GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical modeling in electrodynamics , PG_00065789		
Field of study	MODELOWANIE MATEMATYCZNE W ELEKTRODYNAMICE		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2025/2026
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	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		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	30.0	0.0	0.0	50

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	50	5.0	45.0	100

Subject objectives

The aim of the course is to learn advanced problems in electrodynamics and methods for solving ordinary and partial differential equations.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] has an extended and deepened knowledge of mathematics, including selected issues of numerical methods and knowledge useful for solving tasks in the field of electrotechnology and electrodynamics, has a general knowledge of technical sciences covering their fundamentals and applications	Student uses in-depth knowledge of numerical methods, numerically solves ordinary and partial differential equations. Solves problems using Laplace's equation and Poisson's equation.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K7_U05] is able to select equipment and carry out electrical measurements, design measuring systems for the determination of nonelectrical quantities, and analyse the results obtained	Student creates a computer program to solve ordinary and partial differential equations.	[SU4] Ocena umiejętności korzystania z metod i narzędzi
[K7_U06] is able to analyse, model, simulate and design electrical systems	Student analyzes, models, conducts simulations.	[SU4] Ocena umiejętności korzystania z metod i narzędzi

Subject contents

Course content – lecture
Euler's method, Adams Bashforth method, Adams Moulton method, 4th order Runge-Kutty method, Merson's method, finite difference method, basics of finite element method, Application of Maxwell's equations. Solution of electrostatics, magnetostatics and electromagnetic fields by finite difference method and finite element method (1D and 2D). Poynting vector. Wave equation. Wave propagation in material media. Introduction to the theory of wave systems.

Prerequisites and co-requisites

Knowledge of electrodynamics from undergraduate studies. Basic knowledge of numerical methods.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Tests and lab work	60.0%	100.0%

Recommended reading	Basic literature	Griffiths D.J.: Podstawy elektrodynamiki. PWN Warszawa 2001 Bolkowski S. i inni: Komputerowe metody analizy pola elektromagnetycznego. WNT Warszawa 1993 Jackson J.D.: Elektrodynamika klasyczna. PWN Warszaw 1982 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	
Example issues/ example questions/ tasks being completed	Solve the Laplace or Poisson equation for a given system. Verify that a given vector field has a vector potential. Determine the potential distribution in the system. Calculate the vector magnetic potential in a system. Investigate the phenomenon of skin and proximity.	
Practical activites within the subject	Not applicable	

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