University of Gdańsk

Subject card

Subject name and code	Mathematical Economics, PG_00200019		
Field of study	Economics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master'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	part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
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. Anna Blajer-Gołębiewska	
	Teachers	dr hab. Anna Blajer-Gołębiewska	

Lesson types							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	14.0	10.0	0.0	15.0	0.0	39
	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	39	0.0	36.0	75

Subject objectives	The aim of the course is to familiarize the student with the basics of modeling economic processes and phenomena usingmathematical methods.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[EKONMU2_K01] recognises the importance of knowledge in the field of economics in the process of identifying and solving economic problems and of consulting experts when having difficulties in solving them independently	A student recognises the importance of knowledge in the field of mathematical economics in the process of identifying and solving economic problems, and they are consulting projects with the lecturer.	[SK2] presentation/project/paper/ report [SK4] test/exam - oral or written
[EKONMU2_U08] can independently analyse economic and social phenomena and processes, and can perform a theoretically deepened assessment of such phenomena, using appropriately selected research method	A student is able to independently analyze economic phenomena and processes, has the ability to theoretically in-depth assessment of these phenomena, using an appropriately selected research method in the field of mathematical economics.	[SU4] test/exam - oral or written
[EKONMU2_K02] is aware of the level of their knowledge in the area of solving complex problems in economic,; understands the need to extend and update this knowledge throughout his/her life	A student is aware of the level of his knowledge in the area of mathematical economics and understands the need to deepen and update this knowledge throughout his life. This awareness deepens during consultations, during which the student identifies areas that require improvement, and participation in the consultations is an expression of his/her active attitude towards the process of learning and improving competences.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[EKONMU2_W01] has an in-depth knowledge of the nature of social sciences and their place in the system of sciences; understands the differences between contemporary trends in economic thought; knows the claims of contemporary economic theories	A student has in-depth knowledge of the nature of economics, its connections with mathematics and the possibilities of using mathematics to model economic phenomena.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[EKONMU2_U01] can creatively interpret and explain economic and social phenomena and relations between them, using acquired knowledge of economics, finance and management sciences	A student is able to interpret and explain economic phenomena and the relationships between these phenomena, using his knowledge of mathematical economics.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[EKONMU2_U02] can use acquired knowledge to describe and analyse the causes and course of economic and social processes and phenomena, and can formulate his/her own opinions and critically select data and analysis methods based on the achievements of economic and social sciences	A student is able to use the knowledge of mathematical economics to mathematically describe and analyze the course of economic processes and phenomena and is able to critically select data and analysis methods.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[EKONMU2_U04] can forecast and model complex economic and social processes using quantitative and qualitative methods and tools developed by economic sciences (including statistics and econometrics)	The student is able to model complex economic processes using quantitative methods and tools created by mathematical economics.	[SU4] test/exam - oral or written

Subject contents	1. Mathematical theory of demand Issues: economic model, optimization of consumer choice, optimization of intertemporal consumer choice, Lagrange function, Lagrange multiplier. 2. Modeling choice in conditions of risk and uncertainty Issues: modeling of consumer choices in conditions of risk, criteria for assessing manufacturer's choice variants in conditions of risk and uncertainty. 3. Mathematical game theory as a decision-making tool Issues: zero-sum games, saddle point, simultaneous games, repeated games, sequential games, dominant and dominated strategies, Nash equilibrium, Pareto equilibrium. 4. Partial and general equilibrium Issues: market equilibrium in the Walrasian, Neumannian and neoclassical concept of equilibrium, Edgeworth box, Arrow-Hurwicz model, equilibrium in a dynamic approach. 5. Mathematical theory of production Issues: properties of the production function, cost minimization for a given production volume. 6. Economic growth Issues: models of exogenous and endogenous economic growth, rules for the accumulation of growth factors in mathematical terms, Solow model. Program jest realizowany zarówno w trakcie zajęć, jak i poza nimi w formie samodzielnego wykonywania przez studenta zadań problemowych/projektów, które są konsultowane z prowadzącym. Projekt wymaga bieżącego przeprowadzania konsultacji z prowadzącym. Czas ten obejmuje wybór tematu, omówienie założeń metodologicznych, określenie oczekiwanych rezultatów, konsultowanie wyników. Warunkiem uzyskania oceny pozytywnej jest zdobycie co najmniej 51% sumy punków z ćwiczeń oraz 51% punktów z egzaminu końcowego. Ocena końcowa jest wystawiana na podstawie sumy punktów łącznie z części ćwiczeniowej i wykładowej.
Prerequisites and co-requisites	Skills to apply knowledge acquired during higher education in mathematics, macroeconomics and microeconomics to solve economic problems.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
The lecture part is assessed in the form of a written examination.	51.0%	50.0%
Assessment of the classes is baded on a written test with exercises to be solved and a project.	51.0%	50.0%

Recommended reading	Basic literature	1. A. Blajer-Gołębiewska, L. Czerwonka, E. Pankau, M. Zielenkiewicz, Ekonomia matematyczna w zadaniach, red. T. Kamińska, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2006. 2. A.C. Chiang, Podstawy ekonomii matematycznej, PWE, Warszawa 1994. 3. A. Blajer-Gołębiewska, Rachunek różniczkowy - zadania, [w:] Zastosowanie matematyki w ekonomii i zarządzaniu, red. E. Babula, L. Czerwonka, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015, s. 174-186. 4. A. Blajer-Gołębiewska, Rachunek całkowy - zadania, [w:] Zastosowanie matematyki w ekonomii i zarządzaniu, red. E. Babula L. Czerwonka, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015, s. 211-218. 5. Eric Rasmusen, Games and Information: an Introduction to Game Theory, Wiley-Blackwell, 2007.
	Supplementary literature	1. R. M. Solow, A Contribution to the Theory of Economic Growth, "The Quarterly Journal of Economics", vol. 70, issue 1, 1956, s. 65-94. 2. M. Osborne, An Introduction to Game Theory, Oxford University Press, Oxford 2004. 3. E. Panek, Ekonomia matematyczna, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań 2000. 4. E. Panek, Podstawy ekonomii matematycznej. Materiały do ćwiczeń, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań 2002. 5. A. Ostoja-Ostaszewski, Matematyka w ekonomii. Modele i metody t. 1 i 2, Wydawnictwo Naukowe PWN, Warszawa 1996. 6. E. T. Dowling, Introduction to Mathematical Economics, McGraw-Hill, Schaums Outline Series, 2001. Martin Osborne, An Introduction to Game Theory, Oxford University Press, 2009.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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