GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical modeling in electrodynamics , PG_00045971
Field of study	Electrical Engineering

Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
Education level	second-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	1	ECTS credits	4.0
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	mgr inż. Krzysztof Łuksza
		dr hab. inż. Mirosław Wołoszyn

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60	10.0	30.0	100

Subject objectives	Advanced knowledge of electrodynamics problems and method of solving ordinary and partial differential equations.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_U06	student is able to design a numerical model of the electromagnetic phenomenon and perform numerical calculations	[SU4] Assessment of ability to use methods and tools
	K7_U05	student is able to analyze the results	[SU2] Assessment of ability to analyse information
	K7_W01	student knows numerical methods for the analysis of electromagnetic fields	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	Euler's, Adams Bashforth's method, Adams Moulton's method, 4th order Runge-Kutta, Merson's method, finite difference method, basics of finite element method, Maxwell's equations. Solving problems in electrostatics, magnetostatics and electromagnetic fields using the finite difference method and the finite element method (1D and 2D). Poynting's vector. Wave equation. The propagation of waves in material centers. Introduction to the theory of wave systems. Basics of the theory of antenna systems and waveguides (basic features and parameters, zones and radiation conditions, reciprocity principle). : Discussion of integral methods for solving field problems - the method of boundary elements and the method of moments. Basics of electromagnetic compatibility and radiated disturbances.
Prerequisites and co-requisites	Knowledge of electrodynamics in the scope of this first degree. Basic knowledge of numerical methods

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tests and work in laboratory	60.0%	100.0%

Recommended reading	Basic literature	1. Griffiths D.J.: Podstawy elektrodynamiki. PWN Warszawa 2001
		2. Bolkowski S. i inni: Komputerowe metody analizy pola elektromagnetycznego. WNT Warszawa 1993.
		3. Jackson J.D.: Elektrodynamika klasyczna. PWN Warszaw 1982.
		4. Leon o. Chua, Pen-Min Lin. Komputerowa Analiza Układów Elektronicznych, WNT, Warszawa 1981
	Supplementary literature	M. Sadiku. Elements of electromagnetics.
		K. Chari. S. Salon. Numerical methods in electromagnetism.
	eResources addresses	Adresy na platformie eNauczanie: MODELOWANIE MATEMATYCZNE W ELEKTRODYNAMICE [2023/24] - Moodle ID: 35959 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35959
Example issues/ example questions/ tasks being completed	For a given system solve the Laplace or Poisson equation. Check if the vector field has a vector potential. Find the potential distribution in the system. Calculate the vector's magnetic potential in the system. Examine the skin effect abd proximity effect. Assign the distribution of the electromagnetic field of the elementary radiating dipoles. Design simple antenna systems.	
Work placement	Not applicable	