University of Gdańsk

Subject card

Subject name and code	Mathematical Applications in Economics and Management, PG_00044038		
Field of study	International Economic Relations		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	undergraduate 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	5.0
Learning profile	academic	Assessment form	
Conducting unit	Katedra Mikroekonomii -> Faculty of Economics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Elżbieta Babula	
	Teachers	dr Elżbieta Babula	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	0.0	30

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	30	0.0	0.0	30

Subject objectives

Acquainting students with the introduction to higher mathematics and its applications in economics and management.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MSGL3_W10] knows selected methods and tools, including IT tools and data acquisition techniques, which make it possible to describe and analyse economic entities operating on the international market; knows the processes and phenomena occurring in them and between them, and processes supporting decision-making	The student has knowledge of functions of one and many variables and knows the elements of differential and integral calculus. He knows the methods of unconditional and conditional optimization and their applications in modeling enterprise decisions. Has basic knowledge of modeling the dynamics of economic processes. Has basic knowledge of probability calculus and the possibilities of using Bayes' rule.	[SW4] test/exam - oral or written
	[MSGL3_U04] uses the acquired theoretical knowledge in economics to analyse and evaluate the operation of economic entities on the international market, with particular emphasis on the European Union market	The student has the ability to apply mathematics in economics and management and to use mathematical methods in modeling and interpreting economic phenomena. He can analyze the causes and course of economic processes based on basic economic models. The student independently uses the learned matrix methods to solve market models. With the help of simple mathematical methods and based on the necessary economic indicators, he knows how to assess the degree of convergence of the economies of different countries.	[SU4] test/exam - oral or written
	[MSGL3_K06] is ready to be guided in his/her professional life by business ethics and corporate social responsibility, to respect others and to be loyal to his/her employer	The student develops the ability to autonomously and responsibly perform assigned tasks and is able to cooperate in a team, including assuming various team roles while carrying out group projects in class.	[SK4] test/exam - oral or written
	[MSGL3_U02] can assess economic and social phenomena occurring in an open economy, interpret necessary statistical data and economic indicators, as well as forecast economic phenomena and processes, using standard methods and tools applied in economic sciences	Using the elements of differential calculus, he is able to carry out optimization of functions of one and many variables in the problems of the theory of the firm and market organization. He can use basic methods and tools to diagnose economic processes and on this basis make appropriate economic decisions. Can determine integrals of elementary functions and apply them to solve tasks based on marginal values.	[SU4] test/exam - oral or written
	[MSGL3_W01] has an advanced knowledge of economic sciences, in particular of economics and its place in the system of sciences, including within related disciplines	The student has knowledge of basic economic models such as market equilibrium models, the firm, the consumer, and the national income model. The student also knows the applications of differential equations in economic growth models.	[SW4] test/exam - oral or written

Subject contents	1. Completion of knowledge of selected topics Learning content: sigma notation in writing the sum of a sequence; solving equations using logarithms; inverse function 2. Algebra of matrices Learning content: operations on matrices, basic properties of determinants, finding the inverse matrix, Cramer's formula, linear dependence and independence of vectors and systems of equations; order of matrices; determining the number of degrees of freedom of a system of equations, checking the solvability of the system; solving systems with redundant equations - solutions with parameters; application to market models; performing analysis (solving systems of equations in matrix form) using Excel. 3. Elements of differential calculus Learning content: rules of differentiation for functions of one variable, local extrema of functions of one variable, elasticity of functions, Taylor's formula and its applications; marginal calculus in economics and maximization of the economic result; rules of differentiation of functions of many variables, optimization of functions of many variables, conditional extremum, minimization of costs method of Lagrange multipliers 4. Integral calculus Learning content: concept of prime function, definite and indeterminate integral, method of integration by parts, method of integration by substitution, applications in marginal calculus 5. Difference and differential equations Learning content: first-order difference equations, cobweb model, differential equations, application of differential equations in economic growth models 6. Elements of probability calculus Learning content: Bayes' rule and its use in determining probability
Prerequisites and co-requisites	Knowledge and skills in mathematics from high school

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam	51.0%	100.0%

Recommended reading	Basic literature	1. E. Babula, L. Czerwonka (red.), Zastosowanie matematyki w ekonomii i zarzadzaniu, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015 2. A. Blajer-Gołębiewska, L. Czerwonka, E. Pankau, M. Zielenkiewicz, Ekonomia matematyczna w zadaniach, red. T. Kamińska, Wyd. UG, Gdańsk 2010 3. M. Wisniewski, Mathematics for economics, Palgrave Macmillan, 2013

	Supplementary literature	1. K. Sydsaeter, P. Hammond, A. Seierstad, A. Strom, Further mathematics for economic analysis, FT Prentice Hall, Harlow 2005 2. B. Batog, B. Bieszk-Stolorz, I. Forys, M. Guzowska, K. Heberlein, Mathematics for students of economics, finance and management, Difin, Warszawa 2021 3. T. Bradley, Essential mathematics for economics and business, Wiley, 2013 4. A.C. Chiang, Podstawy ekonomii matematycznej, PWE, Warszawa 1994 5. L. Czerwonka, Matematyczne modele połaczen przedsiebiorstw uwzgledniajace czynniki menedzerskie, Pieniadze i Wiez. Kwartalnik Naukowy, Nr 3/2009, s. 81-88 6. L. Czerwonka, Zastosowanie matematycznych modeli fuzji egzogenicznych, Pieniadze i Wiez. Kwartalnik Naukowy, Nr 1/2008, s. 133-140 7. M. Matłoka, Matematyka dla ekonomistow, Wyd. AE w Poznaniu, Poznan 2008 8. A. Ostoja-Ostaszewski, Matematyka w ekonomii. Modele i metody t. 1 i 2, Wydawnictwo Naukowe PWN, Warszawa2006 9. J. Piszczała, Matematyka i jej zastosowanie w naukach ekonomicznych, Wydawnictwo AE w Poznaniu, Poznan 2008 10. R.A. Barnett, M.R. Ziegler, K.E. Byleen, College Mathematics for Business, Economics, Life Sciences, and Social Sciences, Pearson Prentice Hall, Upper Saddle River, New Jersey 2008
	eResources addresses	Adresy na platformie eNauczanie: WE-MSG-L3DZ-(2024/2025) Zastosowanie matematyki Wykład - Moodle ID: 12340 https://mdl.ug.edu.pl/course/view.php?id=12340
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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