GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics 2, PG_00055876						
Field of study	Power Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
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	8.0			
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						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	0.0	15.0	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	12.0	98.0	200
Subject objectives	Student obtains competence in the range of using methods of mathematical analysis and linear algebra and skills to solve simple problems that can be found in the field of enginering.				

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] has basic knowledge of mathematics necessary to describe the phenomena related to the processes of energy conversion and transfer; uses information technology to solve mathematical problems	Student performs calculations on complex numbers Student determines the real and complex roots of polynomials Student examines complex functions. Student knows the definition of the derivative of complex function. Student uses one variable integral to find area, center of mass plane figures and area and volume of rotational space figures. Student evaluates limits of a function of two variables. Student calculates partial derivatives of a function of two variables. Student analyses properties of a given function of two variables using differential calculus of multivariable functions. Student examines functions of several variables, using the concept of a limit, continuity and derivatives. Student determines local and global extrema of functions of two variables. Students calculates double integrals, and explains the method of substitution in the double integral. Student applies double integrals to solving geometrical problems (also in 3D space). Knows polar coordinates. Calculates triple integrals. Student can tell if a given series is convergent (knows basic criteria). Can find interval of convergence for a power series. Student demonstrates some techniques for solving ordinary differential equations. Student determines general and particular solutions of certain types of the first-order differential equations. Students finds the right method for solving ordinary differential equations. Student determines fundamental set of solutions of the homogeneous linear equation of order n with constant coefficients. Student determines general and particular solutions of higher orders linear differential equations with constant coefficients. Student uses mathematical packages to perform calculations and visualization of mathematical concepts.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
	[K6_K01] is aware of the need for training and self-improvement in the profession of energy and the possibility of further education; can think and act in a creative and entrepreneurial manner; can define priorities for the implementation of an individual or group task	Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem. Student understands the need of lifelong learning. Student is able to inspire others and organize their learning process.	[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness

Course outcome	Subject outcome	Method of verification
[K6_U02] is able to apply the learned mathematical methods to the analysis and design of elements, systems and energy systems	Student can understand and apply complex numbers used to describe electrical circuits. Student can apply of two variable calculus to find characteristic points of a two (or three) variable function (maximum/minimum/saddle point) . Student is able to set up a one or two variable integral to obtain e.g. amount of work/energy (or simply amount of paint) needed in some physical process. Student solves (simple) differential equations arising from (simple) electrical circuits.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Complex numbers (revision from sem.1)

- Algebraic, trigonometric and exponential form of a complex number
- Operations on complex numbers, solving eqations, applications to real polynomials.

Multivariable calculus

- Two variable functions (limit, continuity), partial derivatives.
- Calculus of two variables, extrema and saddle points. Opimalization problems.
- Double integral (over simple regions, changig orgers of intrgration).
- Polar coordinates and double integrals.
- Applications

Ordinary differential equations

- Ordinary first order differential equations
- Higher order linear differential equations with constant coefficients.
- Systems of linear differential equations .

Series and power series

- Basic thms for convergent series (comparison thm. integral thm.)
- D\Alembert and Cauchy theorem.
- Power series, finding interval of convergence.

Differential equations

- Differential equations with separe variables.
- Linear equations (homogenous and nonhomogenous).
- Linear equations of higher degree with constat coefficients

Analitic geometry

- Equation of the plane in 3D space,
- equation of the line in space.
- Vector product, dot product and mixed product of two vectors (in 3D space).

Prerequisites and co-requisites

Mthematics I passed

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	0.0%	10.0%
Midterm tests	0.0%	40.0%
Final Exam	40.0%	50.0%

Recommended reading

Basic literature

Bibliography

1. Leja F., *Rachunek różniczkowy i całkowy*, PWN Warszawa 1962
2. Żakowski W., Leksiński W., *Matematyka cz. IV*, Wydawnictwo Naukowo-Techniczne, Warszawa, 1971

	Supplementary literature	Supplementary Bibliography 1. Fichtenholtz, G. M., *Rachunek różniczkowy i całkowy, t. 1-2*, PWN Warszawa 1962 2. Jankowska K., Jankowski T., *Zbiór zadań z matematyk*i, Wydawnictwo PG Gdańsk 1998 3. Krysicki W., Włodarski L., *Analiza matematyczna w zadaniach, cz. II*, PWN Warszawa 1994 4. Pogorzelski W., *Analiza matematyczna, t. 2-3*, PWN Warszawa 1956
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Compute e.g. (-3+3i)^14, write cube roots of (sqrt(3)-i). 2. Find a plane passing throug three given points. 3. Point on the plane clossest to a given point. 4. Determine extrema/saddle points for a function of two variables. 5. Find a tangent plane to the graph of two variable f-tion. 6. Find min.max of a two fariable f-ion on a disc/halfdisc/triangle ect. 7. Find the volumes of the given solids by means of double integral (or by means of triple integral). 8. Replace double integral by an integrai in polar coordinates. 9. Find area of a lamina (e.g. in polar coordinates). 10. Determine if a series is convergent. 11. Determine the interval where a given power series is convergent. 12. Solve diff. equation with separate variables 13. Solve linear diff. equation (nonhomogenous). 14. Solve linara fiff. equation of higher order and constant coeficients.	
Work placement	Not applicable	

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