

**Subject card**

Subject name and code	Mathematics - lecture, PG_00198760						
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			5.0		
Learning profile	practical	Assessment form			exam		
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 Hatenda				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	60.0	0.0	0.0	0.0	0.0	60
	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	60		1.0		64.0	125
Subject objectives	<ol style="list-style-type: none"> <li>Deepening the understanding of mathematics, enabling to effective solving of mathematical problems that hydrographers encounter in their professional practice.</li> <li>Acquisition of the mathematical knowledge necessary to continue the study of hydrography.</li> </ol>						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[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 solve systems of linear equations using matrix methods, calculate the gradient of real-valued functions, represent real functions in power series form, calculate integrals of selected functions, estimate the expected value, variance, standard deviation, and covariance of random variables, apply the least squares method to research results and interpret its results, distinguish between methods used in the interpolation of one-dimensional and spatial data			[SU4] test/exam - oral or written	
	[HML3-W04] knows and understands, at an advanced level, the issue of measurements related to the exploration of sea basins and inland waters and tools allowing to describe, interpret and present the results of measurements		knows and understands at an advanced level the description and application of plane transformations used in cartography and hydrography; knows and understands at an advanced level the applications of plane and spherical trigonometry in hydrography			[SW4] test/exam - oral or written	

Subject contents	<ol style="list-style-type: none"> <li>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.</li> <li>2. Real and vector valued functions. Partial derivatives and gradient. Series: convergence, expanding functions into power series. Indefinite and definite integrals.</li> <li>3. Plane trigonometry. Spherical angle, spherical triangle. Spherical excess. Rhumb line.</li> <li>4. Random variable, mean, variance, standard deviation. Covariance and correlation. Estimators of mean, variance, covariance. Normal distribution.</li> <li>5. Covariance propagation in linear model. Uncertainty of observation.</li> <li>6. Least squares procedure. Covariance of estimated parameters. Use of unit variance factor estimate. Ellipses of confidence.</li> <li>7. 1D polynomial interpolation. Spatial interpolation by inverse distance weighting methods.</li> </ol>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	100.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. G. Kwiecińska, <i>Matematyka : kurs akademicki dla studentów nauk stosowanych, Cz. 1-3</i>. Wydawnictwo UG, Gdańsk, 2001.</li> <li>2. N. Stiepanow, <i>Trygonometria sferyczna</i>. PWN, Warszawa, 1960.</li> <li>3. J. R. Taylor, <i>An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements</i>. University Science Books, New York, 1997.</li> <li>4. J. Jakubowski, R. Sztencel, <i>Rachunek prawdopodobieństwa dla (prawie) każdego</i>. Script, Warszawa, 2002.</li> </ol>	
	Supplementary literature	None.	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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