



## Subject card

Subject name and code	, PG_00050047						
Field of study	Space and Satellite Technologies						
Date of commencement of studies	February 2024		Academic year of realisation of subject		2023/2024		
Education level	second-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	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Geoinformatics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Jerzy Demkowicz				
	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		8.0		22.0	75
Subject objectives	The acquisition of knowledge and practical skills in the use of GNSS systems by students.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_K03] Can analyse and implement assigned tasks while maintaining high technical standards. Is able to work and interact in a group, taking on different roles. Adheres to the principles of professional ethics and respects the diversity of views and cultures.	Performs measurement task in a group			[SK1] Assessment of group work skills		
	K7_U12	Is able to choose and properly use IT tool for GNSS data processing			[SU4] Assessment of ability to use methods and tools		
	K7_W12	Has the ability to plan GNSS measurements using mission planning softwares and is able to optimize their time based on DOP coefficients.			[SW1] Assessment of factual knowledge		
	K7_W13	Uses GNSS receivers, correctly interprets their indications and is able to assess their positioning accuracy.			[SW1] Assessment of factual knowledge		
K7_U08	Knows the theoretical basis for determining the position and carrying out measurements with the use of GNSS systems.			[SU1] Assessment of task fulfilment			

Subject contents	<p>LECTURES:</p> <ol style="list-style-type: none"> <li>1) Satellite navigation: the origin of satellite navigation systems, classification of GNSS systems.</li> <li>2) GPS system: architecture, elements and their functions, services, pseudorange measurement, pseudorange measurement errors, influence of tropospheric and ionospheric refractions, modeling of the ionosphere and troposphere.</li> <li>3) The essence of determining position coordinates in GNSS code measurements, DOP coefficients and their influence on positioning accuracy, operational characteristics of navigation positioning systems.</li> <li>4) Planning of the GNSS measurement campaign. Signal structure, spread spectrum transmission, noise immunity.</li> <li>5) DGPS system (LF/MF): genesis, architecture, services, signals, receivers, applications, integrity check.</li> <li>6) GLONASS system: architecture, constellation, services, signals, receivers, applications.</li> <li>7) Galileo system: architecture, constellation, services, signals, receivers, applications.</li> <li>8) EGNOS and WAAS systems: segments, services, signals, receivers, applications.</li> <li>9) Satellite geodesy: satellite methods of determining the position of points and creating geodetic networks, geodetic methods of satellite observations and their possible applications, static and kinematic GNSS measurements, RTCM SC-104 standard, determination of position coordinates in real time.</li> <li>10) GNSS phase receivers, the use of permanent GNSS stations, the use of artificial Earth satellites for geodynamic research.</li> <li>11) Active geodetic networks: ASG-EUPOS, SmartNet, TPI NETpro, VRSNet.pl.</li> </ol> <p>LABORATORIES:</p> <p>Sample laboratories:</p> <ol style="list-style-type: none"> <li>1) Planning of the GNSS measurement campaign using Trimble Planning software.</li> <li>2) Calculation of DOP coefficients using Mathcad software.</li> </ol> <p>Development of GNSS measurement results using Mathcad software.</p>											
Prerequisites and co-requisites	Basics of mathematical analysis and algebra, basic engineering knowledge in mechanics, electronics and computer science, ability to work in MS Windows environment.											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Subject passing criteria</th> <th style="width: 25%;">Passing threshold</th> <th style="width: 25%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td></td> <td>51.0%</td> <td>50.0%</td> </tr> <tr> <td></td> <td>51.0%</td> <td>50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade		51.0%	50.0%		51.0%	50.0%
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Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<ol style="list-style-type: none"> <li>1. Beaudette S., Carleton University Spacecraft Design Project; 2004 Final Design Report, Satellite Mission Analysis, FDR-SAT-2004-3.2.A, 2004.</li> <li>2. Larson W. J., Wertz J. R., Space Mission Analysis and Design, 3rd Edition, Microcosm Press, El Segundo, CA, 1999.</li> </ol> <p>None.</p> <p>Adresy na platformie eNauczanie:</p>										

Example issues/ example questions/ tasks being completed	Not specified.
Work placement	Not applicable