University of Gdańsk

Subject card

Subject name and code	Numerical Laboratory, PG_00182328						
Field of study	Physics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	Master's studies		Subject group	Obligatory subject group in the field of study Optional 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	6.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Institute of Theoretical Physics and Astrophysics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Piotr Gnaciński					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	75.0	0.0	0.0	75
	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	75		0.0	75.0	150	
Subject objectives	Student should learn the theory and practical application of numerical methods used in physics.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMU2_W03] knows experimental, observational and numerical techniques to plan and perform a complex physics experiment or computer simulation	The student is able to perform a numerical simulation of a physical experiment.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task
[FIZMU2_W02] has in-depth knowledge in mathematics as well as mathematical and computational methods, necessary to solve physical problems of high complexity and in-depth in the selected area of physics	The student knows the mathematical and numerical methods used to solve physical problems.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task
[FIZMU2_U07] is able to present the results of research (experimental, theoretical or numerical) in written, oral, multimedia presentation or poster form	The student is able to write a report containing a description of the numerical methods used and a presentation of the results.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task
[FIZMU2_U05] has the ability to synthesize methods and ideas from various areas of physics and other exact and natural sciences; is able to notice that even distant phenomena are described by similar models	he student is able to apply the numerical methods learned in problems from various natural sciences.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task
[FIZMU2_U03] is able to make a critical analysis of the results of measurements, observations or theoretical calculations along with the assessment of the accuracy of the results	The student is able to test the correctness and accuracy of calculations.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task
[FIZMU2_W05] knows the theoretical foundations of computational methods and IT techniques used to model and simulate physical systems	The student knows the basic numerical methods used in physical problems.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task
[FIZMU2_W04] knows the principle of operation of measuring systems and research equipment specific to the area of physics related to the selected specialization or knows advanced methods of theoretical and mathematical physics	The student knows the methods of theoretical and mathematical physics used in numerical calculations.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task

Subject contents

Solving algebraic systems of linear equations.
Finding the eigenvalues and eigenvectors of matrices.
Solving nonlinear equations and their systems.
Interpolation.
Approximation.
Minimizing function values.
Fast Fourier transform.
Integration using quadratures.
Pseudorandom number generators.
Monte Carlo integration.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written works	51.0%	100.0%

Recommended reading

Basic literature	Tao Pang, "Metody obliczeniowe w fizyce"
Supplementary literature	Press, Teukolsky, Vetterling, Flannery, "Numerical Recipes 3rd Edition: The Art of Scientific Computing"
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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