GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Numerical methods, PG_00061666					
Field of study	Hydrogen Technologies and Electromobility					
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024	
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	1		Language of instruction		Polish	
Semester of study	2		ECTS credits		3.0	
Learning profile	general academic profile		Assessment form		assessment	
Conducting unit	Katedra Elektrotechniki i Inżynierii Wysokich Napięć -> Faculty of Electrical and Control Engineering					
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Mirosław Wołoszyn				
	Teachers	dr inż. Wiktoria Stahl				
		dr hab. inż. Mirosław Wołoszyn				
		mgr inż. Krzysztof Łuksza				

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	0.0	0.0	45
	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	45	4.0	26.0	75

Subject objectives	To learn the basic numerical methods used in engineering calculations. To learn about numerical libraries and to master the ability to use them.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U02] can work individually and in a team, can communicate using various techniques in a professional environment, as well as document and analyze the results of their work, can estimate the time needed to perform the entrusted task	Student will be able to use computer tools for numerical calculations	[SU4] Assessment of ability to use methods and tools
	[K6_K01] is aware of the need for continuous education and self-improvement in the field of the profession of an electrician and knows the possibilities of further education	Student is aware of the need to learn new methods of numerical calculations	[SK2] Assessment of progress of work
	[K6_W05] has structured knowledge of measuring electrical and non-electrical quantities, documenting their results and calculating measurement uncertainty	Student has a basic knowledge of numerical methods	[SW1] Assessment of factual knowledge

Subject contents	Representation of a real number in a digital machine and its effect on the accuracy of calculations, numerical stability of the algorithm.Matrix algebra. Systems of linear equations: Gauss elimination method, Jordan method, LU decomposition, inverse matrix calculation, iterative methods. Nonlinear algebraic equations: finding zeros of functions of one variable, bysection method, secant method, Newton's method, systems of nonlinear equations - simple iteration method, Newton's method. Interpolation: Lagrange polynomials. Numerical calculation of the derivative of a function of one variable, backward, central and forward differential quotients. Approximation: mean squared. Numerical integration of functions of one variable: Newton-Cotes quadrature, Romberg method, Gauss-Legendre quadrature, singular integrals, integrals on an unbounded interval. Methods of solving initial problems for ordinary differential equations: Euler's method.

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture assignments	60.0%	12.0%
	tests and exercise work	60.0%	88.0%
Recommended reading	Basic literature	C. Pozrikidis: Numerical Computation in Science and Engineering,Oxford University Press 1998.	
	Supplementary literature	James F. Epperson: An introduction to numerical methods and analysis. Wiley, 2013	
	eResources addresses	Adresy na platformie eNauczanie: METODY NUMERYCZNE [TWiE][2023/24] - Moodle ID: 36105 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36105 METODY NUMERYCZNE [TWiE][2023/24] - Moodle ID: 36105 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36105 METODY NUMERYCZNE [TWiE][2023/24] - Moodle ID: 36105 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36105	
Example issues/ example questions/ tasks being completed	Solving a system of equations by the Gauss, LU, GS method. Interpolation of functions by the Lagrange method. Approximation of the function sin(x) using mean-square approximation. Calculation of an integral using Simpson's method. Solution of a non-linear equation using Newton's method. Solving a differential equation using Euler's method.		
Work placement	Not applicable		