University of Gdańsk

Subject card

Subject name and code	Data processing (Laboratory classes), PG_00201196		
Field of study	Physical geography and geoinformation		
Date of commencement of studies	October 2027	Academic year of realisation of subject	2027/2028
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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	academic	Assessment form	credit
Conducting unit	Laboratory of Geomorphological Reconstructions -> Department of Geomorphology and Quaternary Geology -> Faculty of Oceanography and Geography -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Maurycy Żarczyński	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	60.0	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	8.0	7.0	75

Subject objectives	• Developing practical skills in tabular data processing and analysis using the R programming language and the Positron environment, including the use of the Git version control system. • Introducing students to the capabilities of the FME (Feature Manipulation Engine) ETL tool in the area of integration, transformation and automation of spatial and tabular data processing.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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	Knows basic statistical measures and methods for processing and transforming tabular and spatial data.	[SW4] test/exam - oral or written
	[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	Is able to select an appropriate data processing tool or method and justify the choice.	[SU5] implementation of a problem task
	[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	Is able to process and analyse tabular data and perform spatial data transformation using specialised software.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
	[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	Demonstrates a critical approach to obtained results.	[SK5] implementation of a problem task
	[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	Complies with copyright and licences of the data and tools used.	[SK2] presentation/project/paper/ report [SK8] observation of student's independent or team work
	[GFGMU2_U02] is able to precisely and appropriately use terminology in the field of physical geography and geoinformation in oral statements and written works	Is able to prepare a report using specialist terminology from the field of physical geography and geoinformation.	[SU5] implementation of a problem task
Subject contents	• Operating system structure file paths and file locations. • Introduction to R and the Positron environment; basic syntax, code commenting; installation and package management. • Basic data types in R: vectors, lists, numeric and logical types, type hierarchy. • Introduction to version control with Git and GitHub. • Importing tabular data (CSV, Excel, TXT and other formats). • Indexing and operations on data frames. • Basic statistical measures and data transformations (mean, median, logarithm, arithmetic operations). • Data processing with the dplyr package: select, rename, filter, summarise, mutate; tidyselect syntax and anonymous functions. • Introduction and familiarization with basic functions of the ETL tool FME (Feature Manipulation Engine) by SAFE Software. • Integration of the various spatial data types as an example of batch data transformation process into single output. • Automatization of the data processing using variable data sources (raster, vector, tabular) with geometry and attributes manipulation with the FME Workbench.		
Prerequisites and co-requisites			

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Test</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>Term works (FME)</td><td>51.0%</td><td>23.34%</td></tr>
<tr><td>Term work (R)</td><td>51.0%</td><td>46.66%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Komsta, 2004, Wprowadzenie do środowiska R - R Project - https://cran.r-project.org/doc/contrib/Komsta-Wprowadzenie.pdf

Biecek P., 2014, Przewodnik po pakiecie R, GIS, Wrocław - http://biecek.pl/r/przewodnikpopakiecierwydanieiiiinternet.pdf

Wickham H., Çetinkaya-Rundel M., Grolemund G., 2024, R for Data Science. 2nd Edition, O'Reilly Media</td></tr>
<tr><td>Supplementary literature</td><td>FME Transfomer Reference Guide: https://cdn.safe.com/resources/fme/FME-Transformer-Reference-Guide.pdf

Syed Muhammad Fahad Akhtar, 2017, Big Data Architect's Handbook, Packt Publishing Ltd.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">• Loading a tabular file and inspecting data structure.
• Filtering, selecting and aggregating data using the dplyr package.
• Calculating basic statistical measures and transforming columns using anonymous functions.
• Cloning a repository from GitHub and managing project files.
• Transformations of data structure and content.
• File format conversion and geoprocessing using FME.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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