FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

SUBJECT CARD

Name in English	**MATHEMATICAL ANALYSIS I**
Name in Polish	**ANALIZA MATEMATYCZNA I**
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	**MAT001689**
Group of courses	**YES**

	Lecture	Exercise class	Laboratory	Project	Seminar
Number of hours of organized University classes (ZZU)	30	30			
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)	X				
Number of ECTS points	6				
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 mathematics equivalent to high school certificate at the advanced level is recommended.

SUBJECT OBJECTIVES
C1 Provide training in basic elementary functions and their properties.
C2 Provide training in basic differential calculus of one-variable functions.
C3 Introduction to the concept of definite integral, its basic properties and methods of calculation.
C4 Presentation of practical applications of differential and integral calculus of one-variable functions.

SUBJECT EDUCATIONAL EFFECTS
Relating to knowledge a student:
PEK_W1 knows graphs and properties of basic elementary functions,
PEK_W2 knows basic notions and theorems of differential calculus for one-variable functions,
PEK_W3 knows the concept of definite integral, its properties and basic applications.
Relating to skills a student:
PEK_U1 can solve typical equations and inequalities with elementary functions,

PEK_U2 can examine a function and draw its graph, PEK_U3 can evaluate typical indefinite integrals and calculate definite integrals, PEK_U4 can apply differential and integral calculus to solve practical problems.

PROGRAMME CONTENT		
Form of classes - lecture		**Hours**
Lec1	Definition of a function. Basic examples: linear, quadratic and polynomial functions. Rational functions. Composition of functions. Transformations of graphs of functions.	3
Lec2	Injective functions. The inverse function and its graph. Power and exponential functions and their inverses. Properties of logarithms.	2
Lec3	Trigonometric functions. Unit (trigonometric) circle. Inverse trigonometric functions.	2
Lec4	Sequences of real numbers. Finite and infinite limit of a sequence. Basic theorems on limits of sequences. Indeterminate expressions. The number *e*.	3
Lec5	The limit of a function at a point and the limit at infinity. Examples of the limits of certain indeterminate expressions. Asymptotes.	2
Lec6	Continuity of a function at a point and on an interval. Basic properties of continuous functions. Approximate solutions of equations.	2
Lec7	The derivative of a function. Geometrical and physical interpretations of the derivative. Tangent line. Differential of a function. Derivatives of basic elementary functions. Differentiation rules.	2
Lec8	Lagrange's theorem. Intervals of monotonicity of a function. De l'Hospital's rule.	2
Lec9	Local and global extrema. Examples of optimization problems.	2
Lec10	Definition and basic properties of indefinite integral. Basic rules. The substitution rule and integration by parts.	2
Lec11	Definition and basic properties of definite integral. Fundamental theorem of calculus (Newton-Leibniz theorem).	2
Lec12	Applications of integral calculus (average value of a function, area of a flat region, volumes of solids of revolution, arc length etc.)	2
Lec13	Integration of rational and trigonometric functions.	2
Lec14	Examples of applications of mathematical analysis methods for one-variable functions (e.g. Taylor's theorem, convexity and inflection points of a function, or other applications typical for the field of study).	2
	Total hours	**30**
Form of classes – classes		**Hours**
Cl1	Elements of mathematical logic (logical connectives, quantifiers). Determination of the function domain. Even and odd functions.	2
Cl2	Composition of functions. Transformations of graphs of functions. Polynomial and rational equations and inequalities.	2
Cl3	The inverse function. Typical equations and inequalities with exponential and logarithmic functions.	2
Cl4	Trigonometric and inverse trigonometric functions. Unit (trigonometric) circle. Typical trigonometric equations and inequalities.	2
Cl5	Monotonicity and boundedness of sequences. Computing proper and improper limits of sequences.	2
Cl6	Limits of functions. Asymptotes.	2
Cl7	Continuity of a function. Approximate solutions of equations.	2
Cl8	Derivative of a function. Rules of differentiation. Tangent line. Differentials and their applications.	2
Cl9	De l'Hospital's rule. Intervals of monotonicity of a function.	2

Cl10	Determining local and global extrema of a function.	2
Cl11	Evaluation of indefinite integrals of elementary functions. Integration by parts and by substitution.	2
Cl12	Calculating definite integrals. Area of a flat region as an application of definite integral.	2
Cl13	Applications of definite integral.	2
Cl14	Integration of rational and trigonometric functions.	2
Cl15	Test.	2
	Total hours	**30**

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. N4 Tutorial.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F - forming; P - concluding)	Educational effect number	Way of evaluating educational effect achievement
F-Cl	PEK_U1-PEK_U4, PEK_K1	tests, oral presentations, quizzes
F-Lec	PEK_W1-PEK_W3	exam
P - rules set by the lecturer		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] G. Decewicz, W. Żakowski, Matematyka, Cz.1, WNT, Warszawa 2007.
[2] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław, 2015.
[3] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław, 2015.
[4] W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I, PWN, Warszawa, 2006.

SECONDARY LITERATURE:

[1] F. Leja, Rachunek różniczkowy i całkowy, PWN, 2012.
[2] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, cz.1-2, WNT, Warszawa, 2006.
[3] M. Zakrzewski, Markowe wykłady z matematyki. Analiza, Oficyna Wydawnicza GiS, Wrocław, 2013.

SUBJECT SUPERVISORS

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CORRELATION MATRIX BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

MATHEMATICAL ANALYSIS I MAT1689

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	Lec1-Lec6	N1-N4
PEK_W2	K1INF_W01	C2	Lec7-Lec9, Lec14	N1-N4
PEK_W3	K1INF_W01	C3	Lec10-Lec13	N1-N4
PEK_U1	K1INF_W01	C1	Lec1-Lec3, Cl1-Cl4	N1-N4
PEK_U2	K1INF_W01	C1	Lec5-Lec9, Cl5-Cl10	N1-N4
PEK_U3	K1INF_W01	C3	Lec10, Lec11, Lec13, Cl11, Cl12, Cl14	N1-N4
PEK_U4	K1INF_W01	C2, C4	Lec7, Lec12, Lec14, Cl8-Cl10, Cl12, Cl13	N1-N4