

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Analiza matematyczna 1.1 A**  
 Name in English: **Mathematical Analysis 1.1 A**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **obligatory / university-wide**  
 Subject code: **MAT001416**  
 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):	150	90			
Form of crediting:	examination	crediting with grade			
For group of courses mark (X) final course:					
Number of ECTS points:	5	3			
including number of ECTS points for practical (P) classes :		3			
including number of ECTS points for direct teacher-student contact (BK) classes:	3.50	2.10			

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

1. It is recommended that the knowledge of mathematics is equivalent to secondary school certificate at the advanced level.

**SUBJECT OBJECTIVES**

- C1. Knowledge of basic classes of elementary functions.  
 C2. Understanding the basic methods of analysis of the graph of functions of one variable.  
 C3. Understanding the concept of definite integral and its basic properties and methods of determination  
 C4. Understanding the practical applications of mathematical methods for the analysis of functions of one variable.

**SUBJECT EDUCATIONAL EFFECTS***relating to knowledge:*

- PEK\_W01 Knows the basic classes of elementary functions.  
 PEK\_W02 Knows the basic definitions and theorem from Mathematical Analysis of functions of one variable.  
 PEK\_W03 Knows the notion of definite integral and its basic applications.

*relating to skills:*

- PEK\_U01 Can solve equations and inequalities in the class of simple functions.  
 PEK\_U02 Can calculate limits of sequences.  
 PEK\_U03 Can examine graphs of simple functions, can calculate integrals of simple functions.

*relating to social competences:*

- PEK\_K01 Understand how differential calculus affects on the development of technical civilization

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Mathematical notations (logical connectives, quantifiers), elements of set theory, real numbers, subsets of real numbers (intervals, half-lines). Linear and quadratic functions.	2
Lec 2	Basic properties of functions (injective and monotonic functions). Composition of functions. The inverse function. Power and exponential functions, and opposite to them. Properties of logarithms.	2
Lec 3	Knows the notion of definite integral and its basic applications.	2
Lec 4	Sequences and limits. Basic formulas and theorems. Number e. Improper limits.	2
Lec 5	The limit of a function in a point. Directional limits of function. Asymptotics of function.	2
Lec 6	Continuity of a function in a point and on the interval. Basic properties of continuous functions. Approximate solutions of equations. Points of discontinuity.	2
Lec 7	The definition of derivative. Basic formulas and theorems. Geometric and physics interpretations. Mean value theorem. De L'Hospital rule.	2
Lec 8	Extreme values, monotonicity. Higher order derivatives. Convexity of function.	2
Lec 9	Examination of the graph of a function.	2
Lec 10	Taylor formula. Approximation of function. Applications.	2
Lec 11	Definite integral. Simple examples. Connection between integral and derivative (Fundamental Theorem of Calculus). Simple examples	2
Lec 12	Indefinite integral: basic formulas. Areas of simple figures.	2
Lec 13	The basic methods of calculus of integrals: integration by parts and by substitution.	2
Lec 14	The basic methods of calculus of integrals: simple rational functions. Area and perimeter of a circle. The volume of rotary figures.	2
Lec 15	Application of methods of mathematical analysis of one variable functions.	2
Total hours:		30

Form of classes - class		Number of hours:
Cl 1	Tautologies, de Morgan laws, union, intersection and complement of set.	2
Cl 2	Natural numbers, integers, rational and real numbers. Logarithm.	2
Cl 3	Graphs of simple functions. Inverse function. Composition of functions.	2
Cl 4	Trigonometric functions and trigonometric identities.	2
Cl 5	Limit of sequences.	2
Cl 6	The limit of a function in point.	2
Cl 7	Continuous functions	2
Cl 8	Points of discontinuity. Solutions of equations.	2
Cl 9	Derivatives. Tangent line to a graph of a function.	2
Cl 10	Examination of graphs of functions - I	2
Cl 11	Examination of graphs of functions - II	2
Cl 12	Taylor formula. De L'Hospital rule	2
Cl 13	Integration - I	2
Cl 14	Integration - II	2
Cl 15	Integration - applications	2
Total hours:		30

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 <i>F – forming (during semester)</i> <i>P – concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(W)	PEK_W01 PEK_W02 PEK_W03	Exam
P(W)	P=F1	
F1(C)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Colloquium
P(C)	P=F1	

## PRIMARY AND SECONDARY LITERATURE

### PRIMARY LITERATURE:

- A1. F. Leja, Rachunek Różniczkowy i Całkowy, Wydawnictwo Naukowe PWN, 2012  
 A2. W. Krywicki, L. Włodarski, Analiza Matematyczna w Zadaniach, Cz. I, PWN, Warszawa 2006

### SECONDARY LITERATURE:

- B1. K. Kuratowski, Rachunek Różniczkowy i Całkowy. Funkcje Jednej Zmiennej, Wydawnictwo Naukowe PWN, 2012  
 B2. G. M. Fichtenholz, Rachunek Różniczkowy i Całkowy, T. I-II, PWN, Warszawa 2007  
 B3. M. Gewert, Z. Skoczylas, Analiza Matematyczna 1. Przykłady i Zadania, Oficyna Wydawnicza GiS, Wrocław 2011

## SUBJECT SUPERVISOR

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### MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **MAT001416 - Mathematical Analysis 1.1 A** AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**

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_W01	K1ETK_W02	C.1	Lec1 Lec2 Lec3	N.1 N.3
PEK_W02	K1ETK_W02	C.2 C.4	Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10	N.1 N.3
PEK_W03	K1ETK_W02	C.3 C.4	Lec11 Lec12 Lec13 Lec14	N.1 N.3
PEK_U01	K1ETK_U02	C.1	CI1 CI2 CI3 CI4	N.2 N.3
PEK_U02	K1ETK_U02	C.1 C.2 C.3	CI5 CI6	N.2 N.3
PEK_U03	K1ETK_U02	C.2 C.3 C.4	CI9 CI10 CI11 CI12 CI13 CI14 CI15	N.2 N.3
PEK_K01	K1ETK_K05 K1ETK_K07	C.1 C.2 C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 CI1 CI2 CI3 CI4 CI5 CI6 CI7 CI8 CI9 CI10 CI11 CI12 CI13 CI14 CI15	N.1 N.2 N.3