Web GIS
Course description sheet

Basic information

Field of study Geospatial Computer Science	**Didactic cycle** 2023/2024
Major Modeling environment information	**Course code** DGEIMIS.IIi4.07189.23
Organisational unit Faculty of Geo-Data Science, Geodesy, and Environmental Engineering	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatoriness** Elective
Form of study Full-time studies	**Block** Elective Modules in Foreign Language
Profile General academic	**Course related to scientific research** Yes

Course coordinator	Mariusz Twardowski, Krystyna Michałowska
Lecturer	Mariusz Twardowski, Krystyna Michałowska

Period Semester 3	**Method of verification of the learning outcomes** Completing the classes **Activities and hours** Lectures: 15 Project classes: 30	**Number of ECTS credits** 3

Goals

C1	The course aims to equip students with the knowledge and skills needed to effectively share GIS data using various network techniques, and to be able to design, develop, and implement web-based GIS applications that enable data sharing and collaboration. It will cover topics such as data sharing protocols, web mapping, and the use of online GIS platforms for collaboration and data sharing.

Course's learning outcomes

Code	Outcomes in terms of	Learning outcomes prescribed to a field of study	Methods of verification
Knowledge – Student knows and understands:			
W1	Knowledge of possible usages of network protocols and Web applications for GIS data sharing.	GEI2A_W02, GEI2A_W05	Test
Skills – Student can:			
U1	The skill of using Python language for writing network applications.	GEI2A_U02	Project
U2	The skill of Web services configuration through network protocols.	GEI2A_U03	Test
Social competences – Student is ready to:			
K1	Familiarity with new technologies used in data sharing.	GEI2A_K03	Activity during classes

Program content ensuring the achievement of the learning outcomes prescribed to the module

Web application and Python usage for internet data sharing.

Student workload

Activity form	Average amount of hours* needed to complete each activity form
Lectures	15
Project classes	30
Realization of independently performed tasks	30
Examination or final test/colloquium	2
Contact hours	1
Student workload	**Hours** 78
Workload involving teacher	**Hours** 45

* hour means 45 minutes

Program content

No.	Program content	Course's learning outcomes	Activities
1.	Lectures content: Introduction to WebGIS - definitions, history, significance, and applications. Architecture of WebGIS systems - client-server, online map services, cloud computing. Introduction and overview of popular map servers and geospatial services (WMS, WFS, WCS, WMTS). WebGIS application design methodologies - from idea to product. Security and performance aspects of WebGIS applications. Trends and the future in WebGIS - mobile applications, integration with remote sensing systems, big data.	W1, K1	Lectures
2.	Project classes content: Analysis of existing WebGIS solutions in terms of functionality, usability, used technologies, and available data (including identification of used technologies such as map servers, databases, front-end frameworks). Designing and implementing a simple web application (vector and raster data). Spatial database design and implementation (PostGIS, PostgreSQL, others). Integration of map services with the web application. Installation and configuration of a selected map server, importing spatial data, configuring services (WMS, WFS, WCS), defining styles for provided layers.	U1, U2, K1	Project classes

Extended information/Additional elements

Teaching methods and techniques :

Classes partially supported by e-learning tools conducted in the UPEL, BigBlueButton, or MS Teams environment., Team Based Learning, Workshop, Problem Based Learning, Design thinking, Discussion, Classes partially supported by e-learning tools conducted in the UPEL, BigBlueButton, or MS Teams environment., E-learning, Lectures, Classes partially supported by e-learning tools conducted in the UPEL, BigBlueButton, or MS Teams environment.

Activities	Methods of verification	Credit conditions
Lectures	Activity during classes, Test	positive grade
Project classes	Activity during classes, Test, Project	positive grade

Conditions and the manner of completing each form of classes, including the rules of making retakes, as well as the conditions for admission to the exam

To be allowed to take the exam, all projects must be passed.

Method of determining the final grade

Evaluation is subject to the manner of execution and presentation of project.

Manner and mode of making up for the backlog caused by a student justified absence from classes

Compensating for the backlog caused by absence: depending on the classes subject – self-realisation of excercises with the help of individual consultations with the instructor.

Prerequisites and additional requirements

Ability to understand English.
Computer usage knowledge.
Basic Python language familiarity.
Ability to use a web browser.

Rules of participation in given classes, indicating whether student presence at the lecture is obligatory

Lectures: students participate in the class by learning the subsequent teaching content according to the course syllabus. Students should ask questions and clarify doubts on an ongoing basis. Audio-visual recording of the lecture requires the consent of the instructor.
Project classes: students perform in teams projects aimed at achieving the competencies assumed by the syllabus.

Literature

Obligatory

1. 1. Ward Brian : "How Linux Works, 2nd edition", 2015
2. 2. Dawson Michael: "Python Programming for Absolute beginner, 3rd edition". 2010
3. 3. Python documentation: http://pl.python.org
4. 4. Documentation for projects: Linux, Apache, WSGI

Scientific research and publications

Publications

1. K. Pyka, M. Twardowski: "Miejsce wolnego oprogramowania w nauczaniu geoinformatyki". Archiwum Fotogrametrii, Kartografii i Teledetekcji. 2007.
2. Twardowski M., Pastucha E., Kolecki J., 2016: Performance of the automatic bundle adjustment in the virtualized environment
3. Hejamnowska B., Twardowski M., Żądło A., 2021: An application of the "traffic lights" idea to crop control in integrated administration control system
4. Rzonca A., Twardowski M., 2022, The lidargrammetric model deformation method for altimetric UAV-ALS data enhancement

Learning outcomes prescribed to a field of study

Code	Content
GEI2A_K03	aktywnego i kreatywnego włączenia się w dynamiczny rozwój geoinformacji, wzmacniania jej roli w społeczeństwie oraz popularyzowania powszechnego korzystania z danych przestrzennych.
GEI2A_U02	programować, modyfikować i rozbudowywać istniejące aplikacje oraz łączyć różne technologie informatyczne w zakresie geoinformacji.
GEI2A_U03	stosować specjalistyczne metody przetwarzania obrazu i wykorzystania danych fotogrametrycznych i teledetekcyjnych.
GEI2A_W02	złożone zasady programowania oraz konstruowania algorytmów, niezbędne do czytania ze zrozumieniem, pisania, uruchamiania i weryfikacji programów.
GEI2A_W05	zasady i metody automatyzacji przetwarzania danych, pozwalające na rozwiązywanie zagadnień geoinformatycznych i inżynierskich.