GDAŃSK UNIVERSITY OF TECHNOLOGY

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 -> Faculty Of Electrical And Control Engineering -> Wydziały Politechniki Gdańskiej		
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, 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.Translated with www.DeepL.com/Translator (free version)

Prerequisites and co-requisites

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>assignments from lectures, exercises, tests</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Z. Fortuna, B. Macukow, J. Wąsowski: Metody numeryczne, WNT Warszawa 1982

2. J. i M. Jankowscy: Przegląd metod i algorytmów numerycznych. cz. 1, WNT Warszawa 1981.

3. M. Dryja, J. i M. Jankowscy: Przegląd metod i algorytmów numerycznych. cz. 2, WNT Warszawa 1982, .

4. Pozrikidis: Numerical Computation in Science and Engineering,Oxford University Press 1998

.</td></tr>
<tr><td>Supplementary literature</td><td>1. A. Krupowicz: Metody numeryczne zagadnień początkowych równań różniczkowych zwyczajnych. PWN Warszawa 1986.

2. Pozrikidis: Numerical Computation in Science and Engineering,Oxford University Press 1998.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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