



Subject card

Subject name and code	Mathematics II, PG_00060527						
Field of study	Naval Architecture and Offshore Structures						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
Education level	first-cycle 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	2		ECTS credits		9.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Mathematics Center -> Vice-Rector for Education						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Cezary Mrozicki				
	Teachers		mgr inż. Emil Roch mgr inż. Paweł Bielski mgr Justyna Woron dr Cezary Mrozicki				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	0.0	15.0	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		11.0		124.0	225
Subject objectives	Students obtain competence in the range of using methods of mathematical analysis and knowledge how to solve simple problems that can be found in the field of engineering.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U02] can work individually and in a team, communicate through various techniques in professional environment and also record, analyse, and present the results of work, can estimate the time needed to complete a given task	The student mentions applications of double integrals and triple integrals. The student distinguishes between line integrals and applies appropriate methods to calculate them. The student distinguishes between surface integrals and uses appropriate methods to calculate them. The student recognizes different types of differential equations and selects the appropriate methods to solve them. The student solves linear differential equations of order n with constant coefficients using Laplace transform. The student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K6_W01] has knowledge in maths, including algebra, elements of logics, geometry, mathematical analysis, theory of probability necessary to describe and analyse the operation of machines and ocean-technology objects	A student defines the basic concepts of linear algebra. The student describes the methods of solving systems of linear equations. The student calculates the radius of convergence and determines the interval of convergence of a power series. The student applies the concept of functions of several variables to determine the extremes of the function. The student explains the method of substitution in double integral and triple integral. The student mentions applications of double integrals and triple integrals. The student distinguishes between line integrals and applies appropriate methods to calculate them. The student distinguishes between surface integrals and uses appropriate methods to calculate them. The student recognizes different types of differential equations and selects the appropriate methods to solve them. The student solves linear differential equations of order n with constant coefficients using Laplace transform. The student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
Subject contents	<p>Elements of linear algebra: Matrices (definition, types of matrices, matrix operations), determinants (definition and properties), rank of a matrix, system of linear equations (Cramer's rule, Kronecker-Capelli theorem, Gauss-Jordan elimination method). Number series and function series: Number series. Convergent and divergent series. Convergence tests for number series. Power series. Radius and interval of convergence. Taylors and Maclaurins series. Integration and differentiation of power series. Examples of applications - approximate calculation of integrals. Information on Fourier series Functions of two variables: Limit and continuity of a function of several variables. Partial derivatives. Total differential. Taylors formula. Maxima and minima of a function of several variables. Implicit functions. Double integral: Definition, properties, interpretation; expressing the double integral as an iterated integral; integration by substitution (polar coordinates); applications of double integrals. Triple integral: Definition, properties, interpretation; expressing the triple integral as an iterated integral; integration by substitution (cylindrical coordinates and spherical coordinates); application of triple integrals. Line integrals: Line integrals of the first kind - definition, properties and interpretation; transforming the line integral to the corresponding definite integral. Line integrals of the second kind (along oriented curves) - definition, properties and interpretation; transforming the line integral to the corresponding definite one; Green's theorem; path independence. Surface integrals: Integrals of the first kind - definition, properties and interpretation; transforming the surface integral to the corresponding double integral. Integrals of the second kind (surface-oriented) - definition, properties and interpretation; transforming the surface integral to the corresponding double integral; Gauss-Ostrogradski's theorem; Stoke's theorem. Applications of surface integrals. Ordinary differential equations: First order differential equations. General and particular solution. The Cauchy initial value problem. Variables separable, linear, Bernoulli, exact differential equations. Second order linear differential equations with constant coefficients. Fundamental set of solution of the homogeneous linear differential equation. Non-homogeneous linear differential equations. Higher order linear differential equations with constant coefficients. Laplace Transform: Definition, properties, inverse Laplace transform, solving differential equations using Laplace transform.</p>		

Prerequisites and co-requisites	Knowledge of the subject: MATHEMATICS I.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	35.0%
	Midterm colloquium	50.0%	65.0%
Recommended reading	Basic literature	W. Krywicki, L. Włodarski, Analiza matematyczna w zadaniach 1, Wydawnictwo Naukowe PWN, Warszawa 2008 W. Krywicki, L. Włodarski, Analiza matematyczna w zadaniach 2, Wydawnictwo Naukowe PWN, Warszawa 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2008 T. Jurliewicz, Z. Skoczylas, Algebra liniowa 1. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2006 T. Jurliewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2006 T. Jurliewicz, Z. Skoczylas, Algebra liniowa 2. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2006 T. Jurliewicz, Z. Skoczylas, Algebra liniowa 2. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2006 K. Jankowska, T. Jankowski, Zbiór zadań z matematyki, Wydawnictwo PG, Gdańsk 2008 K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, Wydawnictwo PG, Gdańsk 2008 K. Jankowska, T. Jankowski, Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna, Wydawnictwo PG, Gdańsk 2008	
	Supplementary literature	W. Leksiński, I. Nabiałek, W. Żakowski, Matematyka. Definicje, twierdzenia, przykłady, zadania. WNT, Warszawa 2006	
	eResources addresses	Adresy na platformie eNauczanie: WIMiO - Okręty i konstrukcje morskie - sem. 2 - Matematyka 2023/2024 (C. Mrozicki) - Moodle ID: 36451 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36451	
Example issues/ example questions/ tasks being completed	1. Give the definition of the sum of the series. 2. Check whether the given series is convergent using the ratio test, the root test.. the comparison test or the integral test. 3. Discuss the existence of the solution for the given system of linear equations. 4. Compute partial differentials of the second order for the given function $f(x,y)$. 5. Find extreme values of the function $f(x,y)$.		
Work placement	Not applicable		