Absolute and conditional convergence. Cauchy principal value.	2
Lec2	Infinite series. The basic tests for convergence and divergence. Absolute and conditional convergence. The alternating series test (Leibniz's theorem).	2
Lec3	Power series. The radius and interval of convergence. Cauchy-Hadamard theorem. Taylor series.	2
Lec4	Sets in the plane and in space. Functions of several variables. Graphs of typical two-variable functions. Surfaces of revolution and cylindrical surfaces.	2
Lec5	The partial derivative. Definition. Geometric interpretation. Higher order partial derivatives. Schwarz's Theorem.	2
Lec6	The tangent plane to the graph of two-variable function. Directional derivatives. Gradient of a function	2
Lec7	Local and global extrema of two-variable function. Necessary and sufficient conditions for the existence of minimum /maximum. Examples of extremal problems in geometry and engineering.	2
Lec8	Conditional extrema. Applications. Examples of optimization problems.	2
Lec9	Double integral, its definition and interpretation. Methods of calculation of double integrals over normal and regular regions.	2
Lec10	Properties of double integrals. Jacobian determinant. Change of variables in double integrals. Double integrals in polar coordinates.	2
Lec11	Applications of double integrals in geometry, physics and engineering.	2
Lec12	Introduction to theory of ordinary differential equations. Laplace transformation.	2
Lec13	Laplace inverse transformation and its applications in ordinary differential equations.	2
Lec14	Fourier transformation and its applications.	4
	Total hours	**30**
Form of classes - classes		**Hours**
Cl1	Improper integrals.	1
Cl2	Infinite series.	1
Cl3	Power series.	1
Cl4	Functions of two variables.	1
Cl5	Partial derivatives.	1
Cl6	Gradient of a function. Tangent planes.	1
Cl7	Local and global minima and maxima.	1
Cl8	Conditional extrema.	1
Cl9	Double integrals.	1
Cl10	Double integrals in polar coordinates.	1
Cl11	Applications of double integrals.	1
Cl12	Integral transforms.	2
Cl13	Test.	2
	Total hours	**15**

TEACHING TOOLS USED
N1 Lectures – traditional or using multimedia tools. N2 Classes - traditional method (problems sessions and discussion). N3 Student's self-study with the assistance of mathematical packages.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F-forming; P - concluding)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U1- PEK_U4	tests, oral presentations, quizzes
F2	PEK_W1-PEK_W3	exam
P – rules set by the lecturer		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] F. Leja, Rachunek Różniczkowy i Całkowy, Wydawnictwo Naukowe PWN, 2012

[2] R. Leitner, Zarys Matematyki Wyższej dla Studiów Technicznych, Cz. 1-2, WNT, Warszawa, 2006.

[3] M. Gewert, Z. Skoczylas, Analiza Matematyczna 2. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław, 2016

SECONDARY LITERATURE

[1] W. Krysicki, L. Włodarski, Analiza Matematyczna w Zadaniach, Cz. II, PWN, Warszawa, 2006

[2] G. M. Fichtenholz, Rachunek Różniczkowy i Całkowy, T. I - II, PWN, Warszawa, 2007

[3] M. Gewert, Z. Skoczylas, Analiza Matematyczna 2. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław, 2016

SUBJECT SUPERVISORS
Wydziałowa Komisja Programowa ds. Kursów Ogólnouczelnianych doc. dr Zbigniew Skoczylas (Zbigniew.Skoczylas@pwr.edu.pl)

CORRELATION MATRIX BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

MATHEMATICAL ANALYSIS 2.4 A MAT001687

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY ***Computer Science***

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W1	K1INF_W01	C1	Lec2, Lec3, Cl2, Cl3	N1- N3
PEK_W2	K1INF_W01	C2, C3	Lec4-Lec12, Cl4-Cl11	N1- N3
PEK_W3	K1INF_W01	C4	Lec13, Lec14, Cl12	N1- N3
PEK_U1	K1INF_W01	C1	Lec3, Cl3	N1- N3
PEK_U2	K1INF_W01	C2	Lec5-Lec8, Cl5-Cl8	N1- N3
PEK_U3	K1INF_W01	C3	Lec9-Lec11, Cl9-Cl11	N1- N3
PEK_U4	K1INF_W01	C4	Lec12, Lec13, Cl12	N1- N3