University of Gdańsk

Subject card

Subject name and code	Introduction to Geodata Science - laboratory, PG_00200513						
Field of study	Geography						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2028/2029			
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	5		ECTS credits	3.0			
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	dr Maciej Markowski					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	40.0	0.0	0.0	40
	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	40		4.0	31.0	75	
Subject objectives	The aim of the course is to introduce students to the methodology of acquiring, processing, and analyzing spatial data using relational databases and the Python programming language. Students will learn to integrate tabular and geospatial data, apply basic and advanced analytical operations, and visualize results in the form of maps and charts. The exercises develop skills in automating data processing, verifying data quality, and performing spatial analyses.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[GEOGRL3-U09] is able to work in a group and take on various roles within it, look after the equipment entrusted to them, and ensure their own safety and that of others.	The student works effectively in a team during exercises and projects, taking on different roles within the group, ensuring proper and safe use of computer equipment and digital data, and adhering to laboratory safety rules.	[SU2] presentation/project/paper/ report
[GEOGRL3-W04] has advanced knowledge of the Earth's geographical environment, understood as a unified system of interconnected and interacting components; its diversity, functioning, and dynamics of change, including the interaction of environmental components in the area of the South Baltic Coast and Lake District	The student understands the structure and interrelationships of geographic environment components and can analyze their spatial variability and dynamics using data stored in relational databases.	[SW2] presentation/project/paper/ report
[GEOGRL3-U03] can plan and conduct, independently and as part of a team, simple research in the field of geography under the supervision of a scientific advisor, based on the necessary information from professional literature and other sources	The student independently or collaboratively organizes and performs geographic data analyses, including acquisition, processing, and visualization of spatial and tabular data using SQL, Python, and GIS tools, applying appropriate information sources and professional literature.	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task
[GEOGRL3-W06] knows advanced methods of acquiring, processing, and compiling geographic environmental data, as well as methods of analyzing and interpreting such data	The student is knowledgeable about methods for acquiring, integrating, and processing spatial and tabular data, and is familiar with basic methods for analyzing and interpreting results in the context of geographic problems in a selected region.	[SW2] presentation/project/paper/ report
[GEOGRL3-W02] knows and understands key concepts and theories in geography, as well as advanced processes and phenomena related to spatial diversity and the distribution of processes and phenomena on the Earth's surface at various spatial scales, particularly in Poland	The student has knowledge of key concepts and methods in the analysis of spatial and tabular data, understands data variability, the structure of relational databases, and methods for integrating and processing data at different scales.	[SW2] presentation/project/paper/ report [SW5] implementation of a problem task

Subject contents

1. GeoData Science: scope and working environment
2. Relational databases and spatial data models
3. SQL queries and data operations
4. Data verification and quality control in SQL
5. Introduction to programming in Python
6. Analysis of tabular data in Python (pandas)
7. Automation of data processing in Python
8. GeoPandas: working with spatial data
9. Spatial operations in Python
10. Visualization of spatial data in Python
11. Spatial modeling and processing in QGIS
12. Final project: analysis of a spatial problem

Prerequisites and co-requisites

Completeion of GIS and Remote Sensing III

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
final project	51.0%	60.0%
practical exercises	51.0%	40.0%

Recommended reading

Basic literature

- McKinney W., 2023, Python w analizie danych. Przetwarzanie danych za pomocą pakietów pandas i NumPy oraz środowiska Jupyter, Wydawnictwo Helion, Gliwice.
- Grus J., 2020, Data science od podstaw. Analiza danych w Pythonie. Wydawnictwo Helion, Gliwice.
- Goldwasser M., Malik U., Johnston B., 2021, SQL. Analiza danych za pomocą zapytań. Warsztaty praktyczne, Wydawnictwo Helion, Gliwice.

	Supplementary literature	• Rey S. J., Arribas-Bel D., Wolf L. J., 2023, *Geographic Data Science with Python*, CRC Press, Boca Raton.
	eResources addresses	Supplementary https://geographicdata.science/book/intro.html - The book Geographic Data Science with Python is available as an open-access online resource.
Example issues/ example questions/ tasks being completed	• What are the basic types of SQL queries, and how do they allow for data selection, aggregation, and joining data from different tables? • What steps should be taken to verify the quality and consistency of data before starting an analysis? • Which functions and methods in Python enable the processing, filtering, and aggregation of tabular and spatial data?	
Work placement	Not applicable	

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