GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Methods of remote sensing analysis, PG_00045751 | | |
| Field of study | Geodesy and Cartography | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2024/2025 |
| Education level | second-cycle studies | Subject group | |
| 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 | 5.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Geodesy -> Faculty of Civil and Environmental Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Anna Sobieraj-Żłobińska | |
| | Teachers | dr inż. Anna Sobieraj-Żłobińska<br>dr inż. Krystyna Michałowska | |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 30.0 | 30.0 | 15.0 | 0.0 | 0.0 | 75 |
| | 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 | 75 | 10.0 | 40.0 | 125 |

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| Subject objectives | Acquisition of knowledge and skills in the field of advanced processing methods for images obtained from aerial and satellite platforms, as well as the analysis and interpretation of multispectral and multitemporal remote sensing studies |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | [K7_U03] can make the interpretation of aerial and satellite photos and develop products based on remote sensing data | He possesses the ability to analyze and interpret raw and processed remote sensing data obtained from aerial and satellite platforms. He is capable of preparing multitemporal studies in the form of thematic maps (land cover/use, changes in selected environmental factors), index maps for selected parameters (vegetation, soil, temperature, etc.), and performing extraction and analysis of information based on the prepared products. | [SU4] Assessment of ability to use methods and tools |
| | [K7_U04] can use the techniques of digital image processing in digital photogrammetry and remote sensing | He is capable of using digital processing methods for remote sensing images to create orthophotos, perform filtering, calibration, classification, calculate indices, and generate thematic maps and spatial databases. | [SU4] Assessment of ability to use methods and tools |
| | [K7_W03] has knowledge of the basic physical remote sensing; knows the available photographic materials and satellite data as well as their potential uses; knows the basics of digital image processing and analysis of aerial and satellite image; has deep knowledge of remote sensing applications including knowledge of the usage of remote-sensing methods and technologies of data acquisition for the construction of topographic and thematic databases purpose | He has advanced knowledge of remote sensing and its applications in the visible, infrared, and microwave ranges. He is familiar with advanced methods for processing remote sensing images and correcting geometric and radiometric distortions. He is also knowledgeable in technologies for creating thematic maps and databases based on remote sensing data. | [SW1] Assessment of factual knowledge |
| | [K7_W04] has knowledge of the digital image processing basics | He possesses the ability to analyze and interpret raw and processed remote sensing data obtained from aerial and satellite platforms. He is capable of preparing multitemporal studies in the form of thematic maps, index maps for selected parameters, and conducting information analysis based on the prepared products. | [SW1] Assessment of factual knowledge |
| | [K7_U05] can choose, depending on the nature of the study, methods for assessing the quality of photogrammetric and remote sensing products and elaborations. | He possesses the skills to analyze the accuracy and quality of remote sensing data based on the geometric and radiometric parameters of images and is capable of selecting the appropriate source data specifications to achieve optimal results in remote sensing studies. | [SU2] Assessment of ability to analyse information |

## Subject contents

1. Processing of remote sensing images: panchromatic, multispectral, and radar for thematic information extraction.
2. Creation of thematic studies using image filtering techniques, image classification, object-based classification, index calculation, and multitemporal image analysis.
3. Preparation of remote sensing products in the form of thematic maps (land cover/use, changes in selected environmental factors), index maps for selected parameters (vegetation, soil, temperature, etc.), and spatio-temporal variability maps.
4. Spatio-temporal analyses and interpretation of raw and processed remote sensing data obtained from aerial and satellite platforms.
5. Extraction and analysis of information based on multispectral and multitemporal remote sensing products.

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| Prerequisites and co-requisites | Students should possess basic knowledge of remote sensing, including concepts related to data acquisition from satellite and aerial sensors, and the fundamentals of imaging across different spectral ranges. |

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Report 2 | 60.0% | 15.0% |
| Report 4 | 60.0% | 10.0% |
| Report 5 | 60.0% | 10.0% |
| Report 6 | 60.0% | 10.0% |
| Assessment Test | 51.0% | 35.0% |
| Report 3 | 60.0% | 10.0% |
| Report 1 | 60.0% | 10.0% |

**Recommended reading**

Basic literature

- Adamczyk J., Będkowski K.: *Digital Methods in Remote Sensing*. SGGW Publishing House, Warsaw 2005.
- Kurczyński Z.: *Aerial and Satellite Imaging of the Earth*; Publishing House of Warsaw University of Technology, Warsaw 2006.
- 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.
- Sanecki J. (Ed.): *Remote Sensing: Data Acquisition*. WNT, 2006.
- Jensen J. R.: Remote Sensing of the Environment. An Earth Resource Perspective. Prentice Hall, 2000. Lillesand T.M., Kiefer R.W.: Remote Sensing and Image Interpretation. John Wiley & Sons, 2004

Supplementary literature

- Mularz S.: *Fundamentals of Remote Sensing. Introduction to GIS*. PK Publishing House, 2004.
- Pirowski T.: *Ranking of Methods for Integrating Remote Sensing Images of Different Resolutions Evaluation of Photointerpretation Qualities of LANDSAT TM and IRS-PAN Data Fusion*, *Archives of Photogrammetry, Cartography, and Remote Sensing*; 2010.

eResources addresses: Adresy na platformie eNauczanie:

**Example issues/ example questions/ tasks being completed**

- Geometric and atmospheric correction of satellite images.
- Calculation of indices based on multispectral and SAR data: vegetation, moisture, backscatter (sigma0, beta0, gamma). Photointerpretation and analysis of satellite and aerial images.
- Supervised and unsupervised image classification, object-based classification analysis of results along with accuracy assessment.
- Spatio-temporal analyses based on optical and SAR radar images application of "change detection" algorithms.

**Work placement**: Not applicable