



Subject card

Subject name and code	Satellite and space navigation systems, PG_00044838						
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			Obligatory subject group in the field of study 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			exam		
Conducting unit	Department of Geodesy -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Grzegorz Nykiel				
	Teachers		dr inż. Grzegorz Nykiel				
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						
Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23491							
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	6.0		24.0		75
Subject objectives	The aim of the course is to teach students issues related to space and satellite navigation systems. The main focus is on Global Navigation Satellite Systems (GNSS). The student becomes acquainted with the techniques of determining the position, elements that affect its accuracy, methods of data processing, etc. During the course, the student is introduced in detail to the algorithms used for positioning and mitigating measurement errors. In addition, other satellite techniques such as DORIS, SLR or altimetry are presented.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W03] knows and understands the principles of mathematical statistics described in the examples of the adjustment computations		The student knows and understands the rules compilation of GNSS data, and rules of statistics on error analysis.		[SW3] Assessment of knowledge contained in written work and projects		
	[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 able to use modern GNSS receivers to carry out geodesy and cartography tasks, as well as to develop observations using computer applications.		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K6_U06] can solve geodetic tasks and select measurement methods for typical engineering tasks including the curvature of the Earth and the impact of gravity		The student knows and is able to apply measurement and estimation methods used in the GNSS technique, i.e. differential measurements, PPP, etc.		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		

Subject contents	<p>- GNSS: - Types of measurements - GNSS signals - Modeling of observations (modeling and reduction of measurement errors) - Combinations of observations - PPP method - GNSS applications- DORIS- SLR- LLR- Satellite altimetry- Satellite gravimetric measurements</p>		
Prerequisites and co-requisites	<p>- knowledge of the subject "Satellite geodesy with elements of astronomy".</p> <p>- knowledge of the adjustment computations.</p> <p>- basic knowledge of mathematics and physics.</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lab	60.0%	30.0%
	Exam	60.0%	70.0%
Recommended reading	Basic literature	J. Sanz Subirana, J.M. Juan Zornoza and M. Hernández-Pajares: GNSS DATA PROCESSING Volume I: Fundamentals and Algorithms, ESA, 2013, ISSN: 1013-7076	
	Supplementary literature	<p>Shuanggen Jin, Estel Cardellach, Feiqin Xie: GNSS Remote Sensing: Theory, Methods and Applications, Springer, 2014, ISBN 978-94-007-7481-0</p> <p>Bernhard Hofmann-Wellenhof, Herbert Lichtenegger, Elmar Wasle: GNSS Global Navigation Satellite Systems: GPS, GLONASS, Galileo, and more, SpringerWienNewYork, 2008, ISBN 978-3-211-73012-6</p>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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