GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Information technology / GIS - inventory, PG_00068064						
Field of study	Spatial Development						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	first-cycle studies		Subject group	Obligatory subject group in the field of study Subject group related to scientific research 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	2		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Urban Design and Regional Planning -> Faculty of Architecture -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. arch. Weronika Mazurkiewicz				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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		2.0	18.0		50
Subject objectives	The course introduces students to the fundamentals of Geographic Information Systems (GIS), with a focus on the practical use of QGIS and ArcGIS software. Each student selects a municipality in the Pomeranian Voivodeship and develops a set of inventory maps for that area. The course covers work with various types of spatial data vector, raster, WMS/WFS services, as well as terrain models and LAS point clouds. Participants learn georeferencing, digitization, data symbolization, and the creation and management of geospatial databases. An important component is also the creation of map layouts and preparing data for online publication. The course develops skills in map creation, working with geo-surveys, and using field data collection tools. It culminates in a presentation of individual inventory projects.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K01] critically evaluates the received content; Recognizes the importance of knowledge in solving cognitive and practical problems; it reflects on the ethical, scientific and social aspects related to the urban planner and planner's work	The student is able to independently acquire and critically select sources of spatial data, as well as properly symbolize and cartographically present them in the form of clear and visually appealing thematic maps.	[SK3] Assessment of ability to organize work [SK2] Assessment of progress of work
	[K6_U07] evaluates the usefulness of standard methods and tools used in planning and management of spatial development and is able to select and apply the most appropriate ones	The student is able to adapt appropriate cartographic techniques to the specific characteristics of the area under analysis, creating reliable and functional map-based studies that support decision-making processes in spatial planning.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K6_K02] comprehending technical and non-technical aspects and effects of its activity, initiates various activities for the public interest, including co-organizing social projects, workshops and public debates on issues related to spatial management, within which it can reliably present a problem on a non-professional forum and explain the methods and solutions used	The student will develop the ability to present spatial planning issues in a manner that is understandable to non-professional audiences. They will be able to communicate complex spatial problems through accessible cartographic materials and clearly explain the methods and tools applied. The course also fosters a sense of public engagement through the conscious use of GIS technologies in social and educational initiatives.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	**Block 1** **Lecture:** Introduction to GIS what a geographic information system is, examples of applications in spatial management. Overview of basic data types (vector, raster, point datasets) and introduction to the QGIS interface. **Laboratory:** Working with the QGIS interface, adding layers, basic navigation, creating the first map layout Layout 1. **Block 2** **Lecture:** Detailed discussion of polygon vector data structure, attributes, usage examples. Sources of spatial data e.g., Geoportal, BDOT, OpenStreetMap. **Laboratory:** Downloading polygon data, adding it to the project, basic symbolization, and preparing Layout 2. **Block 3** **Lecture:** Vector data points and lines, their applications in spatial analyses. Data sources e.g., addresses, POIs, linear infrastructure. Working with plugins. **Laboratory:** Downloading and adding point and line data, creating heatmaps (cluster maps), preparing Layout 3. **Block 4** **Lecture:** Introduction to raster data types (orthophotos, scans), applications. Raster georeferencing and digitizing tools. **Laboratory:** Practical raster georeferencing using a local spatial development plan example, digitizing map elements, Layout 4. **Block 5** **Lecture:** Web services: WMS, WMTS, WFS characteristics and differences. Overview of national online data sources (Geoportal, GUGiK, UM). **Laboratory:** Adding WMS and WFS services to QGIS, symbolizing layers from web services, Layout 5. **Block 6** **Lecture:** Spatial databases role, structure, and capabilities. Introduction to the geopackage format and styles (qml). **Laboratory:** Creating geopackage databases, assigning styles to layers, exporting data, Layout 6. **Block 7** **Lecture:** Digital Terrain Model (DTM) acquisition, visualization, examples of use in spatial analysis. **Laboratory:** Loading DTM, symbolizing with shading and contour lines, clipping to municipal boundaries, Layout 7. **Block 8** **Lecture:** Introduction to ArcGIS Pro differences compared to QGIS, project structure, synchronization with ArcGIS Online. **Laboratory:** Adding data to ArcGIS Pro, symbolization, creating maps with multiple view windows, Layout 8. **Block 9** **Lecture:** Basic drawing tools in ArcGIS Online editing vector layers, drawing geometries. **Laboratory:** Designing site development for public space in ArcGIS Pro, Layout 9. **Block 10** **Lecture:** LAS data point clouds, data structure, use in elevation analyses. **Laboratory:** Symbolizing LAS data, filtering and clipping, preparing Layout 10. **Block 11** **Lecture:** GML format standard for planning data, GIS integration. 3D data conversion from LAS to multipatch. **Laboratory:** Creating a simplified 3D model of a municipality based on LAS data, converting to multipatch format, Layout 11. **Block 12** **Lecture:** Introduction to ArcGIS Online thematic maps, data publishing. **Laboratory:** Creating and publishing an interactive online map, configuring user view, Layout 12. **Block 13** **Lecture:** Field data collection tools Survey123, QuickCapture, their applications in education and community participation. **Laboratory:** Creating a geo-survey and mobile data collection app, field testing or simulation, Layout 13.

