



## Subject card

Subject name and code	Mathematics, PG_00037396						
Field of study	Biotechnology						
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				
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	7.0				
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-Tłałka					
	Teachers	mgr Mirosław Bednarczyk dr Anita Dąbrowicz-Tłałka					
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						
	WCh - Bt - s2, gr.1,2,3: 2020/21 (M.Bednarczyk) - Moodle ID: 11676 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11676">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11676</a> WCh - Bt, Ch, ChB, TCh - s2: 2020/21 (A.Dąbrowicz-Tłałka) - Moodle ID: 9469 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=9469">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=9469</a> WCh - Bt, Ch, ChB, TCh - s2: Algebra I 2020/21 (A.Dąbrowicz-Tłałka) - Moodle ID: 13901 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13901">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13901</a> WCh - Bt, Ch, ChB, TCh - s2: Równ. różn. 2020/21 (A.Dąbrowicz-Tłałka) - Moodle ID: 13902 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13902">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13902</a>						
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	6.0	79.0	175		
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	<p>Student examines the convergence of the number series. Student determines the convergence range of the power series and develops the function into a series.</p> <p>Student defines basic notions of matrix calculus. Student uses basic notions and formulas of matrix calculus in solving systems of linear equations. Student analyses properties of a given function of two variables using differential 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.</p>	[SW1] Assessment of factual knowledge
	K6_U01	Student uses gained knowledge in basic mathematics to analyse results of experiments .	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
Subject contents	<p>Number series: Convergent and divergent series. Convergence tests of the number series.</p> <p>Power series: Radius and interval of convergence of series. Developing functions in series.</p> <p>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.</p> <p>Systems of linear equations. Cramer patterns. The rank of the main and completed matrix. Kronecker-Capelli theorem. Gaussian elimination method.</p> <p>Functions of two variables: Limit and continuity of a function of several variables. Partial derivatives. Total differential.</p> <p>Taylor's formula. Maxima and minima of a function of several variables.</p> <p>Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications.</p> <p>Elements of field theory: scalar and vector fields. Gradient, divergence, rotation.</p> <p>Ordinary differential equations: First order linear differential equations. Linear differential equations order <math>n</math> with constant coefficients.</p> <p>Calculus of probability - discrete and continuous random variable, distribution function, expected value and variance of a random variable.</p>		
Prerequisites and co-requisites	Student should have passed the exam in mathematics for the first semester.		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm tests	50.0%	40.0%
	quizzes	50.0%	10.0%
	written exam	50.0%	50.0%
Recommended reading	Basic literature	<p>- M. Gewert, Z. Skoczylas : Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław;</p> <p>- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej, Wydawnictwo PG, 2010;</p> <p>- K. Jankowska, T. Jankowski : Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna, Wydawnictwo PG, 2010;</p> <p>- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej. Wydawnictwo PG, 2010;</p> <p>- E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000;</p> <p>- M. Bednarczyk, A. Dąbrowicz-Tlałka, Wdawnictwo PG, 2016</p> <p>- A. Zeliaś : Metody statystyczne, Polskie Wydawnictwo Ekonomiczne, Warszawa 2000.</p>	
	Supplementary literature	<p>G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN</p> <p>W. Kryszicki, L. Włodarski : Analiza matematyczna w zadaniach II, Wydawnictwo Naukowe PWN</p> <p>R. Leitner, Zarys matematyki wyższej II, Wydawnictwo Naukowo-Techniczne</p> <p>W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Examine the convergence of series ... using the appropriate convergence criterion.</p> <p>Expand the given function ... in series and designate the radius at which this expansion is true. Discuss the solvability of the given system of equations ... .</p> <p>Find local extrema of the given function <math>f(x, y) = \dots</math></p> <p>Calculate the double integral ... over the indicated area D.</p> <p>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.</p> <p>Calculate cumulative distribution function of the given discrete random variable ....</p>		
Work placement	Not applicable		