GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	MATHEMATICS, PG_00064376		
Field of study	Chemistry		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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	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 Anita Dąbrowicz-Tlałka	
	Teachers	mgr Dorota Garbowska dr Anita Dąbrowicz-Tlałka	

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	110.0	225

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] applies his/her knowledge of selected branches of mathematics and physics to analyse, interpret and solve problems and to describe physical, chemical phenomena and technological processes	Student examines the convergence of the number series. Student defines basic notions of matrix calculus. Student uses basic notions and formulas of matrix calculus in solving systems of linear equations. Student analisies properties of a given function of two variables using differentional 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.	[SW1] Assessment of factual knowledge
[K6_K01] understands the need for continuous learning, can inspire and organise learning and others, understands the importance of group and team activities	Student recognizes the importance of skillful use of basic mathematical apparatus in terms of study in the future. 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 [SK2] Assessment of progress of work
[K6_U02] determines the time required for the task, plans and organises the work of both the individual and the small team in such a way as to ensure that the task is completed within the set time limit	Student determines the time required to complete tasks, plans the execution of tasks and the manner of their presentation together with the team, cooperates with team members, and ensures timely completion of task stages.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_U04] creates detailed documentation of the results obtained from the experiments carried out individually or as part of a team, analysing and interpreting the results in the form of text documents, spreadsheets, graphs, technological diagrams, multimedia presentations using correct chemical nomenclature	Presenting solutions to tasks. Ability to justify the choice of calculation method. Optimizing the number of solution steps leading to the correct result. Using selected applications to solve task steps and visualizations and assessing their usefulness in a given task.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Number series: Convergent and divergent series. Convergence tests of the number series.

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. Systems of linear equations. Cramer patterns. The rank of the main and completed matrix. Kronecker Capelli theorem. Gaussian elimination method.

Functions of two variables: Limit and continuity of a function of several variables. Partial derivatives. Total differential. Taylors formula. Maxima and minima of a function of several variables..Elements of field theory: scalar and vector fields. Gradient, divergence, rotation.

Multiple integrals: Normal and regular area. Double and triple integral. Change of variables - polar, cylindrical and spherical coordinates. Examples of applications.

Ordinary differential equations: First order linear differential equations. Linear differential equations order n with constant coefficients. Calculus of probability:

Discrete and continuous random variable, distribution function, expected value and variance of a random variable. Basic distribution of a random variable.

Prerequisites and co-requisites

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Activities during classes</td><td>0.0%</td><td>10.0%</td></tr>
<tr><td>Midterm exams and tests</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>Written exam</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td>Basic literature</td><td>- M. Gewert, Z. Skoczylas : Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław;

- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej, Wydawnictwo PG, 2010;

- K. Jankowska, T. Jankowski : Funkcje wielu zmiennych, Całki wielokrotne, Geometria analityczna, Wydawnictwo PG, 2010;

- K. Jankowska, T. Jankowski : Zadania z matematyki wyższej. Wydawnictwo PG, 2010;

- E. Mieloszyk : Macierze, wyznaczniki i układy równań, Wydawnictwo PG, 2000;

- M. Bednarczyk, A. Dąbrowicz-Tlałka, Wydawnictwo PG, 2016</td></tr>
<tr><td></td><td>Supplementary literature</td><td>- G.M. Fichtenholz : Rachunek różniczkowy i całkowy, t. 2, Wydawnictwo Naukowe PWN

- W. Krysicki, L. Włodarski : Analiza matematyczna w zadaniach II, Wydawnictwo Naukowe PWN

- W. Stankiewicz : Zadania z matematyki dla wyższych uczelni technicznych, Wydawnictwo Naukowe PWN</td></tr>
<tr><td></td><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
WCh - Bt, Ch, TCh, ZT – s2: 2024/25 (A.Tlałka) - Moodle ID: 44296
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44296
WCh - Ch - Mat. ćw. s2: 24/25 (D.Garbowska) - Moodle ID: 44304
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44304</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Examine the convergence of series ... using the appropriate convergence criterion.

Discuss the solvability of the given system of equations ... .

Find local extrema of the given function f (x, y) = ...

Using cylindrical or spherical coordinates, calculate the given triple integral ...

Using the prediction method, solve the second order linear differential equations.

Calculate the expected value and variance of the given random variable of the continuous type ..</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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