Subject card

Subject name and code	Mathematics, PG_00048912
Field of study	Chemistry in Construction 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	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	

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						

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. Student defines basic notions of matrix calculus. Student uses basic notions and formulas of matrix calculus in solving systems of linear equations. Student analises properties of a given function of two variables using differentional 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.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents	Number series: Convergent and divergent series. Convergence tests of the number series.
	Power series: Radius and interval of convergence of power series.
	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.
	Systems of linear equations. Cramer patterns. The rank of the main and completed matrix. Kronecker-Capelli theorem. Gaussian elimination method.
	Functions of two variables: Partial derivatives. Total differential.
	Taylors formula. Maxima and minima of a function of several variables.
	Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications.
	Elements of field theory: scalar and vector fields. Gradient, divergence, rotation.
	Ordinary differential equations: First order linear differential equations. Linear differential equations order n with constant coefficients.
	Calculus of probability: Discrete and continuous random variable, distribution function, expected value and variance of a random variable. Basic distribution of a random variable.
Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm tests	0.0%	40.0%
	Class work	0.0%	10.0%
	Written exam	50.0%	50.0%

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, Wydawnictwo PG, 2016

	Supplementary literature	G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN
		W. Krysicki, 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	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Find the radius of convergence of the power series ... and check its convergence at the end points. Discuss the solvability of the given system of equations ... . Find local extrema of the given function f (x, y) = ... Calculate the double integral ... over the indicated area D. Using cylindrical or spherical coordinates, calculate the given triple integral ... Determine the potential of the vector field... Using the prediction method, solve the first and second order linear differential equations. Calculate the expected value and variance of the given random variable of the continuous type ...	
Work placement	Not applicable	