Block 14
Lecture: Introduction to ArcGIS Field Maps linking field data with GIS projects, planning data collections.
Laboratory: Creating a comprehensive summary of all semester work, Layout 14.

Block 15
Lecture: Course summary review of acquired skills, preview of advanced GIS topics and possible development paths.
Laboratory: Presentation of individual municipal inventory projects, discussion of final Layout, and reflection on practical GIS applications.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Timely and accurate completion of all Layouts	51.0%	90.0%
Presentation of results	51.0%	10.0%

Recommended reading

Basic literature

1. Bielecka E., Systemy informacji geograficznej. Teoria i zastosowania, Wyd. PJWSTK, Warszawa 2006

3. Gotlib D., Iwaniak A., Olszewski R., GIS. Obszary zastosowań, PWN, Warszawa 2008

4. Januszewski J., Systemy satelitarne GPS, Galileo i inne, PWN, Warszawa 2006

5. Kraak-Menno J., Ormeling F., Kartografia-wizualizacja danych przestrzennych, PWN, Warszawa 1998

6. Kurczyński Z., Preuss R., Podstawy fotogrametrii, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2004

8. Longley P.A., Goodchild M.F., Rhind D.W., Magnuszewski A. (red.), GIS Teoria i praktyka, PWN, Warszawa 2006

9. Magnuszewski A., GIS w geografii fizycznej, PWN, Warszawa 1999

10. Pasławski J. (red.), Wprowadzenie do kartografii i topografii, Wyd. Nowa Era, 2006

11. Urbański J., GIS w badaniach przyrodniczych, Wyd. Uniw. Gdańskiego, Gdańsk 2008

Supplementary literature

1. Przewłocki S., Geomatyka, Wyd. Naukowe PWN, W-wa 2008

2. Sanecki J. (red.), Teledetekcja. Pozyskiwanie danych, Wyd. WNT, W-wa 2006

3. Specht C., System GPS, Bernardinum, Gdańsk 2007

4. Werner P., Wprowadzenie do systemów geoinformacyjnych, W-wa 2004

eResources addresses

Example issues/ example questions/ tasks being completed	• What are the differences between vector and raster data, and when should each type be used? • How can spatial data be downloaded and its quality verified from various sources, such as Geoportal or OpenStreetMap? • How is the raster georeferencing process performed based on a spatial development plan? • How can thematic maps be created using symbolization and map layouts? • How to use WMS/WFS web services and integrate them into GIS projects? • How to prepare and manage a geopackage database and apply QML styles? • How to utilize the Digital Terrain Model (DTM) for spatial analyses and visualization? • What are the basic drawing and editing tools in ArcGIS Online? • How to create and test geo-surveys and applications for collecting field data?
Work placement	Not applicable

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