GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Geomatics A, PG_00039442		
Field of study	Geodesy and Cartography		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
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	4.0
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. Karolina Zwolak	
	Teachers	dr inż. Karolina Zwolak	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	25.0	10.0	0.0	15.0	0.0	50
	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	50	10.0	40.0	100

Subject objectives	To acquaint students with the issues of obtaining, analyzing, interpreting and practical application of geoinformation through the interconnection of geometric and physical aspects from global to regional issues.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U08] can use echoprobes and sonars to measure depth, interpret, calculate the hotfixes and evaluate the accuracy of the depth measurements; use automated systems to carry out hydrographic measurements, plan, prepare the data, materials and equipment for Hydrographic work;	Can plan the measurements single-beam and multibeam echo sounder on in sea and inland waters. He can plan sonar measurements. Can prepare hydrographic equipment for work including calibration of measuring equipment.	[SU4] Assessment of ability to use methods and tools
[K7_U07] can calculate equipotential surfaces, obtain information from the official websites, created for the needs of geodesy and geodynamics, knows how to use the properties of the actual vector field the force of gravity of the Earth to carry out precise geometric levelling and levelling satellite	Can calculate areas normal equipotential	[SU2] Assessment of ability to analyse information
[K7_W11] knows the basics of hydrography theory and practice, construction and operation of echosonars and sonars, methods of information recording and displaying; principles of depth measurement and conducting marine measurements; knows the theory and practice of bathymetric measurements	Knows the basics of operation and use of bathymetric systems	[SW1] Assessment of factual knowledge
[K7_W10] has knowledge of the physical fundamentals in geodesy, geodetic geometry, earth's gravity field and its properties, geodetic gravimetry, gravimetric and astronomical-surveying methods, geodetic networks, precision leveling networks, integrated networks	Has knowledge in relating gravimetric measurement results to the system elevation system	[SW1] Assessment of factual knowledge
[K7_W10] has knowledge of the physical fundamentals in geodesy, geodetic geometry, earth's gravity field and its properties, geodetic gravimetry, gravimetric and astronomical-surveying methods, geodetic networks, precision leveling networks, integrated networks	Has knowledge in relating gravimetric measurement results to the system elevation system	[SW1] Assessment of factual knowledge
[K7_W11] knows the basics of hydrography theory and practice, construction and operation of echosonars and sonars, methods of information recording and displaying; principles of depth measurement and conducting marine measurements; knows the theory and practice of bathymetric measurements	Knows the basics of operation and use of bathymetric systems	[SW1] Assessment of factual knowledge
[K7_U07] can calculate equipotential surfaces, obtain information from the official websites, created for the needs of geodesy and geodynamics, knows how to use the properties of the actual vector field the force of gravity of the Earth to carry out precise geometric levelling and levelling satellite	Can calculate areas normal equipotential	[SU2] Assessment of ability to analyse information
[K7_U08] can use echoprobes and sonars to measure depth, interpret, calculate the hotfixes and evaluate the accuracy of the depth measurements; use automated systems to carry out hydrographic measurements, plan, prepare the data, materials and equipment for Hydrographic work;	Can plan the measurements single-beam and multibeam echo sounder on in sea and inland waters. He can plan sonar measurements. Can prepare hydrographic equipment for work including calibration of measuring equipment.	[SU4] Assessment of ability to use methods and tools

Subject contents	General rules for hydrographic works. Polish and international normative regulations. Measuring devices for bathymetric measurements. Sonars. Planning hydrographic works - bathymetry and sonar. Data collection - bathymetry and sonar. Measuring devices for magnetometric measurements. Unmanned autonomous vehicles - surface ASV, underwater AUV and ROV in hydrographic data acquisition. Underwater positioning. Hydrographic software. Introduction; Basics of potential theory; Expression on the potential of the equipotential ellipsoid; Surface spherical harmonics; Height system; Altimetry; gravimetry; Instruments for gravimetric measurements; Noise reduction of the gravimetric signal; Gravimetric anomalies. Reductions and corrections; Deviation of the vertical; The tides of the earth's crust.
Prerequisites and co-requisites	Knowledge of Geodesy higher

