

Subject card

Subject name and code	Electromagnetism, PG_00182143						
Field of study	Medical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's 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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Ryszard Drozdowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	45.0	0.0	0.0	0.0	90
	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	90		0.0		90.0	180
Subject objectives	The aim of the course is to learn: - the laws of electrostatics, - the behavior of free charges in an electromagnet field, - the laws and effects related to the flow of direct and alternating current, - the relationships between a magnetic field and the currents that generate it, - superconductivity phenomena, - the mechanism of electromagnetic waves, - the principles of operation and use of various types of electrical devices used in metrology, industry and everyday life, - the effects of electromagnetic radiation on biological tissues.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZMEDL3_U01] He can formulate, analyse, and solve complex problems in physics and medicine, using mathematical formalism, based on the physical phenomena, principles, and theories he has learned.	617 / 5 000 The student is able to: - calculate the intensity of the electric field generated by point charges and charges distributed in space, - generate both direct and alternating electric current and predict the effects of current flow through matter, - generate a magnetic field of a specific intensity and predict the effects of this field on moving electric charges, - measure the intensity of electric and magnetic fields using basic measuring instruments, - generate electromagnetic waves, - predict the effects of electromagnetic radiation on living tissues	[SU1] oral statement/conversation/discussion [SU3] text preparation/written work [SU4] test/exam - oral or written
	[FIZMEDL3_W01] Knows and understands at an advanced level the phenomena, principles, laws and theories specific to physics and biophysics.	The student knows: - what methods can be used to electrify bodies and how to store electric charges - how to generate direct and alternating current and what are the effects of current flowing through a given material medium - how to generate direct and alternating magnetic fields and what are the effects of their interaction with matter - what phenomena can be used to measure the intensity of direct and alternating current - how a direct and alternating current ammeter and voltmeter, a galvanic cell, a transformer, a direct and alternating current generator, and an electric motor work - how to generate and receive electromagnetic waves, and how to use them to transmit information - the basics of electrical diagnostic equipment - the effects of electric and magnetic fields on living organisms	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion [SW3] text preparation/written work
Subject contents	1. Mathematical introduction - elements of vector analysis and field theory 2. Electric charge. 3. Electric field. 4. Magnetic field. 5. Electrical and magnetic properties of substances. 6. Generation of electric currents. 7. DC and AC circuits. 8. Maxwell's equations in vacuum and matter. 9. Electromagnetic waves 10. The effect of electromagnetic radiation on living tissues 11. Elements of electrical engineering		
Prerequisites and co-requisites	A. Formal requirements: passed the course "Mechanics"		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	50.0%
	student's attitude during classes/ activity	0.0%	5.0%
	test	51.0%	45.0%

Recommended reading	Basic literature	A.1. Literature used during classes D. Halliday, R. Resnick, J. Walker, Podstawy fizyki Tom III, IV Wyd. Naukowe PWN, Warszawa 2003. J. Orear, Fizyka, Tom II, Wydawnictwo Naukowo-Techniczne, 1979. A. K. Wróblewski, J. A. Zakrzewski, Wstęp do fizyki tom 2 część 2, PWN Warszawa 1991; E. Koziej, B. Sochoń, Elektrotechnika i elektronika, PWN Warszawa 1982. J. Kalisz, M. Massalska, J. M. Massalski, Zbiór zadań z fizyki z rozwiązaniami, Część I, PWN, 1974 A. Hennel, W. Szuszkiewicz, Zadania i problemy z fizyki, PWN, 1993. A.2. Literature studied independently by the student I. V. Sawieliew, Wykłady z fizyki, PWN, Warszaw 1987; J. Jędrzejewski, W. Kruczek, A. Kujawski, Zbiór zadań z fizyki dla kandydatów na wyższe uczelnie, Wydawnictwo Naukowo-Techniczne, 1984. W. Barański, M. A. Herman. L. Widomski, Zbiór zadań z fizyki. Elektryczność i magnetyzm, PWN, Warszawa 1981.
	Supplementary literature	J. D. Jackson, Elektrodynamika klasyczna, PWN 1982. T. Morawski, W. Gwarek, Pola i fale elektromagnetyczne, Podręczniki Akademickie, Elektronika Informatyka Telekomunikacja 2006. Cz. Bobrowski, Fizyka krótki kurs, Wydawnictwo Naukowo Techniczne Warszawa 1998; W. Hajko, Fizyka w przykładach, WNT, Warszawa 1967; A. McCormick, A. Elliot, Health Physics, Cambridge University Press, 2001. M. Hollins, Medical Physics, 1990. R. Splinter, Physics in medicine and biology, CRC Press, 2010. P. Davidovits, Physics in Biology and Medicine, Academic Press, 2008
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Example issues/ example questions/ tasks being completed	not applicable	
Work placement	Not applicable	

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