GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Application of Mathematics in Technology 2, PG_00042057		
Field of study	Power Engineering		
Date of commencement of studies	October 2024	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	2	Language of instruction	English
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Horiszny	
	Teachers	dr hab. inż. Jacek Horiszny	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

E-learning hours included: 0.0

eNauczanie source addresses:
Moodle ID: 4285 Application of Mathematics in Technology 2 [2025/26]
https://enauczanie.pg.edu.pl/2025/course/view.php?id=4285

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	30	5.0	40.0	75

Subject objectives

Introduction to numerical methods and their application in solving problems in electrical engineering.

Learning outcomes

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	is able to apply the known numerical methods with the use of modern computational tools	[SU4] Assessment of ability to use methods and tools
[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	uses numerical methods to: solve equations and systems of linear and non-linear equations describing electric circuits, interpolation and approximation of functions of one variable in order to develop measurement data, calculating definite integrals for solving problems in an electromagnetic field, solving differential equations describing a transient state in an electric circuit.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

Course content – lecture
Numerical methods in electrical engineering: solving linear DC circuits - Gauss method, Gauss-Jordan method, Jacobi method; solving nonlinear DC circuits - secant method, Newton's method; approximation of measurement data - Lagrange's formula, Newton's formula,the least squares method; solving problems in electrodynamics - integration using the trapezoidal method, Simpson's method; solving electric circuits in a transient state - Adams-Bashforth methods of 1st and 2nd order

Course content – exercises
Numerical methods in electrical engineering: solving linear DC circuits - Gauss method, Gauss-Jordan method, Jacobi method; solving nonlinear DC circuits - secant method, Newton's method; approximation of measurement data - Lagrange's formula, Newton's formula,the least squares method; solving problems in electrodynamics - integration using the trapezoidal method, Simpson's method; solving electric circuits in a transient state - Adams-Bashforth methods of 1st and 2nd order

Prerequisites and co-requisites

Basic knowledge of electrical engineering and electronics.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Tasks solved during exercises</td><td>55.0%</td><td>33.0%</td></tr>
<tr><td>2 tests during the semester</td><td>55.0%</td><td>67.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Shoup T. E.: Applied numerical methods for the microcomputer</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Ceraolo M., Poli D.: Fundamentals of Electric Power Engineering: From Electromagnetics to Power Systems, Wiley-IEEE Press 2014

Alexander C., Sadiku M.: Fundamentals of Electric Circuits, McGraw-Hill 2021</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Solve the given linear DC circuit by Gaussian method

2. Solve the given non-linear DC circuit by the Newton method

3. Perform the approximation of the measurement data using the least squares method

4. Solve a given first-order differential equation using the Euler method.

5. Solve a given second-order differential equation using the Euler method.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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