University of Gdańsk

Subject card

Subject name and code	Software for mathematics education, PG_00155428		
Field of study	Mathematics		
Date of commencement of studies	October 2024	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	3	Language of instruction	Polish
Semester of study	6	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 course is to introduce students to selected software tools that support the work of a mathematician and to demonstrate their application in mathematics education.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATL3_U10] is able to use the known software package or programming language to solve selected issues from the acquired fields, in particular mathematical analysis, linear algebra and statistics	Is able to apply the learned programs in the process of solving mathematical tasks at various educational levels Can write simple procedures in known programs that allow to illustrate selected concepts and mathematical theorems	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task
[MATL3_W10] knows and understands the basics of computational and programming techniques supporting the work of a mathematician and understands their limitations	Knows at least two software packages for symbolic calculations, for learning programming and for geometry Knows the theoretical foundations of computational methods and IT techniques used to solve mathematical problems in the known software packages	[SW4] test/exam - oral or written [SW5] implementation of a problem task
[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_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. Application of artificial intelligence tools in learning and teaching mathematics. Introduction to selected artificial intelligence algorithms. 4. Use of selected multimedia content in learning and teaching mathematics, e.g., selected resources from Khan Academy.
Prerequisites and co-requisites	

Assessment methods and criteria

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

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	Basic https://scratch.mit.edu - website https://www.geogebra.org - website

Example issues/ example questions/ tasks being completed	**Task in GeoGebra** 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 involving the division of a pentagon into triangles. **Task in GeoGebra** **a)** Create an applet visualizing the following definition of an **ellipse** as a **locus of points**: An ellipse is a curve consisting of all points for which the sum of the distances to two fixed points, called the foci, is constant. **b)** Create an animation showing the **surface generated by rotating an ellipse around one of its axes of symmetry**. **Task in Scratch or Python** Write a program that draws the **Peano curve**. Discuss its basic properties. **Task in Excel** Use Excel to **demonstrate the operation of a simple neural network**.

Work placement	Not applicable

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