University of Gdańsk

Subject card

Subject name and code	Data visualization (Laboratory classes), PG_00201217						
Field of study	Physical geography and geoinformation						
Date of commencement of studies	October 2027		Academic year of realisation of subject		2028/2029		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study		
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		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Geographic Information System (GIS) Laboratory -> Faculty of Oceanography and Geography -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		mgr Zbigniew Trusewicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	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	30		4.0		16.0	50
Subject objectives	1. Acquiring knowledge on effective presentation/communication of research results. 2. Improving practical skills in using Information Technology tools to present research results						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[GFGMU2_U02] is able to precisely and appropriately use terminology in the field of physical geography and geoinformation in oral statements and written works	The student uses specialist terminology in the field of geoinformation fluently in written work, applying it correctly and appropriately to the issues discussed. Contents: 1-9.	[SU2] presentation/project/paper/ report
[GFGMU2_U03] is able to use academic literature in the fields of physical geography and geoinformation in Polish and English, selecting it appropriately for the research objective	The student is able to effectively utilize appropriately selected scientific literature in the fields of physical geography and geoinformation in both Polish and English. Contents: 1-9.	[SU2] presentation/project/paper/ report
[GFGMU2_U04] is able, either independently or as part of a group, to formulate and test hypotheses regarding the causes and progression of physical-geographical processes and phenomena; selects and applies advanced research methods and tools, including statistical and geoinformatics methods, adapting them to the context where necessary; skilfully visualises the results of spatial data analysis, critically interprets the findings, and formulates conclusions and their own position based on these, which they justify in debate	The student Is able to use GIS tools to analyse and interpret the spatial variability of physical-geographical processes and phenomena. By applying advanced geoinformatic and statistical methods, processes and analyses spatial data, and interprets the obtained results in the context of environmental conditions, formulating independent conclusions and assessments on this basis. Contents: 1-9.	[SU2] presentation/project/paper/ report
[GFGMU2_K01] is able to behave appropriately in the workplace and in everyday life by critically evaluating information received in the light of their existing knowledge, recognising the importance of knowledge in solving cognitive and practical problems, and, when faced with difficulties, drawing on expert knowledge	The student is ready to critically assess his/her knowledge of Geographic Information Systems, to supplement and verify it by critically engaging with the relevant literature. Contents: 1-9.	[SK2] presentation/project/paper/ report
[GFGMU2_K03] is prepared to fulfil professional responsibilities in both independent and team-based work by advancing the field of geography, upholding the profession’s ethos, adhering to and developing the principles of professional ethics, and ensuring compliance with these principles	The student is ready to take responsibility for group work by assuming various roles within it, participating in the preparation of scientific projects, actively expanding professional competencies and updating knowledge in the field of geoinformation, as well as adhering to and developing professional ethics, including respecting copyright in their own and others' work. Contents: 1-9.	[SK2] presentation/project/paper/ report [SK8] observation of student's independent or team work
[GFGMU2_W05] knows and understands to a deepened extent principles of planning field and laboratory research using techniques and research tools used in geomorphology, hydrology and climatology, as well as principles of operating equipment and devices used to obtain and process digital geographic information in accordance with health and safety principles	The student knows and understands the principles of operating equipment and devices used for acquiring and processing digital geographic information. Contents: 1-9.	[SW2] presentation/project/paper/ report
[GFGMU2_W04] knows and understands theoretical foundations of research methods used in physical geography and closely related sciences, descriptive and mathematical statistics, as well as in a deepened extent methods of analyzing spatial phenomena	The Student has knowledge of and understands the theoretical foundations of research methods used in physical geography and related disciplines, including statistical methods, and is able to apply advanced techniques for the analysis of spatial phenomena using geoinformatics tools. Contents: 1-9.	[SW2] presentation/project/paper/ report

Subject contents	1. Goals, methods, tools, and applications of data visualization in physical geography. 2. Preparing data for visualization using the R package (dplyr package). 3. Pipeline processing (magrittr package). 4. R base package - data presentation methods. 5. R ggplot2 package - introduction, variable mapping, content management, chart creation techniques. 6. Preparing publication-quality charts. 7. Spatio-temporal clustering analyses. 8. 4D visualization of socio-economic and environmental phenomena. 9. Visualization of lithological data using vector graphics.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
practical exercises	51.0%	100.0%

Recommended reading

Basic literature	- J. Sander, M. Ester, H.-P. Kriegel, and X. Xu. Density-based clustering in spatial databases: The algorithm gdbscan and its applications. Data Min. Knowl. Discov., 2(2):169194, 1998. - M. Ester, H.-P. Kriegel, J. Sander, and X. Xu. A density-based algorithm for discovering clusters in large spatial databases with noise. In KDD, 1996. - Biecek P., 2017, Przewodnik po pakiecie R, Oficyna wydawnicza GIS, Warszawa. - Wickham H., 2017, ggplot2: Elegant- Graphics for Data Analysis , Springer International Publishing. - Dykes J., MacEachren A.M., Kraak M-J., 2005, Exploring Geovisualization. - Kraak M-J., 1998, Kartografia: wizualizacja danych przestrzennych.
Supplementary literature	- Bajkiewicz-Grabowska E., Markowski M., Lemańczyk K., 2016, Application of geoinformation techniques to determine zones of sediment resuspension induced by wind waves in lakes (using two lakes from Northern Poland as examples) , Limnological Review, 16: 3-14. - Houlding S., 2012, 3D geoscience modeling: computer techniques for geological characterization. Springer.Natali M., Klausen T.G., Patel D., 2014, Sketch-based modelling and visualization of geological deposition. Computers & Geosciences, 67: 40-48.
eResources addresses	

Example issues/ example questions/ tasks being completed	Processing data using R to prepare it for graphical visualization. Creating a geological profile using vector graphics. Using Space Time Cubes in ArcGIS Pro for spatiotemporal analysis.
Work placement	Not applicable

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