GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Analysis, PG_00047542		
Field of study	Informatics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research 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	general academic profile	Assessment form	exam
Conducting unit	Mathematics Center -> Vice-Rector for Education		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Magdalena Musielak	
	Teachers	mgr Karolina Lademann dr Magdalena Musielak mgr inż. Dorota Żarek mgr inż. Wojciech Dąbrowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	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	6.0	84.0	150

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_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student defines and uses the basic methods of mathematical analysis and differential equations to formulate and solve simple problems in the field of physics and informatics	[SW1] Assessment of factual knowledge
[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student defines basic notions of differential calculus of function with one variable. Student examines functions of one variable, using the concept of a limit, continuity and derivatives. Student uses basic rules and technics of integration to calculate indefinite integrals. Student names some geometric applications of definite integral. Student examines convergence of number series. Student uses power series to approximate calculations. Student determines general and particular solutions of some types of the first and second order differential equations. Uses second order linear differential equations to analysis of linear oscillation. Student uses the packets of software for symbolic and numeric calculations and interprets the results of these calculations .	[SU4] Assessment of ability to use methods and tools

Subject contents

The derivative of one variable function. General rules of differentiation.
Higher order derivatives. Taylor's and Maclauren"s formula. L'Hospital's formula. Asymptotes of a graph of a function.
Extreme points, upward and downward concavity, inflection points.
Information on partial derivatives. Extreme points of two variable function.
Indefinite integral. General rules for integration. Integration of elementary functions.
The Riemann definite integral. The fundamental theorems of integration.
Geometric applications of the definite integral.
Number series. Convergent and divergent series. Convergence tests of the number series.
Power series. Radius and interval of convergence.
Taylor"s and Maclaurin"s series. Integration and differentiation of power series.
Examples of applications - approximate calculation of integrals.
Information on Fourier series.
First order differential equations. General and particular solution. The Cauchy initial value problem.
Separable equations and first order linear 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. Method of undetermined coefficients.
Examples of applications - harmonic oscillator.

Prerequisites and co-requisites

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Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterms	50.0%	40.0%
Final exam	40.0%	60.0%

Recommended reading

Basic literature	• M.Gewert, Z. Skoczylas - Analiza Matematyczna 1, Oficyna Wydawnicza GIS 2007; • M.Gewert, Z. Skoczylas - Analiza Matematyczna 2,, Oficyna Wydawnicza GIS 2007; • J.Dymkowska, D.Beger - Rachunek różniczkowy w zadaniach, Wydawnictwo PG 2016 • J.Dymkowska, D.Beger - Rachunek całkowy w zadaniach, Wydawnictwo PG 2017
Supplementary literature	1. Decewicz G., Żakowski W., "Podręczniki Akademickie - Matematyka. Część I", Wydawnictwo Na-ukowo-Techniczne 2. Fichtenholz G.M., "Rachunek różniczkowy i całkowy", tom 1, Wydawnictwo Naukowe PWN 3. McQuarrie D., "Matematyka dla przyrodników i inżynierów", tomy 1-3, Wydawnictwo Naukowe PWN
eResources addresses	Adresy na platformie eNauczanie: WETI (Informatyka) - Matematyka 2022/23 (M.Musielak) - Moodle ID: 25191 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25191

Example issues/ example questions/ tasks being completed	1. Find local extremes and intervals of monotonicity of the following function f(x)=(ln2x)/x. 2. Find the area between the curve y=x ln(x) and the OX axis from x=√e to x=e. 3. Find the volume of a solid of revolution obtained by the rotation of the graph of the function f(x)=1 /(x2+2x+5) around the OX-axis. Sketch drawing. 4. Check wether the given series with general term an=(2nn!)/nn is convergent. 5. Using the theorems of differentiation or integration of the functional series find the sum of the power series Σ xn / (n+1) and next find the sum of the number series Σ 1/((n+1)2n). 6. Find the solution of the Cauchy problem : y'-y / x=x sin(2x); y(π/2)=π/4. 7. Find the general solution of the equation y''+2y'+y=e-2x.
Work placement	Not applicable

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