



Subject card

Subject name and code	Mathematics III, PG_00043536						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023		
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	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			5.0		
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 Cezary Mrozicki					
	Teachers	mgr Małgorzata Kula dr Cezary Mrozicki					
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						
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		10.0		60.0	130
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;	The student explains the substitution method in computing double integral and triple integral. The student mentions the application of double integrals and triple integrals. The student distinguishes between line integrals and applies appropriate methods to calculate them. The student distinguishes between surface integrals and applies appropriate methods to calculate them. The student presents the use of line integrals. Student presents the application of surface integrals. The student recognizes various types of differential equations and selects the appropriate methods to solve them. The student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in future.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
	[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	The student combines knowledge of mathematics with knowledge from other fields.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
Subject contents	Double integral: Definition, properties, interpretation; expressing the double integral as an iterated integral; integration by substitution (polar coordinates); application of double integrals. Triple integral: Definition, properties, interpretation; expressing the triple integral as an iterated integral; integration by substitution (cylindrical coordinates and spherical coordinates); application of triple integrals. Line integrals: Line integrals of the first kind - definition, properties and interpretation; transforming the line integral to the corresponding definite integral. Line integrals of the second kind (along oriented curves) - definition, properties and interpretation; transforming the line integral to the corresponding definite one; Green's theorem; path independence. Surface integrals: Integrals of the first kind - definition, properties and interpretation; transforming the surface integral to the corresponding double integral. Integrals of the second kind (surface-oriented) - definition, properties and interpretation; transforming the surface integral to the corresponding double integral; Gauss-Ostrogradski's theorem; Stoke's theorem. Application of surface integrals. Ordinary differential equations: First order differential equations. General and particular solution. The Cauchy initial value problem. Variables separable, linear, Bernoulli's, 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.		
Prerequisites and co-requisites	Knowledge of the subject: Mathematics I. Knowledge of the subject: Mathematics II.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	35.0%
	Midterm colloquium	50.0%	65.0%
Recommended reading	Basic literature	W. Kryszewski, L. Włodarski, Analiza matematyczna w zadaniach 2, Wydawnictwo Naukowe PWN, Warszawa 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Definicje. Twierdzenia. Wzory. Oficyna Wydawnicza GIS, Wrocław 2008 M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2008 K. Jankowska, T. Jankowski, Zadania z matematyki wyższej, Wydawnictwo PG, Gdańsk 2008 K. Jankowska, T. Jankowski, Funkcje wielu zmiennych. Całki wielokrotne. Geometria analityczna, Wydawnictwo PG, Gdańsk 2008	
	Supplementary literature	W. Leksiński, I. Nabiałek, W. Żakowski, Matematyka. Definicje, twierdzenia, przykłady, zadania. WNNT, Warszawa 2006	
	eResources addresses	Podstawowe https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25524 - Lecture content. Adresy na platformie eNauczanie:	

Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none">1. Calculate the double integral.2. Calculate the integral of a triple.3. Calculate the integral curved.4. Solve the differential equation.
Work placement	Not applicable