

FACULTY \*\*\*\*\*

SUBJECT CARD

Name in English:

**MATHEMATICAL ANALYSIS II**

Name in Polish:

**ANALIZA MATEMATYCZNA II**

Main field of study (if applicable):

Specialization (if applicable):

Level and form of studies:

**I level, full time**

Kind of subject:

**obligatory**

Subject code:

**MAT001499**

Group of courses:

**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	120	90			
Form of crediting	exam	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	4	2			
including number of ECTS points for practical (P) classes	0	2			
including number of ECTS points for direct teacher-student contact (BK) classes	2,4	1,2			

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

Student must complete Mathematical Analysis I with a passing grade.

**SUBJECT OBJECTIVES**

- C1. Understanding the basic methods of analysis of the graph of functions of several variables.
- C2. Understanding the concept of the definite integral of a function of two and three variables.
- C3. Understanding the practical applications of mathematical methods for the analysis of functions of several variable.
- C4. Understanding the notion of infinite series and basic convergence tests.

## SUBJECT EDUCATIONAL EFFECTS

### Relating to knowledge student:

PEK\_W1 knows basic definitions and theorems from Mathematical Analysis of functions of several variables

PEK\_W2 knows the notion of partial derivatives and the definite integral of a function of two or three variables and their basic applications

PEK\_W3 knows the notion of infinite series and basic convergence tests

### Relating to skills student:

PEK\_U1 can calculate partial derivatives of a function of several variables

PEK\_U2 can calculate double and triple integrals

PEK\_U3 can decide whether an infinite series is convergent or divergent

### Relating to social competences student:

PEK\_K1 understands how calculus affects on the development of technical civilization

## PROGRAM CONTENT

<b>Form of classes - lectures</b>		<b>Hours</b>
Wy1	The definite integral and its area interpretation. The Fundamental Theorem of Calculus.	2
Wy2	Applications of Integration: Average value of a function, Areas, Arc length, Volume of a solid.	2
Wy3	Improper integrals of type I and II. Comparison and Limit Comparison test.	2
Wy4	Functions of several variables. Cross-sections and contour lines. Graphs of typical functions of two variables.	2
Wy5	Limits and continuity. Algebra of limits and continuous functions.	2
Wy6	The partial derivative. Interpretation of partial derivatives. Higher order partial derivatives. Schwarz's Theorem	2
Wy7	The first-order differential and differentiability of a function. The gradient vector.	2
Wy8	Local and global extrema. The closed and bounded region method. Optimization problems.	2
Wy9	The definite integral of a function of two variables. Iterated integrals	2
Wy10	Double integrals over normal and regular regions. Double integrals in polar coordinates.	2
Wy11	Applications of double integrals	2
Wy12	Triple integrals. Iterated integrals.	2
Wy13	Triple integrals in cylindrical and spherical coordinates	2
Wy14	Infinite series. The partial sums. Convergence and divergence tests	2
Wy15	Power series. Representations of functions as power series.	2
	<b>Total hours</b>	<b>30</b>
<b>Form of classes - classes</b>		<b>Hours</b>
Cw1	Definite integrals - interpretation and applications.	4
Cw2	Improper integrals.	2
Cw3	Functions of several variables. Continuity.	4
Cw4	Partial derivatives and differentiability of a function of several variables.	3
Cw5	Local and global extrema.	2
Cw6	Double integrals over normal and regular regions. Double integrals in polar coordinates.	5
Cw7	Triple integrals. Triple integrals in cylindrical and spherical coordinates.	4
Cw8	Infinite series.	2
Cw9	Power series.	2
Cw10	Test.	2
	<b>Total hours</b>	<b>30</b>

### TEACHING TOOLS USED

- N1. Lecture - traditional method
- N2. Classes - traditional method
- N3. Student's self work 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
F-Cw	PEK_U1, PEK_U2, PEK_U3, PEK_K1	quizzes, in class presentations
P-W	PEK_W1, PEK_W2, PEK_W3	exam

### PRIMARY AND SECONDARY LITERATURE

#### **PRIMARY LITERATURE:**

- [1] W.G. McCallum et al., Multivariable calculus, John Wiley & Sons, Inc.1997G. M. Fichtenholz, Rachunek Różniczkowy i Całkowy, T. I - II, PWN, Warszawa 2007
- [2] F. Leja, Rachunek Różniczkowy i Całkowy, Wydawnictwo Naukowe PWN, 2012
- [3] W. Krysicki, L. Włodarski, Analiza Matematyczna w Zadaniach, Cz. I, PWN, Warszawa 2006

#### **SECONDARY LITERATURE:**

- [1] K. Kuratowski, Rachunek Różniczkowy i Całkowy. Funkcje Jednej Zmiennej, Wydawnictwo Naukowe PWN, 2012
- [2] M. Gewert, Z. Skoczylas, Analiza Matematyczna 2. Przykłady i Zadania, Oficyna Wydawnicza GiS, Wrocław 2011

### SUBJECT SUPERVISORS

Wydziałowa Komisja Programowa ds. Kursów Ogólnouczelnianych  
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**CORRELATION MATRIX BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
MATHEMATICAL ANALYSIS MAT001499  
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY .....  
AND SPECIALIZATION .....**

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		C1 C2 C3	Wy1 Wy2 Wy3 Wy4 Wy5 Wy6 Wy7 Wy8 Wy9 Wy10 Wy11 Wy12 Wy13 Wy14 Wy15 Cw1 Cw2 Cw3 Cw4 Cw5 Cw6 Cw7 Cw8 Cw9 Cw10	N1, N2, N3
PEK_W2		C2 C3	Wy11 Wy12 Wy13 Wy14 Wy15 Cw4 Cw5 Cw6 Cw7	N1, N2, N3
PEK_W3		C4	Wy14 Wy15 Cw8 Cw9	N1, N2, N3
PEK_U1		C1	Wy6 Wy7 Wy8 Wy9 Cw3 Cw4 Cw5	N1, N2, N3
PEK_U2		C1 C2 C3	Wy10 Wy11 Wy12 Wy13 Cw6 Cw7	N1, N2, N3
PEK_U3		C4	Wy14 Wy15 Cw8 Cw9	N1, N2, N3
PEK_K1		C1 C2 C3 C4	Wy1 Wy2 Wy3 Wy4 Wy5 Wy6 Wy7 Wy8 Wy9 Wy10 Wy11 Wy12 Wy13 Wy14 Wy15 Cw1 Cw2 Cw3 Cw4 Cw5 Cw6 Cw7 Cw8 Cw9 Cw10	N1, N2, N3