



Subject card

Subject name and code	Mathematics, PG_00048912						
Field of study	Chemistry in Construction Engineering						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2020/2021		
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		10.0		
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 Anita Dąbrowicz-Tlałka				
	Teachers		dr Anita Dąbrowicz-Tlałka				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	45.0	0.0	0.0	0.0	90
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678 WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678 WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678 WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678						
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		20.0		140.0	250
Subject objectives	The aim of this subject is to obtain the students competence in the range of using the basic methods of mathematical analysis and linear algebra. Furthermore, the student is able to use this knowledge to solve simple theoretical and practical problems that can be found in the field of engineering.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] has a basic knowledge from some branches of mathematics and physics useful for formulating and solving simple problems in the field of environmental technologies and modern analytical methods	Student examines the convergence of the number series. Student determines the convergence range of the power series and develops the function into a series. Student defines basic notions of matrix calculus. Student uses basic notions and formulas of matrix calculus in solving systems of linear equations. Student analyses properties of a given function of two variables using differential calculus of several variables functions. Student uses double and triple integral in geometrical applications. Student determines gradient, divergence and rotation as well as field potential. Student demonstrates some chosen techniques of solving ordinary differential equations. Student gives the definition of basic notions of probability theory. Student describes the basic types of distributions of random variable.	[SW1] Assessment of factual knowledge
	K6_U02	Student appreciates the importance of skilful use of the basic mathematical apparatus in the aspect of technical studies and is able to undertake substantive discussion related to the selection of the method for the task he solves. Student is able to integrate the information obtained in a mathematical task, interpret them, draw conclusions and reason opinions.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
Subject contents	<p>Number series: Convergent and divergent series. Convergence tests of the number series.</p> <p>Power series: Radius and interval of convergence of series. Developing functions in series.</p> <p>Elements of linear algebra: Matrices, their properties and operations on matrices. Determinants. Inverse of a square non-singular matrix. Dot product, cross product, their properties and its applications. The triple scalar product and applications.</p> <p>Systems of linear equations. Cramer patterns. The rank of the main and completed matrix. Kronecker-Capelli theorem. Gaussian elimination method.</p> <p>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.</p> <p>Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications.</p> <p>Elements of field theory: scalar and vector fields. Gradient, divergence, rotation.</p> <p>Ordinary differential equations: First order linear differential equations. Linear differential equations order n with constant coefficients.</p> <p>Calculus of probability - discrete and continuous random variable, distribution function, expected value and variance of a random variable.</p>		
Prerequisites and co-requisites			

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	50.0%
	Quizzes	0.0%	10.0%
	Tests	50.0%	40.0%
Recommended reading	Basic literature	- M. Gewert, Z. Skoczylas : Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław; - K. Jankowska, T. Jankowski : Zadania z matematyki wyższej, Wydawnictwo PG, 2010; - K. Jankowska, T. Jankowski : Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna, Wydawnictwo PG, 2010; - K. Jankowska, T. Jankowski : Zadania z matematyki wyższej. Wydawnictwo PG, 2010; - E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000; - M. Bednarczyk, A. Dąbrowicz-Tlałka, Wdawnictwo PG, 2016	
	Supplementary literature	G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN W. Kryszicki, L. Włodarski : Analiza matematyczna w zadaniach II, Wydawnictwo Naukowe PWN R. Leitner, Zarys matematyki wyższej II, Wydawnictwo Naukowo-Techniczne W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN	
	eResources addresses	WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678 WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678 WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678 WCh - ChB - s2: 2020/21 (A.Dąbrowicz-Tlałka) - Moodle ID: 11678 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11678	

<p>Example issues/ example questions/ tasks being completed</p>	<p>Examine the convergence of series ... using the appropriate convergence criterion.</p> <p>Expand the given function ... in series and designate the radius at which this expansion is true.</p> <p>Discuss the solvability of the given system of equations</p> <p>Find local extrema of the given function $f(x, y) = \dots$</p> <p>Calculate the double integral ... over the indicated area D.</p> <p>Using cylindrical or spherical coordinates, calculate the given triple integral ...</p> <p>Determine the potential of the vector field ...</p> <p>Using the prediction method, solve the first and second order linear differential equations.</p> <p>Calculate cumulative distribution function of the given discrete random variable</p>
<p>Work placement</p>	<p>Not applicable</p>