



Subject card

Subject name and code	Calculus, PG_00045353						
Field of study	Data Engineering						
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		English		
Semester of study	1		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Ewa Kozłowska-Walania				
	Teachers		dr Ewa Kozłowska-Walania				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	0.0	0.0	45
	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	45		13.0		67.0	125
Subject objectives	Students obtain competence in using methods of mathematical analysis (single variable calculus) and knowledge how to solve simple problems that are found in the field of engineering, in particular connected to data engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W01] has advanced knowledge in the field of mathematics, including mathematical analysis, algebra, geometry, probability calculus, statistics and numerical methods, necessary to formulate and solve simple tasks in the field of IT		Student uses methods of mathematical analysis to formulate and solve simple problems found in the field of data engineering.		[SW1] Assessment of factual knowledge		
	[K6_K01] is aware of quickly changing trends and the resulting need for further education and self-improvement in the area of the performed profession of an engineer with IT and economic-financial skills.		Student recognizes the importance of skillful use of mathematical analysis apparatus in the context of engineering studies.		[SK2] Assessment of progress of work		
	[K6_U05] Uses matrix calculus in the theory of systems of linear equations, uses differential, integer and vector calculus, performs operations on complex numbers and determines polynomial elements.		Student defines basic elements of single variable calculus, evaluates derivatives and integrals of functions of one variable. Student is able to analyze functions using the notions of limit, continuity, and derivative; is aware of some geometrical applications of integration. Student analyzes the convergence of number series and uses power series to approximate computations. Student uses mathematical software for numerical and symbolic computation, and interprets the results of such computation		[SU4] Assessment of ability to use methods and tools		

Subject contents	<ul style="list-style-type: none"> • Limits of functions. Asymptotes. Continuity. • Derivative of a function of one variable. Geometrical and physical interpretation. Basic differentiation formulas. • Product, quotient, and chain rules. Higher order derivatives. Information about partial derivatives. • Applications of differentiation. De LHospitals rule. The differential. Optimization. Concavity. • Indefinite integral. Basic formulas. Integration by parts, by substitution, by partial fraction decomposition, by trigonometric substitution. • Definite integral. Geometrical interpretation. Fundamental Theorem of Calculus. • Geometrical applications of definite integrals: areas, volumes, lengths. • Number series convergent and divergent. Criteria for convergence testing. • Power series. Radius and interval of convergence. • Taylor and McLaurin series. Differentiation and integration of power series. • Information about Fourier series. 											
Prerequisites and co-requisites	Completion of the Precalculus class											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Final Exam</td> <td>40.0%</td> <td>60.0%</td> </tr> <tr> <td>Tests</td> <td>50.0%</td> <td>40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Final Exam	40.0%	60.0%	Tests	50.0%	40.0%
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Final Exam	40.0%	60.0%										
Tests	50.0%	40.0%										
Recommended reading	Basic literature	<ul style="list-style-type: none"> • H. Anton, <i>Calculus with analytic geometry</i>, John Wiley & Sons, 1989. • <i>Matematyka. Podstawy z elementami matematyki wyższej</i>, edited by B. Wikieł, PG publishing house • J.Dymkowska, D.Beger, <i>Rachunek różniczkowy w zadaniach</i>, PG publishing house • J.Dymkowska, D.Beger, <i>Rachunek całkowy w zadaniach</i>, PG publishing house • B.Sikora, E. Łobos, <i>Advanced calculus - selected topics</i>, Publishing house of Silesian University of Technology, 2009. 										
	Supplementary literature	<ul style="list-style-type: none"> • B.Sikora, E.Łobos, <i>A first course in calculus</i>, Publishing house of Silesian University of Technology, 2010. • H. Anton, <i>Calculus : a new horizon</i>, John Wiley & Sons, 6th ed • K. Jankowska, T. Jankowski, <i>Zbiór zadań z matematyki</i>, PG publishing house, 2010 • W. Żakowski, <i>Algebra i analiza matematyczna dla licealistów i kandydatów na wyższe uczelnie</i>, WNT, Warszawa 1999 • M. Gewert, Z.Skoczylas, <i>Analiza Matematyczna 1</i>, GiS • M.Gewert, Z. Skoczylas, <i>Analiza Matematyczna 2</i>, GiS 2007; 										
	eResources addresses	Adresy na platformie eNauczanie:										

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> 1. Find the local extrema and intervals of monotonicity of the function $f(x) = (\ln 2x)/x$ 2. Find the area between the x-axis and the curves $y = x \ln(x)$, $x = e$, and $x = e$. 3. Find the volume of the solid obtained by rotating about the x-axis, the region bounded by $y = 1/(x^2 + 2x + 5)$. 4. Determine the convergence of the series with terms given by $a_n = (2n!) / (n^n)$. 5. Using differentiation and integration of power series find the formula for the sum of $x^n / (n+1)$, and then use to evaluate the sum $1/((n+1)2^n)$
<p>Work placement</p>	<p>Not applicable</p>

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