



Subject card

Subject name and code	Mathematical modeling in electrodynamics , PG_00065789						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2024/2025		
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						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mirosław Wołoszyn				
	Teachers		dr hab. inż. Mirosław Wołoszyn				
Lesson types and methods of instruction	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_U06] is able to analyse, model, simulate and design electrical systems		Student analyzes, models, conducts simulations.		[SU4] Assessment of ability to use methods and tools		
	[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] Assessment of ability to use methods and tools		
	[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] Assessment of knowledge contained in written work and projects		
Subject contents	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	Adresy na platformie eNauczenie: MODELOWANIE MATEMATYCZNE W ELEKTRODYNAMICE [ET] [2024/25] - Moodle ID: 43433 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43433
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.	
Work placement	Not applicable	

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