University of Gdańsk

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 Hałenda	
	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

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-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

<table>
<tr><td>Subject contents</td><td>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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>50.0%</td><td>100.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>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.</td></tr>
<tr><td>Supplementary literature</td><td>None.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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