



Subject card

Subject name and code	Low-level aerial remote sensing, PG_00053258						
Field of study	Geodesy and Cartography						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Optional 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	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			3.0		
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. Jakub Szulwic				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		5.0		25.0	75
Subject objectives	Acquaintance with methods of acquiring remote sensing data from UAV platforms, techniques for digital processing of multispectral imagery from low altitudes, and the creation of selected remote sensing compilations.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W07] has a well-established knowledge and understands concepts in the field of engineering geodesy including the use of calculations and measurements methods carried out with the use of geodetic instruments and photogrammetric and remote sensing technologies related to geodetic support for investment, surveying and inventory measurements and photogrammetry with remote sensing	The student has knowledge of the fundamental physical principles of remote sensing. They are familiar with selected methods of data acquisition from UAV (Unmanned Aerial Vehicle), aerial, and satellite platforms. They possess basic knowledge regarding the digital processing and analysis of low-altitude images (multispectral, thermal). They are knowledgeable about the methods for creating basic remote sensing products.	[SW1] Assessment of factual knowledge
	[K6_U14] can apply the necessary skills to conduct independent work in the field of topographic surveys along with the elaborating of results, geodetic investment service, surveying and inventory measurement, photogrammetry and remote sensing, and making the maps and elaborations for legal purposes including delimitation and subdivision of real estate	The student possesses basic skills in digital processing of remote sensing data. They are capable of applying image classification methods, calculating indices, and using color compositions to create thematic maps.	[SU4] Assessment of ability to use methods and tools
	[K6_U04] can use contemporary geodetic instruments, including automation of measurements, data transmission and processing in a computer-instrument system with the use of computer networks	The student is capable of utilizing methods of digital processing of remote sensing images for creating orthophotomaps, filtering, calibration, classification, calculating indices, and generating thematic maps.	[SU1] Assessment of task fulfilment
	[K6_W01] has basic knowledge and understands the concepts of physics which allow to use optical and immersive instruments as well as positioning and satellite imaging	The student knows and understands the principles applicable during the acquisition, processing, and analysis of low-altitude remote sensing data.	[SW1] Assessment of factual knowledge
Subject contents	Foundations cover: electromagnetic radiation, digital imagery, multispectral imagery, thermal imagery, spatial, spectral, and radiometric resolution. Types of remote sensing data. Sources of data and methods for acquiring and processing low-altitude remote sensing data. Passive and active methods. Operations on spectral bands. Spectral compositions (color). Types and applications of vegetation/soil/water indices. Developing thematic maps: calculating maps of vegetation/soil indices. Creating Digital Elevation Models (DEMs), developing maps of slope inclination, aspect, and solar radiation exposure. Processing thermal data - generating temperature maps.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Report	60.0%	30.0%
	Test	60.0%	40.0%
	Student's project	60.0%	30.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>Adamczyk J., Będkowski K.: <i>Metody cyfrowe w teledetekcji</i>. Wydawnictwo SGGW, Warszawa 2005</li> <li>Kurczyński Z.: <i>Lotnicze i satelitarne obrazowanie Ziemi</i>; Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2006</li> <li>Bernasik J.: <i>Wykłady z fotogrametrii i teledetekcji</i>, Kraków 2008</li> <li>Sanecki J. (red): <i>Teledetekcja: Pozyskiwanie danych</i>. WNT, 2006</li> </ul>	
	Supplementary literature	<ul style="list-style-type: none"> <li>Noor, N. M., Abdullah, A., &amp; Hashim, M. (2018, June). Remote sensing UAV/drones and its applications for urban areas: A review. In <i>IOP conference series: Earth and environmental science</i> (Vol. 169, No. 1, p. 012003). IOP Publishing.</li> <li>Mazur, P., &amp; Chojnacki, J. (2017). Wykorzystanie dronów do teledetekcji multispektralnej w rolnictwie precyzyjnym. <i>Technika rolnicza ogrodnicza leśna</i> (1)</li> <li>Tang, L., &amp; Shao, G. (2015). Drone remote sensing for forestry research and practices. <i>Journal of Forestry Research</i>, 26, 791-797.</li> </ul>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Processing a collection of multispectral UAV images to develop a thermal map and a moisture map of a selected area. Determining flood risk zones based on Digital Elevation Model (DEM) data and land cover maps.		
Work placement	Not applicable		