University of Gdańsk

Subject card

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| Subject name and code | GIS and Remote Sensing II - lecture, PG_00194276 | | |
| Field of study | Geography | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | Bachelor's studies | Subject group | Obligatory subject group in the field of study<br>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 | 2 | Language of instruction | Polish<br>polish |
| Semester of study | 3 | ECTS credits | 2.0 |
| Learning profile | academic | Assessment form | exam |
| Conducting unit | Geographic Information System (GIS) Laboratory -> Faculty of Oceanography and Geography -> Rector | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Maciej Markowski | |
| | Teachers | | |

| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15 |
| | 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 | 15 | 1.0 | 34.0 | 50 |

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| Subject objectives | The lecture aims to provide students with knowledge of remote sensing and photogrammetry, including understanding the physical principles of image acquisition and various sources of satellite and aerial data. Students will learn the principles of image interpretation and photointerpretation, as well as the use of UAVs in spatial research. The lecture also introduces methods for processing and analyzing remote sensing data, including image correction, creation of color composites, application of remote sensing indices, and use of software for environmental analyses. Ultimately, students will understand the role of remote sensing in monitoring and studying the environment. |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [GEOGRL3-U04] can apply field and laboratory methods and research tools, spatial analysis methods, and methods of presenting research results in the field of geography, assess their usefulness for tasks in which the application goal of geography can be realized | The student applies methods for processing and analyzing remote sensing data, including image corrections, color composition creation, calculation of remote sensing indices, and image interpretation. The student can assess the suitability of these methods for addressing specific research problems. | [SU4] test/exam - oral or written |
| [GEOGRL3-U03] can plan and conduct, independently and as part of a team, simple research in the field of geography under the supervision of a scientific advisor, based on the necessary information from professional literature and other sources | The student can plan and describe a simple research study in remote sensing and photogrammetry, selecting appropriate data sources, analysis methods, and ways of presenting results, both independently and in a team, using scientific literature and available data. | [SU4] test/exam - oral or written |
| [GEOGRL3-W06] knows advanced methods of acquiring, processing, and compiling geographic environmental data, as well as methods of analyzing and interpreting such data | The student knows and understands advanced methods for acquiring, processing, and interpreting remote sensing and photogrammetric data, including satellite, aerial, and UAV-based sources. The student understands the importance of selecting appropriate data sources, spatial, spectral, radiometric, and temporal resolutions in environmental analyses. | [SW4] test/exam - oral or written |
| [GEOGRL3-K02] is prepared to bear full responsibility for the actions taken actions and adhere to the principles of professional ethics and principles of intellectual honesty, is aware of the importance of a professional approach in professional life professional life | The student is aware of the responsibility for the quality and reliability of remote sensing analyses, adheres to professional ethics and intellectual honesty in the acquisition, processing, and presentation of data. The student understands the importance of a professional approach in scientific work and in team collaboration. | [SK4] test/exam - oral or written |

## Subject contents

1. Introduction to Remote Sensing and Photogrammetry development of remote sensing research, basic concepts, scope, and importance of imaging methods in environmental analyses.
2. Physical Principles of Remote Sensing electromagnetic radiation, spectral characteristics of objects, and the significance of spatial, spectral, radiometric, and temporal resolution.
3. Imaging Systems and Sources of Remote Sensing Data satellite and aerial observation systems (e.g., Sentinel, Landsat), Airborne Laser Scanning (ALS), and other data acquisition techniques.
4. Photogrammetry and Image Interpretation aerial photography, principles of photogrammetry, photointerpretation methods, and analysis of image content.
5. Unmanned Aerial Vehicles (UAVs) in Data Acquisition drone classification, technical and legal aspects, mission planning, and applications in spatial studies.
6. Processing and Analysis of Remote Sensing Data image corrections, color composites, spectral curves, remote sensing indices, and software used for analysis.

## Prerequisites and co-requisites

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| test | 51.0% | 100.0% |

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| Recommended reading | Basic literature | • Davis D., 2004, GIS dla każdego, Wydawnictwo Mikom, Warszawa.<br>• Gotlib D., Iwaniak A., Olszewski R., 2007. GIS. Obszary zastosowań. PWN Warszawa.<br>• Urbański J., 2012, GIS w badaniach przyrodniczych (ebook), Centrum GIS, Uniwersytet Gdański.<br>• Sitek Z., 1997. Wprowadzenie do teledetekcji lotniczej i satelitarnej, Wydawnictwa AGH, Kraków.<br>• Adamczyk J., Będkowski K, 2007. Metody cyfrowe w teledetekcji. Wydawnictwo SGGW.<br>• Kurczyński Z., 2006. Lotnicze i satelitarne obrazowanie Ziemi, Oficyna wydawnicza Politechniki Warszawskiej, Warszawa<br>• Kryza M., Szymanowski M., Wieczorek M., 2007, The Application of Selected Interpolation Methods for Modelling Extreme Air Temperature in South-Western Poland, Przegląd Geofizyczny, 52(1):61-82. |
| | Supplementary literature | • Richards J.A., Jia X., 2006. Remote sensing digital image analysis. Springer.<br>• Butowtt J., Kaczyński R., 2003, Fotogrametria, Wojskowa Akademia Techniczna, Warszawa.<br>• Lyon J.G., 2003, GIS for water resources and watershed management, CRC Press.<br>• Tomlinson R., Thinking about GIS, 2013, Esri Press.<br>• Zwoliński Z. (red.), 2010, GIS woda w środowisku. Bogucki Wydawnictwo Naukowe, Poznań.<br>• Markowski M., Golus W., Kwidzińska M., 2015, Aplikacyjność metod oceny wielkości opadów zasilających oczka Pomorza Gdańskiego [w:] D. Absalon, M. Matysik, M. Ruman [red.] Nowoczesne metody i rozwiązania w hydrologii i gospodarce wodnej, Komisja Hydrologiczna Polskiego Towarzystwa Geograficznego, Sosnowiec, s. 287-298.<br>• Bajkiewicz-Grabowska E., Markowski M., Lemańczyk K., 2016, Application of geoinformation techniques to determine zones of sediment resuspension induced by wind waves in lakes (using two lakes from Northern Poland as examples), Limnological Review 1/2016. |
| | eResources addresses | |
| Example issues/ example questions/ tasks being completed | • What is the difference between satellite and aerial imaging in terms of acquiring environmental data?<br>• What do spatial, spectral, and radiometric resolutions mean in remote sensing?<br>• What are the main applications of drones (UAVs) in collecting spatial data? | |
| Work placement | Not applicable | |

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