Earth Observation and Geoinformation Science

Course description sheet

Basic information

Field of study Remote Sensing and Geo Informatics **Major** All **Organisational unit** Faculty of Geo-Data Science, Geodesy, and Environmental Engineering **Study level** Second-cycle studies **Form of study** Full-time studies **Profile** General academic	**Didactic cycle** 2026/2027 **Course code** DRSGIS.II1.15492.26 **Lecture languages** English **Mandatoriness** Obligatory **Block** Foundation Modules **Course related to scientific research** Yes

Course coordinator	Ewa Głowienka
Lecturer	Ewa Głowienka, Sławomir Mikrut, Beata Hejmanowska, Urszula Marmol, Natalia Borowiec, Tomasz Pirowski, Wojciech Drzewiecki, Mariusz Twardowski, Antoni Rzonca

Period	**Method of verification of the learning outcomes**	**Number of ECTS credits**
Semester 1	Exam **Activities and hours** Lectures: 30 Workshop classes: 120	10

Goals

C1	To introduce students to a variety of techniques for remotely recording information about objects and processes occurring on the ground surface.

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	fundamentals knowledge of remote sensing and geoinformation	RSGI2A_W02, RSGI2A_W03	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation
W2	methods and algorithms of remote sensing and geospatial data processing	RSGI2A_W02, RSGI2A_W03, RSGI2A_W04	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation
Skills – Student can:			
U1	apply remote sensing and geoscience knowledge in practice	RSGI2A_U01, RSGI2A_U02, RSGI2A_U03, RSGI2A_U04, RSGI2A_U06	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation
U2	apply methods and algorithms of remote sensing data processing	RSGI2A_U01, RSGI2A_U02, RSGI2A_U03, RSGI2A_U04, RSGI2A_U06	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation
U3	perform remote sensing image analysis using multisensor data	RSGI2A_U01, RSGI2A_U02, RSGI2A_U03, RSGI2A_U04, RSGI2A_U06	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation
Social competences – Student is ready to:			
K1	intentionally select fit-to-use data	RSGI2A_K01, RSGI2A_K02, RSGI2A_K03	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation
K2	apply the appropriate remote sensing technologies depending on the needs	RSGI2A_K01, RSGI2A_K02, RSGI2A_K03	Activity during classes, Participation in a discussion, Examination, Report, Case study, Presentation

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

The module is designed to provide knowledge about the possibilities of remote sensing applications in solving tasks carried out by various fields. In the module, the student will learn about optical, thermal and radar remote sensing data registered from ground, airborne and satellite levels. The student will learn to use remote sensing data in monitoring selected environmental elements.

Student workload

Activity form	Average amount of hours* needed to complete each activity form
Lectures	30
Workshop classes	120
Realization of independently performed tasks	50
Examination or final test/colloquium	2
Preparation of project, presentation, essay, report	50
Preparation for classes	40
Contact hours	5
Student workload	**Hours** 297
Workload involving teacher	**Hours** 150

* hour means 45 minutes

Program content

No.	Program content	Course's learning outcomes	Activities
1.	Within the block of classes lecture, worshop acitivities student will become familiar with topics related to techniques and algorithms for Earth Observation and Geoinformation Science such as: Acquisition of optical and radar images (including Landsat 8, Sentinel-1, Sentinel-2).Sensor calibration: radiometric, atmospheric, geometric correction; Panchromatic, multispectral, hyperspectral images; Image processing (contrast, filtering, thresholding); Information extraction: color compositions, vegetation indices, image classification; Radar data processing - analysis, application; Radar interferometry technique; Thermography - determination of temperature distribution maps from satellite, aerial data. Interpretation of thermograms. During classes student will also receive basic knowledge of the key principles of launch vehicles and propulsion: fundamentals of aerodynamics; guidance, navigation and control of vehicles.	W1, W2, U1, U2, U3, K1, K2	Lectures, Workshop classes

Extended information/Additional elements

Teaching methods and techniques :

Lectures, Discussion, E-learning, Case study, Group work, Design thinking, Problem Based Learning, Mentoring, Workshop

Activities	Methods of verification	Credit conditions
Lectures	Examination	
Workshop	Activity during classes, Participation in a discussion, Examination, Report, Case study, 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

Credit of the lecture - on the basis of a positive mark of the exam. Credit of the project - on the basis of attendance at classes and a positive evaluation of the individual project report. A student may proceed to a resit twice.

Method of determining the final grade

Final grade = average of exam and worshop assignments.

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

No needed

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

Lectures are optional, verification of the knowledge during the exam as part of the transitional work passing.
Worshops are mandatory. Credit is based on student's activity.
Classes in the semester are conducted in blocks. Transitional work is preceded by blocks: Lecture topics are related to the workshop but expand the knowledge in the topic. Lectures are optional. The student is obliged to learn using the lecture method or by himself.
Workshops include the training of practical application of the knowledge and is compulsory.

Literature

Obligatory

1. Hejmanowska B. Wężyk P., 2021 (red.) Satellite data for public administration (in Polish), Polska Agencja Kosmiczna, © Copyright by Polska Agencja Kosmiczna 2020
2. Lillesand T.M., Kiefer R.W.: Remote Sensing and Image Interpretation. John Wiley & Sons, 2004

Scientific research and publications

Research

1. 2020-2022 Integration of remote sensing data for control in the agricultural direct payments system (IACS), Excellence Initiative - Research University - AGH

Publications

1. 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.
2. Hejmanowska, B., Twardowski, M., & Żądło, A. (2021). An Application of the "Traffic Lights" Idea to Crop Control in Integrated Administration Control System. Geomatics and Environmental Engineering, 15(4), 129–152.

https://doi.org/10.7494/geom.2021.15.4.129
3. Michałowska K., Głowienka E., Hejmanowska B., 2017- "Remote Sensing Methods in the Study of the Impact of Long-Term Process of Sulphur Mining on Environmental Changes of the Carpathian Foreland," 2017 Baltic Geodetic Congress (BGC Geomatics), Gdansk, 2017, pp. 292-296. doi: 10.1109/BGC.Geomatics.2017.80

Learning outcomes prescribed to a field of study

Code	Content
RSGI2A_K01	is ready to resolve conflicts, negotiate, work in a team
RSGI2A_K02	is ready for creative time management, working under time pressure
RSGI2A_K03	maintain an ethical attitude while performing and presenting the results of assigned tasks
RSGI2A_U01	can apply knowledge of mathematics and physics to analyze geospatial data
RSGI2A_U02	can acquire remote environmental data
RSGI2A_U03	is able to process geospatial data and automate data processing in an advanced manner
RSGI2A_U04	is able to use IT tools for spatial data processing
RSGI2A_U06	is able to communicate on specialist topics in the field of remote sensing and geoscience with a diverse audience; Student can use a foreign language at the B2 + level of the European System for the Description of Languages and specialist and proper Terminology
RSGI2A_W02	has an enhanced knowledge of physics necessary to understand the interaction of electromagnetic radiation in the atmosphere and with the Earth's surface
RSGI2A_W03	has a deep understanding of remote environmental data acquisition methods
RSGI2A_W04	has a deep understanding of methods, algorithms and automation of spatial data processing