GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Satellite Observation Sensors, PG_00065862		
Field of study	Space and Satellite Technologies		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty subject group 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Geoinformatics -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Berezowski	
	Teachers	dr hab. inż. Tomasz Berezowski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 7918 Sensory Obserwacji Satelitarnej 2027/2027
https://enauczanie.pg.edu.pl/2025/course/view.php?id=7918

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	30	5.0	15.0	50

Subject objectives

Acquisition of knowledge and practical skills in the field of sensors used in satellite remote sensing and Earth observation: physical basis of phenomena used in remote sensing, principles of operation of individual sensors, data obtained from sensors, data processing methods, applications

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] Has well-ordered and extended knowledge on ICT in space and satellite engineering. Has well-ordered and extended knowledge about potential, methods and application areas of satellite remote sensing and Earth observation as well as about the structure of individual segments, principles of operation and applications of satellite navigation systems.	The student is able to use IT tools for processing data from satellite sensors and is able to use these tools to analyze the operation of sensors.	[SW1] Assessment of factual knowledge
[K7_U07] Identifies and describes technical problems and is able to solve them choosing the relevant methods and tools. Is able to select and use the appropriate, also the advanced, IT solution for the specific problem in the field of space and satellite technologies.	The student knows the limitations of various satellite sensors and the resulting limitations in the processing of data from these sensors	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>Course content – lecture

Sensor bands and types. Visible and infrared scanners, types of detectors. Passive thermal and microwave sensors. Radar range, imaging radars. Processing and use of radar images. Synthetic aperture radar (SAR) - principle and basic properties. Synthesis and processing of SAR images. SAR interferometry and polarimetry. Implementation of software for processing satellite data from specific sensors. SRF calculation, radiation transfer models.

Course content – laboratory

During the laboratory sessions, students learn methods for processing and calibrating data from various types of satellite observation sensors. The labs cover the calculation of reflectance for optical sensors, data simulation and atmospheric correction for optical sensors, interferometric and polarimetric processing of SAR data, an introduction to image processing using the R environment, and the processing of long time series of imagery data within the R environment.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written test</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Laboratories</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Elachi C., Van Zyl J. J., Introduction to the Physics and Techniques of Remote Sensing, 2nd Edition, Wiley, 2006

2. Hein A., Processing of SAR Data: Fundamentals, Signal Processing, Interferometry, Springer-Verlag, 2004

3. Richards J., Remote Sensing Digital Image Analysis, Springer-Vergal Berlin Heidelberg 1986 and 1993</td></tr>
<tr><td>Supplementary literature</td><td>1. Chuvieco E., Fundamentals of Satellite Remote Sensing: An environmental aproach, CRC Press, Taylor & Francis Group, 2016

2. Jaehne B., Digital Image Processing. Concepts, Algorithms, and Scientific Applications, Springer, 1995

3. Longley P., Goodchild M., Maguire D., Rhind D., Geographic Information Systems and Science, John Wiley & Sons Ltd., West Sussex 2005

4. Maini A. K., Agrawal V., Satellite Technology: Principles and Applications, Second Edition, John Wiley & Sons, 2011</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Develop a digital terrain model based on data from the Sentinel-1 sensor

What materials are used in FPA thermal sensors?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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