University of Gdańsk

Subject card

Subject name and code	Mathematical Applications in Economics and Management, PG_00200365		
Field of study	Logistics and Mobility		
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	English
Semester of study	1	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit	Department of Microeconomics -> Faculty of Economics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Leszek Czerwonka, prof. UG	
	Teachers	dr hab. Leszek Czerwonka, prof. UG dr Elżbieta Babula	

Lesson types							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	30.0	0.0	75
	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	75	0.0	50.0	125

Subject objectives	Acquainting students with the introduction to higher mathematics and its applications in economics and management. Use of academic English language, references and vocabulary.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[LML3_U02] is able to use its theoretical knowledge and acquire data to analyze specific logistics and mobility processes and systems, and to analyze these processes and systems using methods developed in economics, finance, management science, logistics and mobility	A student is able to apply mathematical and statistical methods to analyze data describing economic processes and management systems, including in the areas of logistics and mobility. The student can acquire and interpret data using approaches appropriate to economics and finance.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[LML3_K04] is ready to think and act in an entrepreneurial manner; adapts to new situations and conditions, takes on the challenges of creative thinking, is resilient to failure, knows how to identify threats and assess the risk of their occurrence	A student is able to think analytically and take entrepreneurial action in solving mathematical problems in economics and management; can assess risk and adapt analytical methods to changing market and informational conditions. A student studies additional examples and tasks, which are discussed and reviewed during office hours with the teacher.	[SK1] oral statement/conversation/ discussion [SK2] presentation/project/paper/ report [SK4] test/exam - oral or written
[LML3_W06] knows to an advanced degree selected methods and tools, including statistical techniques, to describe and model logistics and mobility processes and systems	A student knows selected mathematical and statistical methods used to describe and model economic processes and management systems, including those related to logistics and mobility.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report

Subject contents

1. Matrix algebra
Matrix operations, basic properties of determinants, finding the inverse matrix, Cramer's formula, application to market and national income models (matrix notation and model solution)
2. Sequences and series
Concept of a numerical sequence, arithmetic and geometric sequences, convergence of a sequence, operations on the limits of sequences, concept of a numerical series, sum of a series, application to the calculation of the present value of cash flows (elements of financial mathematics)
3. Functions of one and many variables
Basic elementary functions, graph of a function, inverse representation, monotonicity, limit of a function, continuity of a function, convexity and concavity of a function
4. Elements of differential calculus
Rules of differentiation for functions of one variable, local extrema of functions of one variable, elasticity of functions, marginal calculus, maximisation of economic result, rules of differentiation for functions of many variables, optimisation of functions of many variables, conditional extremum, minimisation of costs by Lagrange multipliers method
5. Integral calculus
Concept of primary function, definite and indefinite integral, method of integration by parts, method of integration by substitution, applications in marginal calculus and financial mathematics
6. Differential equations
Differential equations, application of differential equations in economic growth models.

The programme is delivered both during and outside of class, with students working independently on problem-based tasks and projects, which are discussed with the lecturer.

To pass the course, students must achieve at least 51% of the total marks from the classes and 51% of the marks from the final exam. The final mark is awarded based on the total marks from both the class and lecture components.

Prerequisites and co-requisites

Recommended knowledge in mathematics: Functions of One Variable, Functions of Many Variables, Foundations of Differential Calculus, Solving Systems of Linear Equations.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Assessment for the class is based on a test and the projects carried out by the students.	51.0%	50.0%
An exam is held on the lecture component, which takes the form of a written test.	51.0%	50.0%

Recommended reading	Basic literature	1. Babula E., Czerwonka L. (ed.), Zastosowanie matematyki w ekonomii i zarządzaniu-Mathematical Applications in Economics and Management, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015. 2. Bradley T., Essential mathematics for economics and business, Wiley, 2013. 3. Wisniewski M., Mathematics for economics, Palgrave Macmillan, 2013. 4. Barnett R.A., Ziegler M.R., Byleen K.E., College Mathematics for Business, Economics, Life Sciences, and Social Sciences, Pearson Prentice Hall, Upper Saddle River, New Jersey 2008. 5. Werner F., Sotskov Y., Mathematics of Economics and Business, Routledge, Abingdon 2006.
	Supplementary literature	1. Czerwonka L., Mathematical Models of Mergers: Conditions of Application and Conclusions [in:] Market Concentration and Economy, Series of Monographs, Vol. 7, Macro & Microeconomics Case Studies, T. Bernat (ed.), Publishing House Volumina.pl Daniel Krzanowski, Szczecin 2010, pp. 206-219.
	eResources addresses	
Example issues/ example questions/ tasks being completed	The determinant of matrix of order (n 1) obtained by deleting row i and column j of matrix A of order n is called ...	
Work placement	Not applicable	

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