



Subject card

Subject name and code	Numerical methods, PG_00058338						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
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 hab. inż. Mirosław Wołoszyn dr inż. Maria Chomka				
Lesson types and methods of instruction	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						
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		6.0		39.0	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_U06] has the preparation necessary to work in an industrial environment, applies the principles of occupational health and safety		The student can use computer tools for numerical calculations		[SU4] Assessment of ability to use methods and tools		
	[K6_W01] has basic knowledge of mathematics – including linear algebra, mathematical analysis, numerical methods – necessary to describe physical and chemical phenomena, as well as the analysis of electrical circuits and automation and robotics systems		The 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, 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. Translated with www.DeepL.com/Translator (free version)						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		assignments from lectures, exercises, tests	60.0%
Recommended reading	Basic literature	<p>1. Z. Fortuna, B. Macukow, J. Wąsowski: Metody numeryczne, WNT Warszawa 1982</p> <p>2. J. i M. Jankowscy: Przegląd metod i algorytmów numerycznych. cz. 1, WNT Warszawa 1981.</p> <p>3. M. Dryja, J. i M. Jankowscy: Przegląd metod i algorytmów numerycznych. cz. 2, WNT Warszawa 1982, .</p> <p>4. Pozrikidis: Numerical Computation in Science and Engineering, Oxford University Press 1998</p> <p>.</p>	
	Supplementary literature	<p>1. A. Krupowicz: Metody numeryczne zagadnień początkowych równań różniczkowych zwyczajnych. PWN Warszawa 1986.</p> <p>2. Pozrikidis: Numerical Computation in Science and Engineering, Oxford University Press 1998.</p>	
	eResources addresses	Adresy na platformie eNauczenie:	
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 the mean-square approximation. Calculation of the integral by Simpson's method. Solving a nonlinear equation using Newton's method. Solving a differential equation using Euler's method.		
Work placement	Not applicable		