GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Numerical methods, PG_00064784		
Field of study	Mechatronics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-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	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Mechatronics -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Galewski	
	Teachers	dr hab. inż. Marek Galewski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	15.0	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	4.0	16.0	50

Subject objectives

Providing students with knowledge of selected numerical methods (i.e., computer methods for solving various computational problems), particularly for solving systems of linear, nonlinear, and differential equations, interpolation, approximation, and optimization.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of stationary and non-stationary mechatronic systems/processes with continuous and discrete operation	The student selects an appropriate numerical algorithm for solving the given task.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W02] demonstrates structured and theory supported knowledge encompassing key issues in the field of Mechatronics, enabling modeling and analysis of stationary and non-stationary mechatronic systems, devices, and processes with continuous and discrete operation	The student describes and explains the mathematical dependencies that form the basis of selected numerical algorithms.	[SW1] Assessment of factual knowledge
[K7_W04] demonstrates knowledge encompassing selected issues in the field of detailed knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Mechatronics	The student describes the operation of a selected numerical algorithm and points out its disadvantages, advantages, limitations, and scope of application.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Numerical methods - basic terms

Stability and computational errors

Solving of linear and non-linear set of equations

Eigenvalues and eigenvectors

Numerical integration and derivation

Ordinary differential equation solving (ODE)

Interpolation and aproximation

Optimization

Issues related to the practical implementation of algorithms (optional)</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic programming skills, recommended: Matlab, C, C++, Java</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Written exam</td><td>51.0%</td><td>75.0%</td></tr><tr><td>Project</td><td>51.0%</td><td>25.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>Z. Fortuna, B. Macukow, J. Wąsowski: Metody numeryczne, WNT, 2017

R.L. Burden, J.D. Faires, A.M. Burden: Numerical Analysis- dowolne wydanie

B. Pańczyk, E. Łukasik, J. Sikora, T. Guziak: Metody numeryczne w przykładach, Politechnika Lubelska 2012</td></tr><tr><td>Supplementary literature</td><td>W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, M. Metcalf, Numerical Recipes in C: The Art of Scientific Computing, Second Edition, Cambridge University Press</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Describe selected numerical algorithm

Describe the impact of numerical representation of numbers on computational errors.

What are the advantages and disadvantages of different groups of methods for solving differential equations?

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A list of examplary question will be provided to the students at leas 2 weeks before the exam.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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