GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Numerical Methods, PG_00047665		
Field of study	Informatics		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2021/2022
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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Algorithms and Systems Modelling -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Grzegorz Fotyga	
	Teachers	mgr inż. Michał Tarkowski dr inż. Piotr Sypek dr hab. inż. Grzegorz Fotyga	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	0.0	45
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie:						

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	2.0	28.0	75

Subject objectives	
	The primary objective of the course is to teach student how to analyze and apply basic numerical analysis metods, and how to implement numerical algorithms using high-level programming languages.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student analyzes problems, creates basic numerical algorithms and estimates numerical errors of the received solutions. Analyzes sources, identifies types of numerical errors and their propagation.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	The student knows and understands the basics of numerical analysis used to solve engineering problems, in particular such issues as: solving systems of linear equations, nonlinear equations, approximation, interpolation, numerical integration.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n	The student solves engineering problems using numerical methods that are adequate to the complexity of the problem. Students will be able to assess the computational complexity of the methods used and identify sources of possible numerical errors.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_U43] can analyse date and formulate, apply and assess appropriate formal models and algorithms for solving problems in the field of information systems and applications	The student understands the principle of operation and is able to implement in programming languages such as: c++, Python, Matlab basic numerical algorithms used to solve engineering problems. In particular, she/he is able to implement algorithms related to: solving systems of linear equations, nonlinear equations, approximation, interpolation, numerical integration, operations on matrices.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents

1. Introduction to numerical methods.
2. Floating point representation of numbers.
3. Types of errors and their sources.
4. Well and ill conditioned numerical problems.
5. Stability of numerical algorithms.
6. Solving linear systems using direct and iterative methods.
7. Solving of equations of one variable.
8. Interpolaction using Lagrange, Chebyshew and trigonometric polynomials. Cubic spline interpolation.
9. Discrete and continuous approximation.
10. Numerical integration.
11. Numerical differentiation.
12. Solving of systems of nonlinear equations.
13. Introduction to solving differential equations.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical exercise	50.0%	30.0%
Project	50.0%	30.0%
Midterm colloquium	50.0%	40.0%

Recommended reading

Basic literature	[1] Burden R.L., Faires J.D. , Numerical Analysis, Prindle, Weber & Schmidt, Boston 1981.
Supplementary literature	No requirements
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement	Not applicable