GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematics II, PG_00042604		
Field of study	Environmental 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 Subject group related to scientific research in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
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 Krzysztof Radziszewski	
	Teachers	dr Krzysztof Radziszewski mgr inż. Krystyna Dąbrowska	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

E-learning hours included: 0.0

Adresy na platformie eNauczanie:

WILiŚ - Bud. IŚ niestacjonarne sem.2 - Matematyka 2020/2021 (K.Radziszewski) - Moodle ID: 13624 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13624

WILiŚ - Bud. IŚ niestacjonarne sem.2 - Matematyka 2020/2021 (K.Radziszewski) - Moodle ID: 13624 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13624

WILiŚ - Bud. IŚ niestacjonarne sem.2 - Matematyka 2020/2021 (K.Radziszewski) - Moodle ID: 13624 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13624

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	60	12.0	154.0	226

Subject objectives

Students obtain competence in the range of using methods of mathematical analysis and knowledge how to solve simple problems that can be found in the field of engineering.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] has knowledge in the field of mathematics, including: linear algebra, mathematical analysis and elements of mathematical statistics, probability theory, applications of mathematics, including mathematical methods and numerical methods, necessary for: 1) description and analysis of hydrological phenomena; 2) description and analysis of meteorological phenomena; 3) solving project tasks of the sanitary industry;	Student lists geometrical applications of definite integrals. Student distinguishes between types of improper integrals. Student uses definite integral to solve geometrical tasks. Student computes partial derivatives and uses differential calculus to examine properties of the function of several variables. Student uses the basic operations on complex numbers. Student solves ordinary differential equations. Student computes multiple integrals and uses integral calculus to geometric and mechanics applications. Student computes the gradient of a scalar field, divergence and rotation of a vector field and a potential field. Student studies canvergence of number series. Student calculates the radius of convergence and the interval of convergence of a power series. Student uses power series in order to compute sums of number series. Student calculates the probability of random events. Student describes the basic types of distributions of random variable. Student gives the definition of basic notions of probability theory.	[SW1] Assessment of factual knowledge
	[K6_U01] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions	Student recognizes the importance of self-expanding knowledge and takes the challenge of working with a group to solve a problem. Student combines knowledge of mathematics with knowledge from other fields. Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in the future. Student recognizes the importance of self-expanding knowledge. Student uses methods of mathematical description of phenomena in the physical / mechanical. Student understands the need of lifelong learning. Student is able to inspire others and organize their learning process. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions	[SU2] Assessment of ability to analyse information

Subject contents	**Definite integrals in Riemann's sense**: Newtona-Leibniza Thorem. Methods of evaluations of definite integrals. Applications of definite integrals. Improper integrals. Applications of improper integrals.Integration formulas, the substitution method of integration and integration by parts for definite integrals.Applications of integral calculus in computing areas of plane figures, lengths of arcs, volumes of solids of revolution. **Functions of several variables:** Limit and continuity of a function of several variables. Partial derivatives. Total differential. Taylor's formula. Maxima and minima of a function of several variables. Implicit functions. **Complex numbers:** Algebraic, trigonometric, exponential form, operations, exponentiation (Moivre formula), finding roots of complex numbers. Operations on complex numbers. **Ordinary differential equations:** First order differential equations. General and particular solution. The Cauchy initial value problem. Variables separable, linear, Bernoulli, exact differential equations. Second order linear differential equations with constant coefficients. Fundamental set of solution of the homogeneous linear differential equation. Non-homogeneous linear differential equations. Higher order linear differential equations with constant coefficients. Double and triple integrals. Applications of multiple integrals. Line integrals with applications. **Elements of field theory and differential geometry:** Scalar and vector fields, the gradient of a scalar field, divergence and rotation of a vector field, a potential field. Line integrals with applications. **Number series and function series:** Number series. Convergent and divergent series. Convergence tests of the number series. Power series. Radius and interval of convergence. Integration and differentiation of power series. Examples of applications - approximate calculation of integrals. **Calculus of probability:** Discrete and continuous random variables, distribution function, expected value and variance of a random variable. Basic distribution of random variables.
Prerequisites and co-requisites	No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	50.0%	60.0%
Midterm colloquium	50.0%	40.0%

Recommended reading

Basic literature	K. Jankowska, T. Jankowski, Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna, PG, Gdańsk 2005. K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, PG, Gdańsk 1999. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach I i II, Wydawnictwo Naukowe PWN, Warszawa 1998. E. Pluciński, Elementy probabilistyki, Wydawnictwo Naukowe PWN, Warszawa 1981.
Supplementary literature	E. Mieloszyk, Liczby zespolone, PG, Gdańsk 2003. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 – Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2003. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 – Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2003. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne , Oficyna Wydawnicza GiS, Wrocław 2001. R. Leitner, Zarys matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 2001. R. Leitner, W. Matuszewski, Z. Rojek, Zadania z matematyki wyższej I i II, Wydawnictwo Naukowo-Techniczne, Warszawa 1999.
eResources addresses	WILiŚ - Bud. IŚ niestacjonarne sem.2 - Matematyka 2020/2021 (K.Radziszewski) - Moodle ID: 13624 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13624 WILiŚ - Bud. IŚ niestacjonarne sem.2 - Matematyka 2020/2021 (K.Radziszewski) - Moodle ID: 13624 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13624 WILiŚ - Bud. IŚ niestacjonarne sem.2 - Matematyka 2020/2021 (K.Radziszewski) - Moodle ID: 13624 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13624

Example issues/ example questions/ tasks being completed	1. Find the area between the two curves $y=e^x$ and $y=3-e^x$ from $x=-2$ to $x=0$. 2. Sketch the graph of the function $f(x,y)=x^2$. 3. Identify any local extrema of the function $f(x,y)=e^{x-y}(x^2-2y^2)$. 4. Find the absolute extrema of the function $f(x,y)=xy-x(x+1)-y(y+1)$ on the set $D=\{(x,y): x^2+y^2\leq 25, y\geq 3\}$. 5. Solve the equation $y''+6y'+9y=10\sin x$. 6. Find the divergence and rotation of the vector field $[2xe^{3y}+z^2, 3x^2e^{3y}+z, 2zx+y]$. 7. Find the distribution function, expected value and variance of a random variable X: $P(-2)=0,1$, $P(-1)=0,5$, $P(0)=0,2$, $P(3)=0,1=P(5)$.
Work placement	Not applicable