



Subject card

Subject name and code	Mathematical methods of geodetic observation processing A, PG_00039990						
Field of study	Geodesy and Cartography						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2022/2023		
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	1	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 of lecturer (lecturers)	Subject supervisor	dr inż. Marek Zienkiewicz					
	Teachers	dr inż. Marek Zienkiewicz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	10.0	0.0	0.0	0.0	25
	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	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 verification		
	[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		
	[K7_W13] 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		

Subject contents	<p>Lecture topics:</p> <ol style="list-style-type: none"> 1. Fundamental functional, probabilistic and statistical models used in geodesy, 2. Classic methods of developing geodetic observations, <p>3. Free adjustment performed by the principles of the least squares method,</p> <p>4. Adjustment of geodetic observation by using the least squares method, taking into account the occurrence of deterministic errors,</p> <p>5. Theoretical foundations of non-standard methods of developing geodetic observations - M-estimation, Baarda's method.</p> <p>6. Multi-stage adjustment of geodetic networks.</p> <p>Exercises:</p> <p>Least squares observations adjustments. An example of free adjustment of geodetic networks. Adjustment of geodetic observation by using the least squares method, taking into account the occurrence of deterministic errors. Detection and localization of outliers in the observation material by using the Baarda's approach. Robust adjustment of geodetic network.</p>											
Prerequisites and co-requisites	Basics in the field of matrix calculus											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th> <th>Passing threshold</th> <th>Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>practical exercises</td> <td>100.0%</td> <td>20.0%</td> </tr> <tr> <td>Final test</td> <td>50.0%</td> <td>80.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	practical exercises	100.0%	20.0%	Final test	50.0%	80.0%
Subject passing criteria	Passing threshold	Percentage of the final grade										
practical exercises	100.0%	20.0%										
Final test	50.0%	80.0%										
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:										
Example issues/ example questions/ tasks being completed	Free adjustment of geodetic networks, 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 metho											
Work placement	Not applicable											