

Course title		Mathematical Applications in Economics and Management						ECTS code		14.3.EM.PZ.2		
								ECTS credits		8		
Name of unit administrating study		KMikr		Field of study		MSG**		Field of specialisation		IB;		
Teaching staff		Leszek Czerwonka, Associate Professor ; Elżbieta Babula, Ph.D.										
Number of hours												
Lectures	15	Classes	30	Tutorials	0	Laboratory	0	Seminars	0	Language classes	0	
Forma aktywności							Year&Type of studies*		1 SS1,			
Hours with the participation of the academic teacher (including office hours, exams, others):						54	Semester:		1,			
Hours without the participation of the academic teacher (student's self-study, homeworks):						146	Type of course:		obligatory			
Total number of hours:						200	Language of instruction:		English			
Teaching form		in-class learning										
Teaching methods		Lectures including multimodal presentations, Activating methods in training classes, Collaborating, group activities, Use of academic English terminology and set books, academic English speaking.										
Prerequisites (required courses and introductory requirements)												
Required courses		None.										
Introductory requirements		Recommended knowledge in mathematics: Functions of One Variable, Functions of Many Variables, Foundations of Differential Calculus, Solving Systems of Linear Equations										
Assessment method, forms and criteria												
Assessment method		Exam										
Assessment criteria		The percentage of points to obtain grades: below 50% - 2.0 51% - 3.0 61% - 3.5 71% - 4.0 81% - 4.5 91% - 5.0.										
Course 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												
Knowledge		MSG1_W01	Student has an advanced knowledge of economic sciences, in particular of economics and its place in the system of sciences, including within related disciplines and linking it to mathematics.									
		MSG1_W10	Student knows selected methods and tools, including IT tools and data acquisition techniques and mathematical methods, 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.									
Verification of learning outcomes - Knowledge												
Outcomes		written exam	oral exam	test	essay/paper /portfolio	tasks/ homeworks	individual presentation	group presentation	classroom activities	classroom discussion	individual project	group project
		MSG1_W01	X		X							
		MSG1_W10	X		X							
Skills		MSG1_U02	Student 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 and relating to the application of mathematical methods.
	MSG1_U04	Student uses the acquired theoretical knowledge in economics and relating to the application of mathematical methods to analyse and evaluate the operation of economic entities on the international market, with particular emphasis on the European Union market.

Verification of learning outcomes - Skills

Outcomes	written exam	oral exam	test	essay/paper /portfolio	tasks/ homeworks	individual presentation	group presentation	classroom activities	classroom discussion	individual project	group project
MSG1_U02	X		X								X
MSG1_U04	X		X								

Attitudes	MSG1_K05	Student correctly identifies, diagnoses and solves dilemmas and various options of solutions related to the profession, relating to the application of mathematical methods.
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Verification of learning outcomes - Attitudes

Outcomes	written exam	oral exam	test	essay/paper /portfolio	tasks/ homeworks	individual presentation	group presentation	classroom activities	classroom discussion	individual project	group project
MSG1_K05	X		X								X

Course contents
1. Subject: Matrices.

Contents: matrix operations, inverse of a matrix, determinant of a matrix, properties of determinants of matrices, application to models of a market and national income

2. Subject: Sequences and series.

Contents: notion of sequence, arithmetic and geometric sequence, convergence of the sequence, convergence criteria, notion of series, general properties of series, application to financial mathematics

3. Subject: Functions.

Contents: elementary functions, inverse functions, monotonicity, composition of functions, functions of many variables, notion of limit, continuity of elementary functions, concavity and convexity

4. Subject: The differential calculus.

Contents: tangent to a curve, arithmetic of derivatives, second derivatives, partial derivatives, optimization, profit maximization, cost minimization with Lagrange multipliers

5. Subject: Integration.

Contents: notion of primitive function, definite and indefinite integrals, formula for the integration by parts, formula for the integration by substitution, applications of integration to financial mathematics

6. Subject: Differential equations.

Contents: first order differential equations, application to growth models

Recommended reading lists
Basic references:

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.

Facultative references:

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.

Contact

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* SS1 - undergraduate studies * SS2 - graduate studies * SDang - doctoral studies

** MSG - International Economic Relations