GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Digital Photogrammetry, PG_00053253						
Field of study	Fotogrametria cyfrowa						
Date of commencement of studies	October 2023		Academic year of realisation of subject	2025/2026			
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	5		ECTS credits	8.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Geodesy -> Faculty of Civil and Environmental Engineering -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Paweł Burdziakowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	15.0	30.0	0.0	0.0	90
	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	90		10.0	100.0		200
Subject objectives	The aim of the course is to familiarise students with and enable them to master basic and advanced methods, tools and algorithms of digital photogrammetry and computer vision						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U08] can use modern measurement technologies to solve common tasks in 3D modeling	Knows and is able to perform basic operations on digital images. Knows and is able to describe and present the elements of the process of developing a photogrammetric terrestrial model. Knows and is able to indicate the directions of development of digital photogrammetry. Recognises the differences between aerial and satellite photogrammetry.	[SU1] Ocena realizacji zadania
[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	Knows and is able to describe the elements of analytical photogrammetry (elements of internal, external and mutual orientation). Knows and is able to create a model using elements of single and dual image digital photogrammetry. Knows the characteristics of typical close-range (ground-based) digital studies.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K6_W01] has knowledge and understands the concepts of physics which allow to use optical and immersive instruments as well as positioning and satellite imaging	Knows and understands the physics of image formation. Knows and understands the impact of the camera lens on the image. Knows and understands the impact of the resolution of a digital image on the image. Can describe the structure of a digital camera using a selected example. Can operate a digital camera.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym

Subject contents

Course content – lecture
During the lectures, students will learn about digital photogrammetry.

The main topics covered include digital image description, basic operations on digital images, including geometric transformations, point transformations (context-free), context-sensitive transformations (convolution, logical and median filters), spectral transformations (using Fourier transforms) and morphological transformations. During the laboratory classes, all the operations learned will be performed on images.

In the next stage, students will learn how image correlation is performed and what disparity is. Elements of internal and external orientation are part of learning the analytical part of photogrammetry. During the theoretical classes, students will learn about digital camera aberrations, and during the laboratory classes, they will learn how to calibrate a camera. The laboratory on model creation covers everything from building a model in Matlab (SFM) to building a model in professional software.

During the lectures, features relevant to photogrammetric issues resulting from the construction and design of metric and non-metric cameras are described.

Course content – exercises
Practical exercises in taking measurement and calibration photographs.

Course content – laboratory
During the workshops, all operations learned during the lectures will be performed on images in Matlab.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory	50.0%	50.0%
Laboratory	50.0%	25.0%
Laboratory	50.0%	25.0%

Recommended reading	Basic literature	1. Kurczyński Z., Preuss R.: "Podstawy Fotogrametrii", Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2002 2. Bernasik J.: Fotogrametria. Wykład dla II roku Geoinformacji i Geodezji Górniczej, http://oen.dydaktyka.agh.edu.pl/dydaktyka/obliczenia_inzynierskie/a_fotogrametria/fotogr ametria.pdf 3. Zygmunt Wróbel, Robert Koprowski. Praktyka przetwarzania obrazów z zadaniami w programie Matlab - EXIT Warszaw 2012 4. Cyfrowe przetwarzanie obrazów W. Malina, M.Siatacz . EXIT, 2008 5. Obraz cyforwy M.Domański , WKŁ Warszawa 2010 6. Komputerowe przetwarzanie obrazów trójwymiarowych. Bogusław Cyganek. EXIT, 2002.
	Supplementary literature	1. Thomas Luhmann, Stuart Robson, Stephen Kyle, Jan Boehm, Close-Range Photogrammetry and 3D Imaging De Gruyter; 3rd revised and expanded edition (18 listopada 2019) 2. Wilfried Linder, Digital Photogrammetry A Practical Course, Springer, Berlin, Heidelberg 2016 3. Francesco Mancini and Riccardo Salvini (Eds.), Applications of Photogrammetry for Environmental Research, ISBN 978-3-03928-180-0 (Pbk); ISBN 978-3-03928-181-7 (PDF)
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Perform basic operations on digital images in Matlab 2. Detect elements in digital images (edges, lines, characteristic points) 3. Create a 3D model using the SFM algorithm in Matlab 4. Calibrate a digital camera 5. Take calibration photos 6. Complete a basic Matlab course	
Practical activites within the subject	Not applicable	

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