

Subject card

Subject name and code	Mathematics for Economics, PG_00156070						
Field of study	Management						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		6.0		
Learning profile	academic		Assessment form				
Conducting unit	Department of Econometrics -> Faculty of Management -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Lech Kujawski				
	Teachers		mgr Katarzyna Raca mgr Agata Majkowska dr Lech Kujawski mgr Tomasz Jastrzębski mgr Karolina Diakowska dr hab. Beata Jackowska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		16.0		74.0	150
Subject objectives	Equalizing the level of students' knowledge and then developing their understanding of mathematical methods necessary for further education. Gaining knowledge of the applications of mathematical methods in economics. Learning the principles of calculating capital value over time and applying them to: • Determining the value of capital at any given moment, • Updating a sequence of payments to any chosen moment, • Preparing debt repayment schedules.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[ZARZL3_U05] The student can correctly select and apply advanced methods and tools used in management and quality sciences.	Understands the applications of sequences in economic sciences.	[SU4] test/exam - oral or written
	[ZARZL3_K05] The student is ready to correctly evaluate phenomena and clearly justify his position through rational, logical and entrepreneurial use of knowledge - basing his assertions and decisions on the analysis of received information.	Understands the concept of a function and its limit, and is able to apply limits of functions in economic sciences.	[SK4] test/exam - oral or written
	[ZARZL3_U06] The student is able to forecast and simulate selected economic and social phenomena in relation to macro (economy), as well as micro (enterprise) scale using methods and tools applied in management and quality sciences.	Knows what a difference quotient is, understands the concept of its limit, and is able to interpret it economically.	[SU4] test/exam - oral or written
	[ZARZL3_W13] The student knows advanced methods and techniques of managerial analysis to support the process of economic decision-making, and is familiar with sources of data and information from various fields of social sciences, especially management and quality sciences.	Is able to independently perform operations on matrices.	[SW4] test/exam - oral or written
	[ZARZL3_K01] The student is aware of the depreciation of knowledge over time and understands the need for lifelong learning and deepening of knowledge in both academic and non-academic modes.	Is able to independently formulate and solve systems of equations.	[SK4] test/exam - oral or written
	[ZARZL3_K02] The student is aware of the need to supplement and expand the acquired knowledge and skills and strives to combine knowledge from different fields and disciplines of science interdisciplinarily.	Understands the concept of a derivative of a function and is able to use it to analyze the monotonicity of functions.	[SK4] test/exam - oral or written

Subject contents	Heres the translation: Elements of Linear Algebra Matrices: concept of a matrix, types of matrices, operations on matrices and their properties, determinant of a square matrix and its properties, elementary operations on a matrix, finding the inverse matrix. Examples of applications of matrices in economic problems. Systems of linear equations: matrix form of a system of linear equations, solving systems of linear equations. Examples of linear systems in economic problems. Elements of Mathematical Analysis Number sequences: arithmetic and geometric sequences, limits of sequences, convergent and divergent sequences, sequences converging to the number e. Functions of a single variable: examples of functional relationships in economics, limits of functions. Differential calculus of functions of a single variable: difference quotient, derivative of a function at a point, geometric interpretation of the derivative, properties of the derivative, higher-order derivatives, monotonicity of functions and the sign of the derivative, necessary and sufficient conditions for the existence of local extrema, maximum and minimum values of a function. Examples of applications of differential calculus in economics. Financial Mathematics Simple interest: updating the value of capital, average interest rate, calculations involving percentages, simple actual discount, simple trade (bank) discount. Compound interest: updating the value of capital, equivalence of capitals, equivalence of interest conditions, nominal interest rate, effective interest rate, interest intensity, average interest rate, compound actual discount, compound trade discount, condition for equivalence of interest rate and discount rate. The impact of inflation on the purchasing power of capital: periodic inflation rate, average inflation rate, real value of capital. Annuities: temporary and perpetual annuities, annuities payable in arrears and in advance, deferred annuities, annuities with fixed payments, present and future value of annuities at any given moment. Installment debt repayment: repayment of interest and principal, debt repayment schedule with fixed principal installments or fixed payment amounts, loans with deferred repayment periods, cost of debt. The syllabus includes the minimum program requirements specified in the "Regulation of the Minister of Infrastructure and Development of June 12, 2014, on the minimum program requirements for postgraduate studies in real estate valuation": 3. Basics of Financial Mathematics (8 hours) - Fundamentals of the theory of the time value of money - Sources of changes in the value of money - Future value of money - Simple interest - Compound interest - Types of interest rates - Calculation examples - Present value of money - Concept of discounting, discount rate, and discount factor - Present value of disposable income - Present value of fixed and variable income		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	2 to 3 written tests during the semester	51.0%	100.0%
Recommended reading	Basic literature A1 Mathematics Bańska T., Nykowska M., <i>Matematyka w zadaniach dla wyższych zawodowych uczelni ekonomicznych</i>, Wydawnictwo Branta 2003 A2 Financial Mathematics Podgórska M., Klimkowska J., <i>Matematyka finansowa</i>, PWN, Warszawa 2000. Wycinka E., Szreder M. (red.), <i>Zastosowanie metod ilościowych w ubezpieczeniach</i>, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2020 (rozdz. 8-11).		

	Supplementary literature	B1 Mathematics Bednarski T., <i>Elementy matematyki w naukach ekonomicznych</i>, Oficyna Ekonomiczna, Kraków 2004 Chiang A. C., <i>Podstawy ekonomii matematycznej</i>, PWN, Warszawa 1994 Krysicki W., Włodarski L., <i>Analiza matematyczna w zadaniach</i>, część I i II, PWN, Warszawa 2003 Matłoka M. (red), <i>Matematyka dla ekonomistów</i>, Wydawnictwo AE w Poznaniu, Poznań 2000 Piszczała J., <i>Matematyka i jej zastosowanie w naukach ekonomicznych</i>, Wydawnictwo AE w Poznaniu, Poznań 1998 Piszczała J., Piszczała M., Wojcieszyn B., <i>Matematyka z zadaniami</i>, PWN, Warszawa 1981 Sadowski M., Spaniły T., <i>Matematyka w zadaniach dla studentów kierunków ekonomicznych</i>, Wydawnictwo UG, Gdańsk, 1999 B2 Financial Mathematics Dobija M., Smaga E., <i>Podstawy matematyki finansowej i ubezpieczeniowej</i>, PWN 1995. Bieszk-Stolorz B., <i>Matematyka finansowa z arkuszem kalkulacyjnym</i>, CEDEWU, Warszawa 2021. Kozubski J., <i>Matematyczne modelowanie wybranych procesów finansowych</i>, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk, 2002. Redo M., Prewszyn-Kwitno P., <i>Matematyka finansowa. Teoria i praktyka</i>, PWN, Warszawa 2021. Sobczyk M., <i>Matematyka finansowa</i>, Agencja Wydawnicza Placet, Warszawa 2000.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Any tasks from the textbook: Bazańska T., Nykowska M., <i>Matematyka w zadaniach dla wyższych zawodowych uczelni ekonomicznych</i>, Wydawnictwo Branta 2003 1. Solve the matrix equation... 2. Solve the system of equations... 3. Calculate the limit of the sequence... 4. Calculate the limits of the function... 5. Determine the intervals of monotonicity of the function...	
Work placement	Not applicable	

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