GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00069059		
Field of study	Zaawansowane metody geoinformatyczne		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Geodesy -> Faculty of Civil and Environmental Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Adam Inglot	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 1204 Zaawansowane metody geoinformatyczne, (WILiŚ, GiK, st. II, sem. 2) - rok 2025/2026 https://enauczanie.pg.edu.pl/2025/course/view.php?id=1204

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	45	0.0	0.0	45

Subject objectives

Students become familiar with the design and execution of advanced spatial analyses in a GIS environment using Python. Over the course, they master programming fundamentals, working with the **arcpy** library, performing raster and vector analyses through scripts, and the basics of point-cloud processing (LAS/LAZ) with **laspy**, developing the ability to build reproducible workflows and to document results rigorously.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W05] has a well-established knowledge of analytical methods and surveying techniques necessary for creating and solving a variety of problems in geodesy and cartography	Has a solid knowledge of modern surveying techniques (GNSS, photogrammetry, ALS/TLS scanning) and of how to integrate them with GIS data to solve complex spatial problems.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K7_U06] creates solutions to complex and unstructured problems taking into account the variability of the environment by synthesising information from different sources, using analytical and simulation methods	Formulates and solves an unstructured geoinformatics problem: defines objectives, criteria, and constraints; selects appropriate analytical/simulation methods; and iteratively updates assumptions in response to data and environmental variability.	[SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania

Subject contents

The course covers the design and execution of advanced spatial analyses in GIS using Python (arcpy/geopandas), including vector/raster operations, network analyses, and cost-distance/least-cost path modeling. Participants learn point-cloud processing (ALS/TLS with laspy) and generation of elevation products (DTM/DSM/CHM). We integrate measurement data (GNSS, orthophotos, ALS), with a focus on quality control and uncertainty assessment. Emphasis is placed on workflow automation, transparent documentation, and preparing results for publication (maps/reports).

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
project	50.0%	100.0%

Recommended reading	Basic literature	1. P. A. Longley, M. F. Goodchild, D. J. Maguire, D. W. Rhind - GIS. Teoria i praktyka. Wydawnictwo Naukowe PWN, Warszawa, 2008 2. J. Urbański - GIS w badaniach przyrodniczych. Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk, 2008 3. J. Adamczyk, K. Będkowski - Metody cyfrowe w teledetekcji, Wydawnictwo SGGW, Warszawa, 2007 4. R. J. Wilson Wprowadzenie do teorii grafów, Wydawnictwo Naukowe PWN, Warszawa 2012 5. J. Smith, P. Smith - Environmental modeling an introduction, Oxford University Press, 2007
	Supplementary literature	1. Bonaccorso, Giuseppe. *Machine learning algorithms*. Packt Publishing Ltd, 2017. 2. Toms, Silas. *ArcPy and ArcGISGeospatial Analysis with Python*. Packt Publishing Ltd, 2015. 3. Beyeler, Michael. *Machine Learning for OpenCV*. Packt Publishing Ltd, 2017.
	eResources addresses	
Example issues/ example questions/ tasks being completed	• GIS data models (vector/raster/DTM/DSM/CHM) and data quality/uncertainty. • Network analyses: cost-distance, shortest path, route variants. • Point-cloud processing (LAS/LAZ): filtering, DTM/DSM/CHM. • Integration of GNSS/orthophotos/ALS, georeferencing and fit control. • Workflow automation in Python (arcpy, geopandas, rasterio, laspy).	
Practical activites within the subject	Not applicable	

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