

Subject card

Subject name and code	Mathematical Models in Economics, PG_00161302						
Field of study	Mathematics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Marek Halenda				
	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		10.0		80.0	150
Subject objectives	The aim of the course is to present the mathematical foundations of economic theories and an introduction to mathematical modelling of economic processes.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MATL3_U08] is able to formulate definitions and theorems in an understandable way, both orally and in writing, and present correct mathematical reasoning regarding the acquired issues	Verifies basic properties and proves simple facts about the mathematical foundations of economics.	[SU4] test/exam - oral or written
	[MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	Knows and understands the basic concepts, theorems, and mathematical methods used in consumer choice theory and production theory.	[SW4] test/exam - oral or written
	[MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically	Is ready to understand and appreciate the importance of intellectual honesty in one's own and others' actions; ethical conduct.	[SK8] observation of student's independent or team work
	[MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	Is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education.	[SK8] observation of student's independent or team work
	[MATL3_K06] is ready to formulate opinions on basic mathematical issues	Is ready to formulate opinions on basic mathematical issues.	[SK8] observation of student's independent or team work
	[MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning	Is able to provide solutions to simple mathematical economics tasks along with a justification for their correctness.	[SU4] test/exam - oral or written
	[MATL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	Is ready to formulate precise questions that serve to deepen one's understanding of a topic or to find missing elements of reasoning.	[SK8] observation of student's independent or team work
Subject contents	1. Preference relation, optimal basket, utility function. 2. Consumer demand function, comparative statics, price change effect, income effect. 3. Demand as a solution to the utility maximization problem, characterization using Lagrange multipliers, marginal rate of substitution, indirect utility function. 4. Weak axiom of revealed preferences, compensated law of demand. 5. Expense minimization problem, consumer expenditure function, compensated Hicks demand, compensated law of demand. 6. Slutsky equations, substitution matrix. 7. Production, production sets and their types, production function. 8. Dual-argument production function, technical equipment of labor. 9. Problem of maximizing the firm's profit function, firm supply. 10. Properties of profit and supply, Hotelling's lemma, law of supply. 11. Problem of minimizing the firm's costs, cost function, average costs, marginal cost. 12. Properties of the cost function, Shepard's lemma. 13. Simple and complex lotteries. 14. Utility function, axioms of continuity and independence. 15. Expected utility function, Allais paradox. 16. Von Neumann-Morgenstern theorem. 17. Risk aversion, risk propensity, risk neutrality. The certainty equivalent of the lottery. 18. Statement of subject-related nomenclature in English.		
Prerequisites and co-requisites	Calculus, basics of probability.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	51.0%	50.0%
	Test	51.0%	50.0%
	Observation of the student's attitude	51.0%	0.0%
Recommended reading	Basic literature	1. E. Panek, <i>Ekonomia matematyczna</i>, Akademia Ekonomiczna, Poznań, 2003 2. A. Mas-Colell, M. Whinston, J. Green, <i>Microeconomic Theory</i>, Oxford University Press, New York, 1995 3. A. Blajer, L. Czerwonka, E. Pankau, M. Zielenkiewicz, <i>Ekonomia matematyczna w zadaniach</i>, Wydawnictwo Uniwersytetu Gdańskiego 2006 4. A. C. Chiang, <i>Podstawy ekonomii matematycznej</i>, PWE Warszawa 1994 5. J. Górka, W. Orzeszko, M. Wata, <i>Ekonomia matematyczna, materiały do ćwiczeń</i>, Wydawnictwo C.H. Beck, Warszawa 2009 6. H. R. Varian, <i>Mikroekonomia. Kurs średni-ujęcie nowoczesne</i>, WN PWN Warszawa 2002. 7. A. Ostoja-Ostaszewski, <i>Matematyka w ekonomii, modele i metody</i>, WN PWN, Warszawa, 1996	

	Supplementary literature	none
	eResources addresses	
Example issues/ example questions/ tasks being completed	not included	
Work placement	Not applicable	

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