GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Geospatial Analysis with GIS in Science, Engineering, and Industry, PG_00073941		
Field of study	Electrical Engineering		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle 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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Power Converters and Energy Storage Group -> Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Andrzej Augusiak	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	25.0	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	5.0	30.0	75

Subject objectives

Providing knowledge and skills related to the acquisition, processing, analysis and visualization of spatial data and the use of Geographic Information Systems (GIS) for solving research, technical, environmental and socio-economic problems. Developing the ability to apply spatial analysis methods in decision-making processes and interdisciplinary team projects.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W101] is able to make an in-depth identification of key objects and phenomena related to the field of study, as well as theories that describe them and applicable analytical and design methods	Understands spatial data models, geographic data sources, spatial analysis methods and the application of GIS technologies for investigating and modelling phenomena occurring in science, engineering and the economy.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_K03] can interact and work in a group assuming various roles and identify priorities for the achievement of a specific task	Effectively collaborates within a project team, participates in task allocation, project planning and presentation of project results.	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice
[K7_U101] is able to formulate complex research problems and adopts appropriate methods, obtaining innovative solutions, cooperating with other people, both as a leader and a team member	Is able to select appropriate GIS methods and tools for solving complex research or practical problems, perform spatial analyses, and develop and justify proposed solutions while working in a project team.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject
[K7_U03] is able to obtain information from literature, databases and other sources, also in English, draw conclusions, formulate and fully justify opinions. substantiate opinions; is able to identify directions for further learning and implement the process of self-education	Is able to acquire, integrate and critically evaluate spatial data obtained from various sources, including Geoportal, spatial databases, scientific literature and other online resources.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

Geographic Information Systems (GIS) and their role in modern science, technology and economy. Spatial data and data models. Raster and vector maps. Coordinate systems and cartographic projections. Sources of spatial data, spatial information infrastructures and public spatial data resources, including Geoportal, BDOT10k, OpenStreetMap, and WMS/WFS services. Methods of spatial data acquisition, including satellite imagery and digital terrain models. Cartographic visualization. Spatial databases and spatial queries. Spatial and multi-criteria analyses supporting decision-making processes. GIS applications in power engineering, renewable energy systems, technical infrastructure, environmental protection, transport, spatial planning and socio-economic analyses. Contemporary GIS developments, including machine learning and artificial intelligence methods supporting spatial analyses.

Course content – project

Implementation of a GIS project in teams of 2–3 students using the QGIS software. Acquisition, integration and verification of spatial data obtained primarily from Geoportal and other public data sources. Development of a GIS project, performance of spatial analyses, preparation of thematic maps and visualization of results. Interpretation of analysis results and assessment of the limitations of the applied methods. The project addresses research or practical problems proposed by or agreed with the lecturer, related, among others, to power engineering, renewable energy sources, technical infrastructure, transport, environmental protection, spatial planning, or socio-economic analyses. The project includes problem identification, selection of appropriate datasets and spatial analysis methods, execution of GIS analyses, interpretation of the obtained results, as well as preparation of a project report and presentation of the results.

Prerequisites and co-requisites

Basic computer literacy and ability to use Internet resources. No prior knowledge of GIS or geospatial software is required.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Evaluation of the project final report	50.0%	30.0%
Evaluation of project implementation and outcomes	50.0%	70.0%

Recommended reading

Basic literature

1. Longley P.A. i in.: **GIS. Teoria i praktyka.** Wydawnictwo Naukowe PWN, Warszawa 2006.

2. Chang K.-T.: **Introduction to Geographic Information Systems.** McGraw-Hill Education 2019.

3. Izdebski W.: **Infrastruktura danych przestrzennych w Polsce.** GeoSystem, Warszawa 2020.

Supplementary literature

1. Szczepanek R.: **Systemy informacji przestrzennej z QGIS. Część I i II.** Wydawnictwo Politechniki Krakowskiej, Kraków 2017.

2. Iwańczak B.: **QGIS. Tworzenie i analiza map.** Helion, Gliwice 2020

3. Izdebski W., Seremet A.: **Praktyczne aspekty Infrastruktury Danych Przestrzennych w Polsce.** Główny Urząd Geodezji i Kartografii, Warszawa 2020

eResources addresses

Supplementary

https://geoportal.gov.pl - Central node of the Polish Spatial Data Infrastructure (SDI); map viewer and access point for official state WMS, WFS, and WMTS services.

https://docs.qgis.org - Official QGIS documentation, including the Desktop User Guide and A Gentle Introduction to GIS.

https://geoforum.pl - A web portal covering topics related to geodesy, cartography, cadastre, GIS, photogrammetry and remote sensing, satellite navigation, etc. It also includes downloadable publications: https://geoforum.pl/gis/publikacje

https://openinframap.org - Open Infrastructure Map is a view of the world's infrastructure mapped in the OpenStreetMap database.

https://geogdansk.pl - GIS of Gdańsk.

Example issues/ example questions/ tasks being completed

Concepts and definitions related to Geographic Information Systems (GIS).
Spatial data models: raster and vector data.
Coordinate systems and cartographic projections used in GIS.
Geoportal, BDOT10k, OpenStreetMap and other spatial data sources.
WMS and WFS services and their use in GIS environments.
Spatial data visualization and thematic mapping.
Spatial and multi-criteria analyses supporting decision-making.
Assessment of spatial data quality and reliability.
GIS applications in power engineering and renewable energy systems.
GIS applications in transport, environmental protection and spatial planning.
Development of a GIS project using QGIS software and data obtained primarily from Geoportal.
Interpretation of spatial analysis results and presentation of project outcomes.

Practical activites within the subject	Not applicable

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