GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electricity and Magnetism, PG_00067426		
Field of study	Automatic Control, Cybernetics and Robotics		
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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Stefański	
	Teachers	dr hab. inż. Tomasz Stefański	

Lesson types and methods of instruction

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

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	4.0	16.0	50

Subject objectives

The aim of the course is to familiarize students with the physics of electromagnetic phenomena in order to understand the operation of coupling and communication elements in automation systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student has mastered the basic issues of Maxwell's equations and their physical interpretation, as well as the principle of energy conservation for electromagnetic fields. Thanks to this, he is able to design sensors and actuators operating on the basis of these principles.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student knows the laws of electrodynamics and the properties of electromagnetic waves, the phenomena and mechanisms of their propagation, and understands the principles of operation of AiR coupling systems based on these phenomena.	[SW1] Assessment of factual knowledge

Subject contents

1. Introduction to the subject; discussion of electromagnetic phenomena used to implement actuators, sensors and communication elements in automation systems.
2. Gauss's law for electricity and magnetism.
3. Ampere's law.
4. Faraday's law of electromagnetic induction.
5. Maxwell's equations for vacuum and matter.
6. Propagation and guidance of electromagnetic waves.
7. Energy of electromagnetic waves and Poynting's theorem.
8. Radio communication.
9. Geometric optics and fiber optic communication.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>5 quizzes</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. K. Suchocki, "Sensors and Measurement Transducers," p. 1-2, Gdansk University of Technology Publisher 2016

2. J. Orear, "Physics," p. 1-2, Scientific and Technical Publishers 1993

3. P. Kowalczyk, R. Lech, W. Zieniutycz, "Basics of Electromagnetism in Excercises," Gdansk University of Technology Publisher 2015

4. D. Griffiths, "Introduction to Electrodynamics," PWN Scientific Publishing House 2005</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. T. Morawski, W. Gwarek, "Fields and Electromagnetic waves," Scientific and Technical Publishers 2014</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Discuss the propagation and guidance of electromagnetic waves,
Derive and discuss Poynting's theorem,
Derive the wave equation from Maxwell's equations.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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