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test	60.0%	70.0%
raport	80.0%	30.0%

Recommended reading

Basic literature	Stateczny A., (red.) Metody nawigacji porównawczej. Gdańskie Towarzystwo Naukowe, Gdańsk, 2004. IHO, M-13 MANUAL on HYDROGRAPHY, International Hydrographie Bureau, Monaco, 2005. IHO, IHO S-44 - Standards for Hydrographic Surveys (5th edition), International Hydrographie Bureau, Monaco, 2008. BHMW, Zasady gromadzenia danych i przedstawianie wyników, PDNO-06-A073, Gdynia, 2009. BHMW, Organizacja i zasady prowadzenia badań, PDNO-06-A072, Gdynia, 2009. Kazimierz Czarnecki, Geodezja współczesna. Wyd. PWN 2014; Adam Łyszkowicz, Geodezja fizyczna. Wyd. Uniwersytetu Warmińsko-Mazurskiego w Olsztynie 2012; Marcin Barlik, Andrzej Pachuta, Geodezja fizyczna i grawimetria geodezyjna. Teoria i praktyka. Oficyna Wydawnicza Politechniki Warszawskiej 2007; Martin Vermeer, Physical Geodesy. https://users.aalto.fi/ mvermeer/mpk-en.pdf; Hofmann-Wellenhof B., Moritz H., Physical Geodesy, Institut für Navigation und Satellitengeodäsie Technische Universität Graz, Graz, Austria, 2006; Barlik M., Pomiary grawimetryczne w geodezji. OWPW 2001; Barlik M., Wstęp do teorii figury Ziemi, 1995; Stefan Przewłocki, Geomatyka. Wyd.: naukowe PWN, Warszawa 2009.
Supplementary literature	Articles in scientific journals. Eg. Remote Sensing, Sensors, Journal of Navigation, Journal of Geo-Information, Journal of Geodesy; Marine Geophysical Research; Journal of Geodynamics; Journal of the Geodetic Society of Japan
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1.The purpose and types of hydrographic work. 2. Division of survey works and general principles of conducting survey works. 3) Vertical echo sounder - definition, measurement principle, construction. 4) Multibeam sounder - definition, measurement principle, construction. 5. Interferometer echo sounder. 6. Laser depth measurement systems. 7 Side scanner - definition, purpose, classification, advantages and disadvantages. 8 Side scan sonar - directional characteristics, resolution. 9. Side scan sonarr - geometric distortion of the sonar image. 10. Stationary sonar. 11. Planning of hydrographic works - technical task, 12. Measuring profile system and its components. 13. Principles of planning measurement profiles in bathymetric measurements in limited areas. 14. Planning of sonar measurements. 15. Sonar searches of the bottom - 100%, 200% and 400% coverage. 16. Side scan sonar dead zone. 17. Speed determination of sonar searches. 18. Calibration of hydrographic devices - singlebeam echosounder. 19. Calibration of hydrographic devices - multibeam echosounder. 20. Collection of data from bathymetric measurements - data recording, control, data processing. 21. Reporting documentation of survey works. 22. Sonar measurement data collection - selection of measuring range, frequency of operation, towing height, positioning of the towed sonar. 23. Sonar examination of the detected object. 24. Data quality control and proper functioning of the sonar. 25. Report on sonar measurements. 26. Mosaicking. 27. Examination of the Earth's magnetic field. 28. Collection of supplementary measurement data-ROV, towed camera, diving reconnaissance. 29. ROV vehicles - restrictions, general rules, planning of use sites. 30. Towed camera - profile planning, site planning, general principles of diving reconnaissance planning. Characterize the measurements made at the LIGO Laser Interferometer Gravitational Wave Observatory. Characterize the potential of the body as Newton's integral. Characterize the Poisson and Laplace equations related to the potential of a solid. Introduce functions called solid spherical harmonics and functions called surface harmonics (Laplace). Give Dirichlet's boundary issues and their solutions to the sphere. Please, write down the radial derivative of the harmonic function. Present the solution of the Laplace equation in ellipsoidal coordinates
Work placement	Not applicable

Document generated electronically. Does not require a seal or signature.