

FACULTY OF MECHANICAL ENGINEERING	
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	MAT001649
Group of courses	NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15	15			
Number of hours of total student workload (CNPS)					
Form of crediting	exam	crediting with grade			
For a group of courses mark the final course (X)					
Number of ECTS points	2	2			
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
Knowledge of differential calculus and integration for functions of one variable.

SUBJECT OBJECTIVES
C1 Exposition of basic notions and laws of multivariable differential calculus and its applications. C2 Exposition of basic notions and laws for double integrals and their applications in geometry. C3 Exposition of basic notions and laws concerning improper integrals. Exposition of the basic criteria for convergence of numerical series and properties of power series.

SUBJECT EDUCATIONAL EFFECTS
Relating to knowledge a student: PEK_W1 knows rudiments of multivariable differential calculus, PEK_W2 has basic knowledge of double integrals and knows their applications, PEK_W3 has basic knowledge of improper integrals of type I and numerical and function series.
Relating to skills a student: PEK_U1 can compute partial derivatives, the gradient and directional derivatives of multivariate functions and use them to find local extrema of multivariate functions, PEK_U2 can calculate integrals of functions of two variables and apply integral calculus geometry and physics, PEK_U3 can verify convergence of improper integrals of type I and numerical and function series and can construct power series approximating given functions of one variable.

Relating to social competences a student:

PEK_K01 understands the need of systematic and independent work on mastery of the course material.

PROGRAMME CONTENT		
Form of classes - lecture		Hours
Lec1	Functions of several variables. The domain of a function of two variables. Graphs of typical functions of two variables. The partial derivative. The plane tangent to the graph of a function of two variables. The differential of multivariate function and its applications.	2
Lec2	Directional derivatives. Gradient of a function. Higher order partial derivatives.	2
Lec3	Local and global extrema. Sufficient conditions for the existence of the extreme.	2
Lec4	The definite integral of a function of two variables. Geometric interpretation. Double integrals over normal and regular regions.	2
Lec5	Change of variables in double integrals. Double integrals in polar coordinates. Applications of double integrals in geometry.	2
Lec6	Improper integrals of type I. Comparison and limit comparison test.	1
Lec7	Infinite numerical series. The basic criteria for convergence of series. Absolute convergence.	2
Lec8	Power series. Taylor and Maclaurin series.	2
Total hours		15
Form of classes – classes		Hours
C11	Partial derivatives. The plane tangent to the graph of a function of two variables. Applications of the differential of multivariate function.	2
C12	Directional derivatives. Gradient. Higher order partial derivatives.	2
C13	Local and global extrema.	1
C14	Calculation of double integrals over normal regions.	2
C15	Double integrals in polar coordinates. Applications of double integrals in geometry.	2
C16	Improper integrals of type I.	1
C17	Infinite numerical series.	2
C18	Power series.	2
C19	Test.	1
Total hours		15

TEACHING TOOLS USED

N1. Lecture - traditional method.

N2. Classes - traditional method (problems sessions and discussion).

N3. Student's self-study with the assistance of mathematical packages.

N4. Tutorial.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F-forming; P - concluding)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U1-PEK_U3, PEK_K1	tests, oral presentations, quizzes
F2	PEK_W1-PEK_W3	exam
P - rules set by the lecturer		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] W.G. McCallum et al., Multivariable calculus, John Wiley & Sons, Inc.1997G.
- [2] M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2016.
- [3] F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 2012.
- [4] W. Żakowski, W.Kołodziej, Matematyka, cz. II, WNT, Warszawa 2014.

SECONDARY LITERATURE:

- [1] M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Przykłady i zadania, Oficyna a. Wydawnicza GiS, Wrocław 2016.
- [2] W. Krywicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. II, PWN, Warszawa 2006.
- [3] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2, WNT, Warszawa 2006.

SUBJECT SUPERVISORS

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CORRELATION MATRIX BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **MATHEMATICAL ANALYSIS II MAT001649** 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	Lec1-Lec3	N1-N4
PEK_W2		C2	Lec4-Lec5	N1-N4
PEK_W3		C3	Lec6-Lec8	N1-N4
PEK_U1		C1	C11-C13	N1-N4
PEK_U2		C2	C14-C15	N1-N4
PEK_U3		C3	C16-C18	N1-N4
PEK_K1		C1-C3	Lec1-Lec8, C11-C19	N1-N4