University of Gdańsk

Subject card

Subject name and code	Mathematics - laboratory classes , PG_00199124		
Field of study	Marine Hydrography		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Bachelor's studies	Subject group	Obligatory subject group 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	6.0
Learning profile	practical	Assessment form	credit
Conducting unit	Division of Geometry -> Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Marek Hałenda	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	90.0	0.0	0.0	90
	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	90	4.0	56.0	150

Subject objectives	
	1. Deepening the understanding of mathematics, enabling to effective solving of mathematical problems that hydrographers encounter in their professional practice. 2. Acquisition of the mathematical knowledge necessary to continue the study of hydrography.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[HML3-U07] is able to effectively use information and communication techniques, including utility programs to solve professional problems	is able to create and compare interpolated surfaces from one set of sparse survey measurements using appropriate software under different configurations	[SU4] test/exam - oral or written
[HML3-U02] is able to select and apply basic research techniques and tools in the field of aquatic environment research, as well as plan and carry out measurements, develop the obtained results and interpret them correctly	is able to apply plane and spherical trigonometry to surveying problems	[SU4] test/exam - oral or written
[HML3-K02] is ready to correctly determine the priorities in professional work for the implementation of a task specified by himself/ herself or others	is ready to independently organize work on computational tasks	[SK8] observation of student's independent or team work
[HML3-U01] is able to plan and conduct experiments, including computer simulations, interpret the results obtained and draw conclusions	is able to estimate the mean, variance and standard deviation for a random variable and also the covariance between random variables. Interpret results from a least square estimation applied to survey measurements	[SU4] test/exam - oral or written
[HML3-U08] is able to independently use the professional literature available in traditional and electronic form, make an assessment, critical analysis and synthesis as well as the correct interpretation of the information obtained	is able to solve linear equations using matrix methods, compute the gradient of a real valued function, calculate explicit integrals of classical functions	[SU4] test/exam - oral or written

Subject contents

1. Vector and affine spaces, vector and inner products, norm. Linear equations and linear operators. Matrices, determinants, operations on matrices, inversion, transposition. Basis of a space, matrix of an linear operator. Analytical geometry, line and plane equations. Translations, rotations, coordinate transformations.
2. Real and vector valued functions. Partial derivatives and gradient. Series: convergence, expanding functions into power series. Indefinite and definite integrals.
3. Plane trigonometry. Spherical angle, spherical triangle. Spherical excess. Rhumb line.
4. Random variable, mean, variance, standard deviation. Covariance and correlation. Estimators of mean, variance, covariance. Normal distribution.
5. Covariance propagation in linear model. Uncertainty of observation.
6. Least squares procedure. Covariance of estimated parameters. Use of unit variance factor estimate. Ellipses of confidence.
7. 1D polynomial interpolation. Spatial interpolation by inverse distance weighting methods.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Activity on classes	0.0%	10.0%
Test	50.0%	90.0%

Recommended reading

Basic literature	1. G. Kwiecińska, Matematyka : kurs akademicki dla studentów nauk stosowanych, Cz. 1-3. Wydawnictwo UG, Gdańsk, 2001. 2. N. Stiepanow, Trygonometria sferyczna. PWN, Warszawa, 1960. 3. J. R. Taylor, An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements. University Science Books, New York, 1997. 4. J. Jakubowski, R. Sztencel, Rachunek prawdopodobieństwa dla (prawie) każdego. Script, Warszawa, 2002.
Supplementary literature	None.
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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