University of Gdańsk

Subject card

Subject name and code	Software for mathematics education, PG_00178997						
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				
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 Adrian Karpowicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	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 classes is to familiarize students with selected programs supporting mathematics teachingand to prepare them to conduct lessons and other activities using educational programs such as GeoGebra,Scratch and Python.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	He is willing to acknowledge the limitations of his own knowledge and is willing to pursue further education.	[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	The student is able to create an algorithm that solves a selected mathematical problem and justify the correctness of that algorithm.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[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	The student is able to clearly formulate definitions and theorems and present correct mathematical reasoning related to geometry and arithmetic.	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task
[MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	The student knows and understands the role and significance of proof in geometry and arithmetic.	[SW4] 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	The student is prepared to formulate precise questions aimed at deepening their own understanding of issues related to data analysis and the algorithmization of selected mathematical problems.	[SK1] oral statement/conversation/ discussion [SK2] presentation/project/paper/ report
[MATL3_K06] is ready to formulate opinions on basic mathematical issues	The student is prepared to formulate opinions on the algorithmic solutions of selected mathematical problems.	[SK1] oral statement/conversation/ discussion [SK8] observation of student's independent or team work
[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 other people's actions; ethical conduct	[SK8] observation of student's independent or team work

Subject contents

1. Application of DGS (e.g. GeoGebra program) in the field of learning and teaching mathematics in primary,secondary and higher schools. In particular: creating dynamic presentations of definitions, theorems and mathematical proofs, formulating mathematical hypotheses and their justification and generalization, creating geometric structures, solving tasks in an experimental (dynamic) way in the field of geometry, algebra and mathematicalanalysis and developing their mathematical solutions, creating animations and computer simulations,2. Using programming languages (e.g. Scratch or Python) and spreadsheets in learning and teachingmathematics in primary, secondary and higher education. Especially for algorithmizing simple mathematical problems and presenting mathematical content, to study the properties of natural numbers (including comparison of different algorithms solving thesame problem), for solving selected probabilistic and statistical problems and data analysis.3. The use of selected multimedia content in learning and teaching mathematics, e.g. Corinth applications,selected Khan Academy resources4. The use of artificial intelligence tools in learning and teaching mathematics.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
problem test	51.0%	35.0%
projects	51.0%	20.0%
test	51.0%	35.0%
activity	51.0%	10.0%
observation of the student's attitude	51.0%	0.0%

Recommended reading	Basic literature	Winkowska Nowak Katarzyna , Pobiega Edyta i in. ABC GeoGebry . Poradnik dla początkujących, OEKP, 2016. Farrell Peter, Matematyczne przygody z Pythonem, PWN, 2021
	Supplementary literature	Amit Saha, Matematyka w Pythonie. Algebra, statystyka, analiza matematyczna i inne dziedziny, Helion, 2021.
	eResources addresses	
Example issues/ example questions/ tasks being completed	**Task in GeoGebra** **1.** Create an applet that helps answer the question: Why is the sum of the interior angles of any convex pentagon equal to 540 degrees? Assume that it is known that the sum of the angles in a triangle is 180 degrees. Include a hint related to dividing the pentagon into triangles. **2.** a) Create an applet visualizing the following definition of an ellipse (as a geometric locus): An ellipse is a curve consisting of all points for which the sum of the distances from two fixed points, called the foci of the ellipse, is constant. b) Create an animation showing the surface formed by rotating the ellipse around its axis of symmetry. **Task in Scratch or Python** Program the drawing of the Peano curve. Discuss its basic properties. **Task in Excel** Use Excel to demonstrate the operation of the simplest neural network.	
Work placement	Not applicable	

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