



## Subject card

Subject name and code	Electronic Coupling Systems in Automatic Control, PG_00047942						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Obligatory subject group 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						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Stefański					
	Teachers	dr inż. Sebastian Dziedziewicz 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	2.0		18.0		50
Subject objectives	The aim of the course is to familiarize students with the physics of electronic coupling systems in automation.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[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 electrostatics and electromagnetic wave properties, phenomena and mechanisms of their propagation, and understands the principles of operation of AiR electronic coupling systems based on these phenomena.			[SW1] Assessment of factual knowledge		
	[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 understood the basic issues of Maxwell's equations and their physical interpretation as well as the principles of energy conservation for electromagnetic fields. Thanks to this, he can design sensors and actuators operating based on these principles.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		

Subject contents	<p>1. Introduction to the subject; discussion of applications and techniques for implementing executive, sensory and communication elements in automation systems.</p> <p>2. Fundamentals and principles of physics of electronic and electro-mechanical actuators, sensory and communication elements:</p> <ul style="list-style-type: none"> <li>- Gauss's law {electricity and magnetism},</li> <li>- Amper's law {charge and inductance},</li> <li>- Faraday's law {electromagnetic induction},</li> <li>- Propagation and guidance of electromagnetic waves,</li> <li>- Electromagnetic wave energy and Poynting's theorem,</li> <li>- geometrical optics,</li> <li>- Photoelectric effect,</li> <li>- Forced emission and lasers.</li> </ul> <p>3. Sensory elements based on electromagnetic phenomena (proximity sensors, laser rangefinders, electromagnetic radiation detectors, cameras).</p> <p>4. Actuators based on electromechanical phenomena (engines, MEMSs).</p> <p>5. Piezoelectric coupling elements.</p> <p>6. Radio communication.</p> <p>7. Fiber optic communication.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1" data-bbox="450 911 1489 974"> <thead> <tr> <th data-bbox="450 911 794 943">Subject passing criteria</th> <th data-bbox="794 911 1139 943">Passing threshold</th> <th data-bbox="1139 911 1489 943">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 943 794 974">5x quiz</td> <td data-bbox="794 943 1139 974">50.0%</td> <td data-bbox="1139 943 1489 974">100.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	5x quiz	50.0%	100.0%			
Subject passing criteria	Passing threshold	Percentage of the final grade										
5x quiz	50.0%	100.0%										
Recommended reading	<table border="1" data-bbox="450 983 1489 1256"> <tbody> <tr> <td data-bbox="450 983 794 1158">Basic literature</td> <td colspan="2" data-bbox="794 983 1489 1158">           1. K. Suchocki, "Sensors and Transducers," vol. 1-2, Gdańsk University of Technology Publishing House 2016            2. J. Orear, "Physics," vol. 1-2, Scientific and Technical Publishing House 1993            3. P. Kowalczyk, R. Lech, W. Zieniutycz, "Basics of Electromagnetism in Tasks," Gdańsk University of Technology Publishing House 2015            4. T. Stefański, Presentations for the lecture         </td> </tr> <tr> <td data-bbox="450 1158 794 1216">Supplementary literature</td> <td colspan="2" data-bbox="794 1158 1489 1216">1. T. Morawski, W. Gwarek, "Electromagnetic Fields and Waves," Scientific and Technical Publishing House 2014</td> </tr> <tr> <td data-bbox="450 1216 794 1256">eResources addresses</td> <td colspan="2" data-bbox="794 1216 1489 1256">Adresy na platformie eNauczanie:</td> </tr> </tbody> </table>			Basic literature	1. K. Suchocki, "Sensors and Transducers," vol. 1-2, Gdańsk University of Technology Publishing House 2016 2. J. Orear, "Physics," vol. 1-2, Scientific and Technical Publishing House 1993 3. P. Kowalczyk, R. Lech, W. Zieniutycz, "Basics of Electromagnetism in Tasks," Gdańsk University of Technology Publishing House 2015 4. T. Stefański, Presentations for the lecture		Supplementary literature	1. T. Morawski, W. Gwarek, "Electromagnetic Fields and Waves," Scientific and Technical Publishing House 2014		eResources addresses	Adresy na platformie eNauczanie:	
Basic literature	1. K. Suchocki, "Sensors and Transducers," vol. 1-2, Gdańsk University of Technology Publishing House 2016 2. J. Orear, "Physics," vol. 1-2, Scientific and Technical Publishing House 1993 3. P. Kowalczyk, R. Lech, W. Zieniutycz, "Basics of Electromagnetism in Tasks," Gdańsk University of Technology Publishing House 2015 4. T. Stefański, Presentations for the lecture											
Supplementary literature	1. T. Morawski, W. Gwarek, "Electromagnetic Fields and Waves," Scientific and Technical Publishing House 2014											
eResources addresses	Adresy na platformie eNauczanie:											
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> <li>- Discuss the propagation and guiding of electromagnetic waves,</li> <li>- Discuss the photoelectric phenomenon,</li> <li>- Discuss the phenomenon of stimulated emission and lasers.</li> </ul>											
Work placement	Not applicable											