GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Numerical Methods, PG_00038088		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	
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	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. Piotr Szczeciński dr inż. Krzysztof Iwan dr inż. Wiktoria Stahl dr inż. Joanna Wołoszyn	

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

Knowledge of basic numerical methods used in engineering calculations. Knowledge of numerical libraries and mastering the skills to use them.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W01		
[K6_U05] can use analytical and simulation methods to solve tasks in the field of automation and robotics and use various techniques to carry out engineering tasks related to automation and robotics devices and systems		
K6_U05		
[K6_W01] has basic knowledge in the field of mathematics including algebra, geometry, mathematical analysis, probabilistics, numerical methods - necessary to describe and analyze automation and robotics systems		

Subject contents

Computer arithmetic and round-off error, floating-point representation. Numerical matrix algebra: systems of linear algebraic equations, Gauss elimination, Gauss - Jordan elimination, LU decompostion, computation of the inverse matrix, iterative methods. Nonlinear algebraic equations: one equation: bisection, regula-falsi method, secant method, Newtons method, system of equations: fixed-point iterations, Newtons method. Function interpolation: Lagrange polynomials. Numerical differentiation of a function of one variable, backward, centered, and forward differences. Approximation of functions: least-squares n polynomials. Numerical integration of one-dimensional integrals: Newton-Cotes rules, Romberg integration, Gauss-Legendre quadrature, singular integrands, integrals over infinite domains. Initial-value problems for ordinary differential equations: polynomial approximation, Euler method.

Prerequisites and co-requisites

no prerequisites

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	tasks from lectures	60.0%	12.0%
	tests and work on exercises	60.0%	88.0%
Recommended reading	Basic literature	Z. Fortuna, B. Macukow, J. Wąsowski: Metody numeryczne, WNT Warszawa 1982 J. i M. Jankowscy: Przegląd metod i algorytmów numerycznych. cz. 1, WNT Warszawa 1981. M. Dryja, J. i M. Jankowscy: Przegląd metod i algorytmów numerycznych. cz. 2, WNT Warszawa 1982	
	Supplementary literature	C. Pozrikidis: Numerical Computation in Science and Engineering,Oxford University Press 1998. A. Krupowicz: Metody numeryczne zagadnień początkowych równań różniczkowych zwyczajnych. PWN Warszawa 1986.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	The solution of equations by Gauss, LU, GS. Lagrange interpolation function method. Approximation of the function sin (x) using the mean square approximation. Calculation of integrals by Simpson. The solution of nonlinear equations using Newton's method. The solution of differential equations using Euler's method.		
Work placement	Not applicable		