University of Gdańsk

Subject card

Subject name and code	Mathematical Applications in Economics and Management, PG_00204851						
Field of study	Economics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	Bachelor's studies		Subject group	Obligatory subject group in the field of study Subject group related to scientific research 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	9.0			
Learning profile	academic		Assessment form	exam			
Conducting unit	Department of Microeconomics -> Faculty of Economics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Elżbieta Babula				
	Teachers						
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		4.0		161.0	225
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
[EKONL3_W06] has an advanced knowledge of selected methods and tools, including statistical and econometric techniques, for describing economic agents and structures as well as social institutions and the processes taking place in them	The student has knowledge in the field of single and multivariable functions, elements of differential and integral calculus, unconditional and conditional optimization methods and their applications in business decision modeling, and has basic knowledge related to modeling the dynamics of economic processes	[SW4] test/exam - oral or written
[EKONL3_K05] correctly identifies, diagnoses and resolves professional dilemmas and different options for solutions	The student correctly identifies, diagnoses and solves dilemmas and possibilities regarding economic problems related to the use of mathematical methods	[SK4] test/exam - oral or written
[EKONL3_U04] can predict and forecast the course of economic and social processes and phenomena	The student has the ability to apply mathematics in economics and management and to use mathematical methods in modeling and interpreting economic phenomena. Using elements of differential calculus, she/he can optimize functions of one and many variables in issues related to the theory of enterprise choice and market organization.	[SU4] test/exam - oral or written
[EKONL3_U02] is able to use the knowledge of theory and data to analyse concrete economic and social processes and phenomena and to analyse these phenomena using methods developed in economics, finance and management sciences	The student is able to analyze the causes and course of economic processes based on basic economic models. Deepens knowledge by solving problems outside of classes and consulting with the instructor.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written

Subject contents

1. Algebra of matrices: operations on matrices, basic properties of determinants, finding the inverse matrix, Cramer's formula, linear dependence and independence of vectors and systems of equations; the rank of a matrix; the number of degrees of freedom of a system of equations, the verification of existence of the solution; solving systems with redundant equations - solutions with parameters; application to market models
2. Elements of differential calculus: rules of differentiation for functions of one variable, local extrema of functions of one variable, elasticity of functions, rules of differentiation of functions of many variables, optimization of functions of many variables, bounded optimization
3. Integral calculus: concept of primary function, definite and indefinite integral, method of integration by parts, method of integration by substitution
4. Applications of derivatives and integrals in economics and finance: marginal calculus in economics and maximization of profit by the firm; minimization of costs using Lagrange multipliers method, applications of integrals in profit maximization model
5. Difference and differential equations: first-order difference equations, cobweb model, differential equations, application of differential equations in economic growth models

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 zarządzaniu, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015 2. A. Blajer-Gołębiewska, L. Czerwonka, E. Pankau, M. Zielenkiewicz, Ekonomia matematyczna w zadaniach, red. T. Kamińska, Wyd. UG, Gdansk 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 połączeń przedsiębiorstw uwzględniające czynniki menedżerskie, Pieniądze i Więź. Kwartalnik Naukowy, Nr 3/2009, s. 81-88 6. L. Czerwonka, Zastosowanie matematycznych modeli fuzji egzogenicznych, Pieniądze i Więź. Kwartalnik Naukowy, Nr 1/2008, s. 133-140 7. M. Matłoka, Matematyka dla ekonomistów, Wyd. AE w Poznaniu, Poznań 2008 8. A. Ostoja-Ostaszewski, Matematyka w ekonomii. Modele i metody t. 1 i 2, Wydawnictwo Naukowe PWN, Warszawa 2006 9. J. Piszczała, Matematyka i jej zastosowanie w naukach ekonomicznych, Wydawnictwo AE w Poznaniu, Poznań 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	
Example issues/ example questions/ tasks being completed	Open tasks.	
Work placement	Not applicable	

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