

Subject card

Subject name and code	Data Visualization, PG_00179797						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
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	3		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Division of Geometry -> Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Michał Jabłonowski				
	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		0.0		0.0	60
Subject objectives	The aim of the course is to familiarize students with modern methods and techniques of data visualization and the results of statistical analyses visualization. During laboratory exercises, students will be introduced to a programmable tool for graphical data presentation. As part of the assessment, students will complete a short project on a given topic, using the tool they have learned.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[MMiADL3_U11] knows how to arrange and analyse an algorithm in accordance with the specification and save it in the selected programming language		The student is able to operate at least one program for two-dimensional data visualization and presentation, including generating graphic elements using computer code or algorithm.		[SU6] demonstration of practical skills [SU8] observation of student's independent or team work		
	[MMiADL3_U10] is able to recognise problems, including practical issues, that can be solved algorithmically; can make a specification of such a problem		The student is able to prepare a visualization of the data in accordance with applicable rules, using a programmable computer package.		[SU2] presentation/project/paper/report [SU8] observation of student's independent or team work		
	[MMiADL3_W09] knows and understands the basics of computational and programming techniques supporting mathematician's work and understands their limitations		The student has extended and deepened knowledge of mathematics regarding formulating and solving problems related to the graphical presentation of data.		[SW4] test/exam - oral or written		
	[MMiADL3_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 ready to precisely formulate questions to deepen understanding of a given topic.		[SK1] oral statement/conversation/discussion [SK8] observation of student's independent or team work		

Subject contents	1. Technical issues related to computer graphics needed for laboratory tasks. 2. Automatic marking of basic mathematical analysis values and features (like monotonicity, downward and upward trend on the function graph. 3. Importing and pre-processing and cleaning of available data. 4. Visual coding using variables: position, size, angle, color, shape. 5. Description of the most commonly used types of charts and their characteristics, including: bar, pie, scatter, line, radar, column, bubble, heat map, connection graph, box graph. 6. Contour plots of multidimensional variables. 7. Visual perception and color in the context of correct data visualization. 8. Selecting a chart type for specific data. 9. Examples of incorrect or manipulated graphics. Elements of the history of visualization. 10. Presentation of data about a variable that is a geographical coordinate. Cartographic projections. 11. Interpolation and approximation charts for point data. 12. Animations showing data changes when changing the selected parameter. 13. National and international guidelines and standards regarding types of charts and their presentation.		
Prerequisites and co-requisites	A. Formal PrerequisitesNo requirements B. PrerequisitesKnowledge of the basics of programming, mathematical analysis and descriptive statistics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	30.0%
	observation of the student's attitude	51.0%	0.0%
	project and its quality	51.0%	70.0%
Recommended reading	Basic literature	• R. Johansson, Matematyczny Python, Helion (2021). • C. Wilke, Podstawy wizualizacji danych : zasady tworzenia atrakcyjnych wykresów, Helion (2023). • W. McKinney, Python w analizie danych : przetwarzanie danych za pomocą pakietów pandas i NumPy oraz środowiska Jupyter (2022) • J. Schwabish, Better Data Visualizations, Columbia University Press (2021).	
	Supplementary literature	• C.N. Knaflic, Storytelling with data: A data visualization guide for business professionals (2015).	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Import raw data; clean/reformat it; transform and extract the data we want to show; select the appropriate chart type; write computer code to display the chart while meeting formal guidelines.		
Work placement	Not applicable		

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