GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Global Navigation Satellite Systems, PG_00049647		
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	dr inż. Jerzy Demkowicz	

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_W05	Has knowledge on construction of space and ground component of a satellite system.	[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
K7_U09	Can define the engineering application areas of GNSS systems and match them with measurement methods.	[SU2] Assessment of ability to analyse information
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

Subject contents	LECTURES: 1) Satellite navigation: the origin of satellite navigation systems, classification of GNSS systems. 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. 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. 4) Planning of the GNSS measurement campaign. Signal structure, spread spectrum transmission, noise immunity. 5) DGPS system (LF/MF): genesis, architecture, services, signals, receivers, applications, integrity check. 6) GLONASS system: architecture, constellation, services, signals, receivers, applications. 7) Galileo system: architecture, constellation, services, signals, receivers, applications. 8) EGNOS and WAAS systems: segments, services, signals, receivers, applications. 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. 10) GNSS phase receivers, the use of permanent GNSS stations, the use of artificial Earth satellites for geodynamic research. 11) Active geodetic networks: ASG-EUPOS, SmartNet, TPI NETpro, VRSNet.pl. LABORATORIES: Sample laboratories: 1) Planning of the GNSS measurement campaign using Trimble Planning software. 2) Calculation of DOP coefficients using Mathcad software. Development of GNSS measurement results using Mathcad software.
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

Subject passing criteria	Passing threshold	Percentage of the final grade
	51.0%	50.0%
	51.0%	50.0%

Recommended reading

Basic literature	1. Beaudette S., Carleton University Spacecraft Design Project; 2004 Final Design Report, Satellite Mission Analysis, FDR-SAT-2004-3.2.A, 2004. 2. Larson W. J., Wertz J. R., Space Mission Analysis and Design, 3rd Edition, Mircrocosm Press, El Segundo, CA, 1999.
Supplementary literature	None.
eResources addresses	Adresy na platformie eNauczanie: Systemy nawigacji satelitarnej 2024 - Moodle ID: 36583 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36583

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