Platforms and Sensors
Course description sheet

Basic information

Field of study Geospatial Computer Science	**Didactic cycle** 2024/2025
Major Remote Sensing and GIS	**Course code** DGEITGS.IIi1.07197.24
Organisational unit Faculty of Geo-Data Science, Geodesy, and Environmental Engineering	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatoriness** Obligatory
Form of study Full-time studies	**Block** Major Modules
Profile General academic	**Course related to scientific research** Yes

Course coordinator	Ewa Głowienka

Lecturer	Ewa Głowienka, Krystyna Michałowska

Period Semester 1	**Method of verification of the learning outcomes** Exam **Activities and hours** Lectures: 15 Project classes: 30	**Number of ECTS credits** 4

Goals

C1	Familiarizing students with the fundamental principles of observation platforms and sensors used in remote sensing, including their classification, characteristics, and applications.
C2	Preparing students to effectively apply remote sensing technologies in environmental monitoring, mapping, and spatial analyses across various fields of science and professional practice.

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	applied digital image processing methods	GEI2A_W03	Participation in a discussion
W2	electromagnetic radiation and basic physical quantities that can be determined by remote sensing	GEI2A_W01, GEI2A_W03	Examination
Skills – Student can:			
U1	perform basic operations on digital images including: digital image filtering with appropriate algorithms and lossy and lossless compression	GEI2A_U02, GEI2A_U05	Project
Social competences – Student is ready to:			
K1	fluently communicate in stressful business situations, expresses clearly own point of view during presentations and negotiation	GEI2A_K01, GEI2A_K04	Presentation

Student workload

Activity form	Average amount of hours* needed to complete each activity form
Lectures	15
Project classes	30
Realization of independently performed tasks	50
Contact hours	5
Student workload	**Hours** 100
Workload involving teacher	**Hours** 45

* hour means 45 minutes

Program content

No.	Program content	Course's learning outcomes	Activities

No.	Program content	Course's learning outcomes	Activities
1.	Introduction to observation platforms - overview, types, and applications in remote sensing. Remote sensing satellites - characteristics of orbits (low, medium, geostationary), types of satellites (meteorological, earth observation systems), overview of major missions. Aerial platforms in remote sensing - UAVs (unmanned aerial vehicles), aircraft and balloons as sensor carriers; advantages and limitations.	W1, W2	Lectures
2.	Remote sensing sensors - classification, characteristics, operating principles, technologies, data analysis methods, applications in remote sensing, applications in monitoring and mapping. - optical and multispectral, - radar (SAR) and lidar, - thermal and microwave.	W1, W2, U1, K1	Project classes

Extended information/Additional elements

Teaching methods and techniques :

Discussion, Lectures, Design thinking, E-learning, Problem Based Learning, Project Based Learning, Case study, Workshop, Team Based Learning

Activities	Methods of verification	Credit conditions
Lectures	Participation in a discussion, Examination	
Project classes	Project, Presentation	

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

Students should have a basic knowledge of remote sensing and the use of Geographic Information Systems (GIS). Proficiency in English at a level enabling work with scientific literature is required.

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. Paul M. Mather, Magaly Koch, 2011. Computer Processing of Remotely-Sensed Images: An Introduction. John Wiley & Sons, Ltd
2. 2. Robert A. Schowengerdt, 2012. Remote Sensing, Third Edition: Models and Methods for Image Processing. Elsevier.
3. 3. Emilio Chuvieco, 2016, Fundamentals of Satellite Remote Sensing: An Environmental Approach. CRC Press.

Scientific research and publications

Publications

1. Michałowska, K.; Pirowski, T.; Głowienka, E.; Szypuła, B.; Malinverni, E.S. Sustainable Monitoring of Mining Activities: Decision-Making Model Using Spectral Indexes. Remote Sens. 2024, 16, 388. https://doi.org/10.3390/rs16020388
2. Hejmanowska, B.; Kramarczyk, P.; Głowienka, E.; Mikrut, S. Reliable Crops Classification Using Limited Number of Sentinel-2 and Sentinel-1 Images. Remote Sens. 2021, 13, 3176. https://doi.org/10.3390/rs13163176
3. Głowienka, E; Zembol, N. Forest Community Mapping Using Hyperspectral (CHRIS/PROBA) and Sentinel-2 Multispectral Images. Geomatics and Environmental Engineering 2022, 16, 103 -117.

Learning outcomes prescribed to a field of study

Code	Content
GEI2A_K01	samodoskonalenia, a także postępowania profesjonalnego, odpowiedzialnego i zgodnego z zasadami etyki zawodowej.
GEI2A_K04	aktywnego i kreatywnego współdziałania w zespole oraz efektywnego kierowania nim.
GEI2A_U02	programować, modyfikować i rozbudowywać istniejące aplikacje oraz łączyć różne technologie informatyczne w zakresie geoinformacji.
GEI2A_U05	formułować i rozwiązywać zadania przestrzenne, posługując się zaawansowanymi funkcjami analitycznymi, w tym implementować adekwatne algorytmy obliczeniowe.
GEI2A_W01	złożone zasady pozyskiwania z różnych źródeł danych przestrzennych oraz środowiskowych.
GEI2A_W03	zaawansowane metody i techniki, w tym teledetekcyjne, stosowane do pozyskiwania i przetwarzania danych przestrzennych i środowiskowych na potrzeby geoinformacji.