

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical methods of geodetic observation processing B, PG_00040002							
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			2.0		
Learning profile	general academic profile		Assessment form			assessment		
Conducting unit	Department of Geodesy -> Faculty of Civil and Environmental Engineering							
Name and surname	Subject supervisor dr inż. Marek Zienkiewicz							
of lecturer (lecturers)	Teachers							
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial Laboratory Project		t	Seminar	SUM	
	Number of study hours	15.0	10.0	0.0			0.0	25
	E-learning hours inclu	ided: 0.0						
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	n didactic ed in study	Participation in consultation hours		Self-study		SUM
	Number of study hours	25		7.0		18.0		50
Subject objectives	Acquainting and discussing issues related to standard and unconventional methods of developing geodetic observations							
Learning outcomes	Course outcome Subject outcome Method of verifica						fication	
	K/_W13J knows advanced models of geodetic surveying, theoretical foundations of non- standard estimation methods, free and multi-step equations (sequential) adjustment methods		The student has a well- established knowledge of the theory of the least squares method and non-standard estimation methods. He knows the methods of developing geodetic data in both classical and free observation systems. The student also has knowledge of the diagnosis of observational material in the context of gross errors in measurements.			[SW1] Assessment of factual knowledge		
	[K7_U09] can apply methodologies in advanced geodetic observation		The student correctly uses the algorithms of the least squares method and non-standard estimation methods to develop geodetic observations. He analyzes the obtained results and correctly draws conclusions about the tested measurement structure			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
Subject contents	Lecture topics: 1. Methods of analyzing the quality of geodetic observations, 2. Robust M-estimation and its application in geodetic measurement practice, 3. Sequential adjustment of geodetic observations, 4. Kalman filtering in the process of predicting changes in the position of navigational and engineering objects. Exercises: Detection and localization of outlier observations in observation material using the Baardy approach. Robust adjustment of geodetic network using the Huber method. Sequential adjustment of observations using the least squares method. Prediction of changes in the position of geodetic network points using the Kalman filter.							
Prerequisites and co-requisites	Basics in the field of matrix calculus. Adjustment of observations by the classical and free versions of the least squares method.							

Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	Final test	50.0%	80.0%			
	practical exercises	100.0%	20.0%			
Recommended reading	Basic literature	Wiśniewski Z. 2016. Rachunek wyrównawczy w geodezji z przykładami, Wiśniewski Z. 2013. Zaawansowane metody opracowania obserwacji geodezyjnych z przykładami				
	Supplementary literature	Koch K.R. 1999. Parameter estimation and hypothesis testing in linear models, Caspary W. 2000. Concepts of network and deformation analysis. The University of New South Wales, Kensington				
	eResources addresses Adresy na platformie eNauczanie:					
		Matematyczne metody opracowania obserwacji geodezyjnych B - Moodle ID: 41917 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41917				
Example issues/ example questions/ tasks being completed	Robust adjustment of the geodetic network by using the Huber method, Detection and localization of gross errors in the observation material by using the Baardy method. Application of the Kalman filter in the process of predicting changes in the position of geodetic network points.					
Work placement	Not applicable					

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