FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

SUBJECT CARD

Title in Polish: Matematyka
Title in English: Mathematics 1 for Economists
Main field of study (if applicable): Management
Specialization (if applicable): Organizational Management
Level and form of studies: first level, full-time
Type of subject: obligatory
Subject code: MAT1448
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)	**270**				
Form of crediting	**Examination**				
For a group of courses mark the final course (X)	**X**				
Number of ECTS points	**9**				
including number of ECTS points for practical (P) classes	**4**				
including number of ECTS points for direct teacher-student contact (BK) classes	**2,0**				

*delete as applicable

 PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. High school graduation at basic level.

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SUBJECT OBJECTIVES
C1. Acquiring basic knowledge related to solving equations and inequalities involving elementary functions such as polynomials and rational functions, exponential and logarithmic functions.
C2. Study of the basic concepts of algebra with the purpose of solving systems of linear equations.
C3. Learning the basic concepts, theorems, methods and applications of calculus of functions of one and two variables .
C4. Constructing mathematical models with the aim of applications in economy and technology.

SUBJECT EDUCATIONAL EFFECTS
Relating to knowledge, the student:
PEK_W01 possesses basic knowledge essential for solving equations and inequalities
　　　　involving absolute value, polynomials, and rational, exponential and logarithmic
　　　　functions
PEK_W02 possesses elementary knowledge essential for solving systems of linear equations
PEK_W03 knows basic properties of elementary functions and basics of differential calculus
　　　　and integral calculus of function of one variable
PEK_W04 possesses basic knowledge of calculus of functions of two variables.

Relating to skills, the student:

PEK_U01 is capable of solving equations and inequalities involving absolute value, polynomials, and rational, exponential and logarithmic functions

PEK_U02 is capable of solving systems of linear equations

PEK_U03 can calculate limits of sequences and functions, can determine asymptotes of functions, can calculate derivatives of functions and interpret calculation results, can calculate and interpret indefinite and definite integrals

PEK_U04 is capable of finding extrema of functions of two variables.

Relating to social competences, the student:

PEK_K01 can, without assistance, search for necessary information in the literature

PEK_K02 understands the need for systematic and independent work on mastery of course material.

PROGRAMME CONTENT

Form of classes - lecture	Number of hours
Lec 1 Absolute value; equations and inequalities. Geometric interpretation. Economy based examples.	2
Lec 2 Polynomials and rational functions; equations and inequalities. Graphical interpretation.	2
Lec 3 Exponential and logarithmic functions. Natural logarithm. Graphs of functions. Simplifying algebraic expressions involving exponentials and logarithms. Economy based examples.	2
Lec 4 Systems of linear equations. Gaussian elimination method.	4
Lec 5 Limits of sequences, basic properties of limits. Applications of a geometric sequence and arithmetic sequence in economy.	2
Lec 6 Limit of a function. Continuity. Asymptotes. Examples of applications in economy.	2
Lec 7 The derivative of a function; geometric and physical interpretation. Rules of differentiation. Chain rule. Higher order derivatives. Applications in economy.	2
Lec 8 Intervals of monotonicity of a function. Local and global extrema. Intervals of convexity and concavity. Study of graphs of functions.	4
Lec 9 Indefinite integral, definition and basic properties. Indefinite integral of certain classes of functions, including polynomials and exponential functions. Integration by parts and by substitution.	2
Lec 10 Definite integral; definition and basic properties. Geometric interpretation. Connection between definite and indefinite integral.	2
Lec 11 Applications of integral calculus. Area of a flat region.	2
Lec 12 Functions of two or more variables. Partial derivatives;geometrical interpretation. Partial derivatives of composite functions. Local extrema of functions of two variables. Applications in economy.	4
Total hours	30
Form of classes – Exercise class	**Number**

