



Subject card

Subject name and code	Fundamentals of electrodynamics, PG_00068823						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
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	3		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Electrical Engineering -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Adam Młyński				
	Teachers		dr inż. Adam Młyński				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 7150 PODSTAWY ELEKTRODYNAMIKI [2026/27][2026/27] https://enauczanie.pg.edu.pl/2025/course/view.php?id=7150						
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	30		5.0		40.0	75
Subject objectives	The aim of the course is to familiarize students with the phenomena occurring in the electromagnetic field and methods of their description, as well as to obtain competence in electromagnetic field calculations in simple technical problems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W02] has knowledge of physics and chemistry including electrostatics, electromagnetism, electrodynamics, wave motion, acoustics, mechanics, thermodynamics, optics, solid state physics; including knowledge necessary to understand the basic physical phenomena occurring in hydrogen devices, systems and installations as well as automation and robotics systems		The student describes and analyzes the fields electric and magnetic, analyzes phenomena occurring in the electric field and magnetic.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_U04] can apply the learned methods to the analysis and design of electrical elements, devices and systems		The student calculates the parameters of systems electrical (resistances, inductance, capacity), force electrodynamic, voltage induced.		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	Course content – lecture Electrostatics: Coulomb's law, quantities describing the electric field, Gauss's law, Maxwell's laws for electrostatics, electrostatic properties of the environment, electric capacitance. Electric flow field: quantities describing the flow field, Maxwell's laws in a conductive environment, electrical properties of the environment, resistances of conductors and earthing. Magnetostatics: Ampere's law, quantities describing the magnetic field, Biot's and Savarte's law, Maxwell's laws for magnetostatics, self and mutual inductance, magnetic properties of the environment, magnetic circuits, forces electrodynamic. Faraday's law.		
	Course content – exercises Solving computational examples in electrostatics and magnetostatics and for flow fields. Calculations of the distribution of electrostatic and magnetostatic fields, calculations of electrostatic and electrodynamic forces, resistance capacitances, self and mutual inductances. Calculations of induced voltages.		
Prerequisites and co-requisites	Knowledge of vector calculus. Ability to calculate derivatives of functions of many variables. Knowledge of the concept of linear, surface and volume integrals.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tests during the semester	55.0%	30.0%
	Written exam	55.0%	70.0%
Recommended reading	Basic literature	1. Griffiths D.J.: Podstawy elektrodynamiki. PWN Warszawa 2001 2. Krakowski M: Elektrotechnika teoretyczna, tom 2. Pole elektromagnetyczne. PWN, Warszawa 1980 3. Piątek Z., Jabłoński P.: Podstawy teorii pola elektromagnetycznego. WNT, Warszawa 2010 4. Sikora R.: Teoria Pola Elektromagnetycznego. WNT, Warszawa 1997 5. Sikora J., Skoczylas J., Sroka J., Wincenciak S.: Zbiór zadań z teorii pola elektromagnetycznego. Oficyna Wyd. Politechniki Warszawskiej. Warszawa 2004	
	Supplementary literature	1. Zahn M.: Pole elektromagnetyczne. PWN Warszawa 1989. 2. Feynman R.P., Leighton R.B., Sands M.: Feynmana wykłady z fizyki (tom II). PWN Warszawa 2001 2. Kurdziel R.: Podstawy elektrotechniki. WNT, Warszawa 1965 3. Rawa H.: Podstawy elektromagnetyzmu. Wydawnictwo Politechniki Warszawskiej	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Calculate the distribution of the electric field intensity from the given system of point charges. 2. What conditions should the dimensions of a coaxial cable meet so that the maximum intensity of the electric field in the cable is minimal? 3. Calculate the capacity of a single-core coaxial cable of length l , whose core diameter is d , the inner diameter of the shield is D , and the relative permittivity of the dielectric is ϵ_r . 4. Calculate the leakage of a coaxial cable of length l , whose core diameter is d , the inner diameter of the shield is D , and the insulation conductivity is s . 5. Calculate the unit self-inductance of a two-wire line with wires of diameter d spaced apart by a distance h . 		

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