Subject card

Subject name and code	Mathematics, PG_00057771
Field of study	Green Technologies

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	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 Hanna Guze
	Teachers	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	60.0	0.0	0.0	0.0	105
	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	105	10.0	125.0	240

Subject objectives	Students obtain competence in using methods of mathematical analysis and linear algebra, and knowledge how to solve simple problems that are found in the field of engineering, in particular connected to green technologies and environment protection.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K01] understands the need for learning throughout life, can inspire and organize the learning process of others. Is aware of his/her own limitations and knows when to ask the experts, can properly identify priorities for implementation, critically evaluate his knowledge	Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_U03] is able to use information and communication technologies relevant to the common tasks of engineering, is able to use known methods and mathematical-physical models to describe and explain phenomena and chemical processes	Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in the future. Student uses methods of mathematical description of phenomena in the physical and chemical processes.	[SU4] Assessment of ability to use methods and tools
	[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 analyses properties of a given function of two variables using differential calculus of multivariable functions. Student defines the basic concepts of linear algebra. Student evaluates the limits of sequences, radius and interval of convergence of a power series. Student is able to determine the type of convergence of a number series. Student evaluates double and triple integrals and explains the methods of change of variables. Student knows various types of differential equations and selects the appropriate methods to solve them. Students explains the definitione of the cross product.	[SW1] Assessment of factual knowledge

Subject contents	Infinite number series: necessary condition for convergence, criteria for convergence, alternating series, conditional and absolute convergence. Power series. Elements of Linear Algebra: matrices (definition, types of matrices, operations, inverse matrix),determinants (definition, properties), systems of linear equations (Cramer's rule, Kroneckera - Capelli theorem, Gaussian elimination). Analytic Geometry: vectors (dot product, cross product, mixed product, and their application). Conic sections and graphs of selected surfaces. Multivariable Functions: limits and continuity, partial derivatives with applications. Integrals of multivariable functions: double integrals (definition, polar coordinates, application in geometry and physics), triple integrals (definition, cylindrical and spherical coordinates, application in geometry and physics). Ordinary Differential Equations: separable, homogeneous, Bernoulli, first order linear equations, linear of order n with constant coefficients, variation of parameters and undetermined coefficients method. Probability and Statistics: discrete and continuous random variable, probability distribution, expected value and variation of a random variable, distribution functions, elements of statistics.

Prerequisites and co-requisites	Working knowledge of the concepts of the first semester of mathematics.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final Exam	50.0%	50.0%
	Tests and activity during the classes.	50.0%	50.0%

Recommended reading	Basic literature	Sherman K. Stein, Calculus and analytic geometry, McGraw - Hill Book Company, 4th edition, 1987.
		Howard Anton, Calculus. A new horizon., John Wiley and Sons Publishing Company, 6th edition, 1999.
		D.J. Hartfiel, Arthur M. Hobbs, Elementary linear algebra, Prindle, Weber & Schmidt, Boston, 1987.
		T. Jankowski, Linear algebra, Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2001.
		K. Jankowska, T. Jankowski, "Zbiór zadań z matematyki", cz. 2 i 3, PG Gdańsk.
	Supplementary literature	M. Gewert, Z. Skoczylas,"Analiza matematyczna II - Definicje, twierdzenia, wzory", Oficyna Wydawnicza GiS.
		M. Gewert, Z. Skoczylas,"Analiza matematyczna II - Przykłady i zadania", Oficyna Wydawnicza GiS.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Determine convergence of the series. 2. Find the Taylor expansion of the given function. 3. Find the inverse matrix. 4. Solve the given system of linear equations. 5. Sketch the graph of the following surface. 6. Evaluate the triple integral. 7. Find local extreme values of the function f(x,y)=... . 8. Find the general solution of the differential equation. 9. Compute the expected value and the variation of the given continuous random variable..	
Work placement	Not applicable	