

Subject card

Subject name and code	Artificial Intelligence in Mathematics Education, PG_00208870						
Field of study	Mathematics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	Master'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	3		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Elżbieta Mrozek				
	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 prepare students to use artificial intelligence tools in mathematics education in a conscious, critical, and responsible way, with a focus on supporting mathematical reasoning, designing learning activities, and creating or adapting mathematical tasks.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MATMU2_U06] is able to apply methods and examples from a selected field of mathematics in related fields	The student is able to use artificial intelligence tools to apply methods and examples from a chosen area of mathematics to related fields, recognising both their usefulness and limitations.	[SU8] observation of student's independent or team work
	[MATMU2_K06] is ready to formulate opinions on basic mathematical issues	The student is able to formulate well-grounded opinions on mathematical topics and on the use of artificial intelligence in mathematics education.	[SK1] oral statement/conversation/discussion [SK8] observation of student's independent or team work
	[MATMU2_U03] can understand mathematical texts of various types from selected fields of mathematics	The student is able to use artificial intelligence tools to analyse, interpret, and understand mathematical texts of various types.	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written [SU8] observation of student's independent or team work
	[MATMU2_U07] is able to define his/her interests and develop them; in particular, is able to establish contact with specialists in his/her field, e.g. understand their lectures intended for young mathematicians	The student is able to use artificial intelligence tools to develop their mathematical interests	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written [SU8] observation of student's independent or team work
	[MATMU2_U04] is able, at an advanced level and including modern mathematics, to apply and present, orally and in writing, methods of at least one selected branch of mathematics	The student is able to use artificial intelligence tools to apply and clearly present, both orally and in writing, selected methods of modern mathematics at an advanced level.	[SU2] presentation/project/paper/report [SU8] observation of student's independent or team work
	[MATMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning	The student understands the role and importance of constructing valid mathematical reasoning and can evaluate how artificial intelligence tools may support or interfere with the process of building mathematical arguments.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[MATMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; ethical conduct	The student understands the importance of intellectual honesty when working with artificial intelligence tools and applies ethical principles when creating, analysing, and using mathematical materials.	[SK2] presentation/project/paper/report
	[MATMU2_K02] is ready to precisely formulate questions to deepen his/her understanding of a given topic or find missing elements of reasoning	The student is able to formulate precise questions related to the use of artificial intelligence in mathematics education, aimed at deepening understanding and identifying gaps in reasoning.	[SK2] presentation/project/paper/report [SK4] test/exam - oral or written
	[MATMU2_U01] can construct mathematical reasoning: prove theorems and refute hypotheses through construction and selection of counterexamples	The student is able to use artificial intelligence tools to construct valid mathematical arguments, including proving theorems and identifying counterexamples that disprove given hypotheses.	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written
	[MATMU2_W01] knows and understands in-depth the theory of selected areas of mathematics	The student has an in-depth understanding of the principles, capabilities, and limitations of artificial intelligence tools used in mathematics education, in relation to selected areas of mathematics.	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion
	[MATMU2_U05] can perform proofs in a selected field and, if necessary, also use tools from other areas of mathematics	The student is able to use artificial intelligence tools to carry out correct proofs in a chosen area of mathematics, applying methods from other branches when needed.	[SU2] presentation/project/paper/report [SU4] test/exam - oral or written [SU8] observation of student's independent or team work
	[MATMU2_W03] knows and understands in-depth a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections of issues in this field with other areas of mathematics	The student understands the principles and applications of selected artificial intelligence tools within a chosen area of mathematics	[SW2] presentation/project/paper/report

	Course outcome	Subject outcome	Method of verification
	[MATMU2_K01] is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education	The student recognises the limits of their knowledge in applying artificial intelligence tools in mathematics education and is willing to engage in further self-directed learning.	[SK1] oral statement/conversation/discussion
	[MATMU2_K05] is ready to independently search for information in literature, also in foreign languages	The student is able to independently search for and select information on the use of artificial intelligence in mathematics education, including sources in foreign languages.	[SK2] presentation/project/paper/report
Subject contents	- Foundations of artificial intelligence in education language models, capabilities and limitations of AI tools. - Techniques for using AI in the work of a mathematics teacher generating and adapting tasks, analysing students solutions, creating teaching materials. - AI in supporting students mathematical reasoning guiding questions, hints, personalised instruction. - Critical analysis of AI-generated responses typical errors, verification of reasoning correctness. - Risks and challenges academic dishonesty, factual errors, data protection, ethical use of AI. - Good practices and responsible use of AI principles of safe implementation, designing tasks resistant to misuse. - Practical workshops creating tasks, worksheets, error analyses and mini-lessons using AI. - Final project developing a teaching material using AI tools.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	60.0%
	observation of student's work	51.0%	0.0%
	project	51.0%	40.0%
Recommended reading	Basic literature	- Walton Family Foundation & Gallup. (2025). <i>Teaching for Tomorrow: Unlocking Six Weeks a Year With AI</i>. - Tomczyk, Ł., & Fąka, A. (2025). <i>Integrating AI in Education: Polish Teachers</i>. Human Behavior and Emerging Technologies, 5599169. - Pyżalski, J. (2025). <i>Challenges for Education Based on Empirical Model of GAI in Schools</i>. Springer CCIS, 2537. • Polska Akademia Nauk. (2025). <i>Biała Księga: Sztuczna inteligencja w polskiej szkole</i>. J. Mytnik, Edukacja w lustrze generatywnej sztucznej inteligencji: potencjalnie negatywne skutki dla procesu uczenia się., 2025r. J. Mytnik, Gamifikacja w edukacji. O budowaniu fabularnych systemów motywacyjnych., 2025r. J. Mytnik, B. Wikieł, M. Kaczmarek, A learning community model: the Center for Innovative Education supporting academic didactics at Gdańsk University of Technology, Poland, Global Journal of Engineering Education, 2024r. W. Wątor, artykuły: I ty możesz wykorzystać sztuczną inteligencję, Sztuczna inteligencja sceptyczny punkt	
	Supplementary literature	- Miao, F., & Cukurova, M. (2024). <i>AI Competency Framework for Teachers</i>. UNESCO. - Kestin, G., Miller, K., Klaes, A., Milbourne, T., & Ponti, G. (2025). <i>AI tutoring outperforms in-class active learning: an RCT</i>. Scientific Reports, 15, 17458. - Wang, J., Fan, W., et al. (2025). <i>Efekt ChatGPT na uczenie: meta-analiza 51 badań</i>. Humanities and Social Sciences Communications. https://doi.org/10.1038/s41599-025-04787-y . (doi.org in Bing)	
	eResources addresses		

Example issues/ example questions/ tasks being completed	not included
Work placement	Not applicable

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