		of hours
Ex 1	Absolute value: solving equations and inequalities.	2
Ex 2	Decomposition of a polynomial into irreducible components. Solving polynomial and rational (functions) equations and inequalities.	2
Ex 3	Equations and inequalities with exponential and logarithmic functions.	2
Ex 4	Finding inverse matrices. Solving systems of linear equations using matricial methods.	4
Ex 5	Computing proper and improper limits of sequences.	2
Ex 6	Computing proper and improper limits of functions. Asymptotes. Verifying continuity of functions.	2
Ex 7	Computing derivatives of various functions using rules of differentiation. Tangent line to the graph.	2
Ex 8	Determining local and global extrema of a function. Examination of a function.	4
Ex 9	Indefinite integral of elementary functions, including polynomials and exponentials. Integration by parts and by substitution.	2
Ex 10	Calculating definite integrals. Area of a flat region as an application of definite integral.	2
Ex 11	Calculating partial derivatives. Finding local and global extrema of functions of two variables.	2
Ex 12	Tests	2
	Total hours	30

TEACHING TOOLS USED
N1. Lecture – traditional method N2. Exercise class – traditional method (problems sessions and discussion) N3. Office hours N4. Student's individual work – preparation for the classes

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation F – forming (during semester), P – final (end of semester)	Educational effect number	Way of evaluating educational effect achievement
F - Ex	PEK_U01-PEK_U04 PEK_K01-PEK_K02	oral presentations, quizzes, tests
F - Lec	PEK_W01-PEK_W04 PEK_K02	Exam
P	PEK_U01-PEK_U04 PEK_W01-PEK_W04 PEK_K01-PEK_K02	Rules set by the lecturer

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] F. Ayres, E. Mendelson: Calculus, 5th edition, McGraw Hill, 2009.

[2] T. Bednarski, Elementy matematyki w naukach ekonomicznych, Oficyna Ekonomiczna, Kraków 2004.

[3] J. Banaś, Podstawy matematyki dla ekonomistów, WNT, Warszawa 2005.

[4] M. Zakrzewski, Markowe wykłady z matematyki. Analiza. Oficyna Wydawnicza GiS, Wrocław 2013.

[5] T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2007.

[6] T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2007.

[7] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2007.

[8] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2007.

[9] Mike Rosser, Basic mathematics for economists, Second edition, Routledge, 2003.

SECONDARY LITERATURE:

[1] A. C. Chiang, Podstawy ekonomii matematycznej, PWE, Warszawa 1994.

[2] M. Dobija, W. Smaga, Podstawy matematyki finansowej i ubezpieczeniowej, PWN, Warszawa-Kraków 1995.

[3] A. Ostoja-Ostaszewski, Matematyka w ekonomii-modele i metody 1. Elementarny rachunek różniczkowy, PWN, Warszawa 1996.

[4] A. Ostoja-Ostaszewski, Matematyka w ekonomii-modele i metody 1. Algebra elementarna, PWN, Warszawa 1996

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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Wydziałowa komisja programowa ds. kursów ogólnouczelnianych

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
MATHEMATICS
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Management**
AND SPECIALIZATION **Organizational Management**

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 (knowledge)		C1	Lec 1-Lec 3	N1,N3,N4
PEK_W02		C2	Lec 4	N1,N3,N4
PEK_W03		C3	Lec 5- Lec 11	N1,N3,N4
PEK_W04		C3	Lec 12	N1,N2,N3

PEK_U01 **(skills)**		C1, C4	Ex1-Ex 3	N2,N3,N4
PEK_U02		C2, C4	Ex 4	N2,N3,N4
PEK_U03		C3, C4	Ex 5 – Ex 10	N2,N3,N4
PEK_U04		C3, C4	Ex 11	N2,N3,N4
PEK_K01- **PEK_K02** **(competences)**		C1-C4	Lec1 – Lec12 Ex 1- Ex 11	N1-N4

** - enter symbols for main-field-of-study/specialization educational effects
*** - from the above table