



Subject card

Subject name and code	Electricity and magnetism, PG_00051065						
Field of study	Technical Physics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			6.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Waldemar Stampor					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	0.0	0.0	0.0	75
	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	75	5.0	70.0	150		
Subject objectives	The aim of the course is to teach students the basics of electricity and magnetism						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] has systematized knowledge of the basics of physics, including mechanics, thermodynamics, electricity and magnetism, optics, atomic and particle physics, solid-state physics, nuclear and elementary particle physics	* Student knows properties of electric charge. Student calculates forces between charges. * Student applies Gauss law for electric field calculations. * Student explains the terms of potential and capacitance. * Student calculates forces between charges. * Student explains the terms of current intensity and current density * Student calculates electric circuits parameters. Student describes motion of charges in magnetic field. * Student explains Biot-Savart and Ampere laws. * Student explains Maxwell equations. * Student explains influence of matter on electric and magnetic fields.			[SW1] Assessment of factual knowledge		
	[K6_W01] understands the importance of physics and its applications in connection to civilization	He knows the physical foundations of the phenomena in the field of electromagnetism in the modern world			[SW1] Assessment of factual knowledge		
[K6_U01] learns independently, obtains information from literature, databases and other properly selected sources	Can learn independently, relying on the recommended literature on the subject and is able to critically obtain information from the Internet and other source materials			[SU2] Assessment of ability to analyse information			

Subject contents	<p><b>ELECTROSTATICS.</b> Electric charge. Electric field strength: Coulomb's law and Gauss's law. Electric potential and the relationship of the potential with the electric field strength. Electric dipole and its behavior in an external electric field. Electric field in matter, conductors and dielectrics. Three electrical vectors: E, D, and P.</p> <p><b>ELECTRIC CURRENT.</b> Electric current intensity and density. Electrical conductivity and Ohm's law. Kirchhoff's laws for electrical circuits.</p> <p><b>MAGNETOSTATICS.</b> Lorentz force. Magnetic induction vector: Gauss's law, Biot-Savart law and Ampere's law. Electrodynamical force. Magnetic dipole and its behavior in an external magnetic field. Magnetic field in matter, types of magnetics. Three electric vectors: E, D and P and three magnetic vectors: B, H and M. Maxwell's equations in electro- and magneto-statics.</p> <p><b>ELECTRODYNAMICS.</b> The phenomenon of electromagnetic induction and Faraday's law. Self-induction. Generalized Faraday's law. Generalized Ampere's law and displacement current. Maxwell's equations.</p>														
Prerequisites and co-requisites	No requirements														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="451 649 794 683">Subject passing criteria</th> <th data-bbox="794 649 1137 683">Passing threshold</th> <th data-bbox="1137 649 1487 683">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 683 794 716">Oral exam</td> <td data-bbox="794 683 1137 716">50.0%</td> <td data-bbox="1137 683 1487 716">30.0%</td> </tr> <tr> <td data-bbox="451 716 794 750">Written exam</td> <td data-bbox="794 716 1137 750">50.0%</td> <td data-bbox="1137 716 1487 750">30.0%</td> </tr> <tr> <td data-bbox="451 750 794 786">Midterm colloquium</td> <td data-bbox="794 750 1137 786">50.0%</td> <td data-bbox="1137 750 1487 786">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Oral exam	50.0%	30.0%	Written exam	50.0%	30.0%	Midterm colloquium	50.0%	40.0%
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Written exam	50.0%	30.0%													
Midterm colloquium	50.0%	40.0%													
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. D. Halliday, R. Resnick, J. Walker. Podstawy fizyki tom 3; PWN, Warszawa 2003 lub wydania późniejsze.</li> <li>2. Cz. Bobrowski. Fizyka. Krótki kurs. WNT, Warszawa 2004 lub wydania późniejsze.</li> <li>3. I.W. Sawieliew, Kurs fizyki tom 2, PWN 1989 lub wydania późniejsze.</li> <li>4. Fizyka dla szkół wyższych tom 2. OPENSTAX POLSKA 2018. <a href="https://openstax.org/details/books/fizyka-dla-szkol-wyzszych-polska">https://openstax.org/details/books/fizyka-dla-szkol-wyzszych-polska</a>.</li> </ol>													
	Supplementary literature	No requirements													
	eResources addresses	Adresy na platformie eNauczenie:													
Example issues/ example questions/ tasks being completed	Electric field strength and magnetic field induction vector. Coulomb's law and Biot-Savart's law. Gauss's law for an electric field and Gauss's law for a magnetic field. Ampere's law for a magnetic field. Maxwell's equations in electro- and magnetostatics. Electric dipole and its behavior in an external electric field. Magnetic dipole and its behavior in an external magnetic field. Faraday's law for electromagnetic induction and an example of its application. Maxwell's equations in vacuum and material medium.														
Work placement	Not applicable														

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