



## Subject card

Subject name and code	Numerical methods, PG_00061666						
Field of study	Hydrogen Technologies and Electromobility						
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 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 -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Mirosław Wołoszyn					
	Teachers	dr hab. inż. Mirosław Wołoszyn dr inż. Dmytro Kondratenko dr inż. Wiktoria Stahl					
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	The purpose of the course is for the student to master the numerical methods used in engineering calculations.						
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 use computer tools for numerical calculations			[SU4] Assessment of ability to use methods and tools		
	[K6_W05] has structured knowledge of measuring electrical and non-electrical quantities, documenting their results and calculating measurement uncertainty	Student uses numerical methods in engineering work			[SW1] Assessment of factual knowledge		
	[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 learns new algorithms used in numerical methods			[SK2] Assessment of progress of work		
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, bisection 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 eNauczenie: METODY NUMERYCZNE [TWiE][2024/25] - Moodle ID: 43407 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=43407">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=43407</a> METODY NUMERYCZNE [Ćwiczenia][WS][I][2024/25] - Moodle ID: 44251 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=44251">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=44251</a> METODY NUMERYCZNE [Ćwiczenia][DK][I][2024/25] - Moodle ID: 44252 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=44252">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=44252</a>	
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		

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