



Subject card

Subject name and code	Industrial Supply and Control Systems, PG_00046059						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2020	Academic year of realisation of subject				2022/2023	
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery				at the university	
Year of study	3	Language of instruction				Polish	
Semester of study	6	ECTS credits				4.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Electrical Engineering of Transport -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Dariusz Karkosiński				
	Teachers		dr hab. inż. Dariusz Karkosiński				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	0.0	45
	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	45		10.0		45.0	100
Subject objectives	Getting to know devices, installations and power systems as well as control systems in industrial and public facilities. Learning principles of designing electrical systems for power supplying and controlling industrial drives using CAE programs.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U04] has the ability to self-educate, among other things, in order to improve professional qualifications	Provides the basis for acquiring current knowledge and regulations in the field of industrial electrical engineering.			[SU4] Assessment of ability to use methods and tools		
	[K6_W06] knows the structure of computers and microprocessors and the tasks of operating systems, has basic knowledge of the basics of computer software, drivers, microprocessor technology, design of simple algorithms and the operation of information networks	The student has acquired the skills of selecting wires and cables, as well as the automation of engine start-up control as well as the backup power supply of industrial facilities.			[SW1] Assessment of factual knowledge		
	[K6_W11] knows the hazards arising from devices, installations, systems and technical systems, basic principles of occupational health and safety, taking into account the role of control and security systems in controlling automation and robotics facilities	The student distinguishes the requirements of the Machinery Directive, including the categories of emergency stop, redundancy and diversification in motor power control systems.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_W07] has basic knowledge related to control and automation systems	He can describe the construction and purpose of electrical apparatus and the principles of their parameterization.			[SW1] Assessment of factual knowledge		
	[K6_K05] can think and act in an entrepreneurial way	He is able to analyze the costs of the designed installation and propose cheaper components			[SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	<p>LECTURE: Graphical symbols, letter-digit designations of electrical devices and devices used in power supply systems. Electricity distribution systems for powering large industrial facilities. Selection and operation of devices and apparatus. Designing cable lines and busducts. Construction and operation of power connectors. Overcurrent and overvoltage protection systems. Backup sources of power supply. Automatic power supply switching devices (ATSE) with the function of automatic switching on the power reserve (AS) and automatic return transfer (ARS). Fundamentals of power protection automation. Coordination of selection of motor connection kits. Implementation of the requirements of the Machinery Directive, including the category of emergency stop, redundancy and diversification in power supply control systems for motors and industrial facilities.</p> <p>PROJECT: Intensive course of creating diagrams and design documentation of power supply systems using the EPLAN Electric P8 design aid program. Parameterization of selective power protections - work supported by software tools of well-known equipment manufacturers. Preparation of the installation design for 3 electric industrial drives, in particular: power supply installation containing internal equipment of switchgears (including circuit breakers, disconnectors, fuses), cables, wires and fire protection switch; manual control and emergency stop installations and systems; signaling elements.</p>											
Prerequisites and co-requisites	Fundamentals of theoretical electrical engineering and technical physics											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 613 794 642">Subject passing criteria</th> <th data-bbox="799 613 1141 642">Passing threshold</th> <th data-bbox="1145 613 1485 642">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 649 794 678">2 tests after 45 minutes</td> <td data-bbox="799 649 1141 678">51.0%</td> <td data-bbox="1145 649 1485 678">50.0%</td> </tr> <tr> <td data-bbox="453 685 794 714">design</td> <td data-bbox="799 685 1141 714">50.0%</td> <td data-bbox="1145 685 1485 714">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	2 tests after 45 minutes	51.0%	50.0%	design	50.0%	50.0%
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2 tests after 45 minutes	51.0%	50.0%										
design	50.0%	50.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Wiatr J.: Poradnik projektanta elektryka tom 1 i 2. Wyd. Medium 2021 2. S. Niestępski i in., Instalacje elektryczne - budowa, projektowanie i eksploatacja, Warszawa 2001. 3. Strojny J., Strzałka J.: Projektowanie urządzeń elektroenergetycznych. Uczelniane Wydawnictwo Naukowo-Dydaktyczne AGH, Krakow 2008. 4. Markiewicz H.: Urządzenia elektroenergetyczne. WNT, Warszawa 2008. 5. Gruss S.: Poradnik elektryka i automatyka, Merlin Gerin 1996 6. Markiewicz H.: Urządzenia elektroenergetyczne. WNT, Warszawa 2001 										
	Supplementary literature	<ol style="list-style-type: none"> 1. Markiewicz H.: Instalacje elektryczne. WNT, Warszawa 2007. 2. Musiał E.: Instalacje i urządzenia elektroenergetyczne. WSiP, Warszawa 2008. 3. Markiewicz H.: Instalacje elektryczne. WNT, Warszawa 2007. 4. D. Karkosiński, Nowe trendy w budowie automatycznych urządzeń przełączających SZR/SPP niskiego napięcia. Gdańskie Dni Elektryki SEP 2008. 5. Lakervi E., Holmes E.J.: Electricity Distribution Network Design. 2nd Edition. London 2007. 6. PN-EN 60204-1:2010 : Bezpieczeństwo maszyn -- Wyposażenie elektryczne maszyn -- Część 1: Wymagania ogólne 										

	eResources addresses	<p>Podstawowe</p> <p>https://pbc.gda.pl/dlibra/publication/14114/edition/12259 - The electrician and automation guide contains the basics, especially in terms of design</p> <p>Uzupełniająca</p> <p>https://www.eaton.com/content/dam/eaton/country/poland/designers-materials/ups/general-files-ups/eaton-electrical-designer%2527s-guide-for-the-emergency-and-uninterruptible-power-supply-system-2009-catalog-pl-pl.pdf - guide</p>
<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> 1. What phenomenon / parameter limits the maximum length of contactor control circuits? Give two ways to eliminate the impact of this phenomenon? 2. The category of use of switchgears that are not used for frequent starting and reversing of an induction motor is marked with the symbol: a) AC3 b) DC4 c) AC4 d) AC 3. Explain the designation: gG 32 A, aF 630 A, D32A 15kA 4. What are the two basic differences visible from the outside between the tariff circuit breaker and the motor switch and the three-pole circuit breaker? 5. The compact circuit breaker was turned off as a result of its overload release. What steps should you take to re-enable it? 6. The YAKy 4x 50 mm² cable laid in the ground should be extended with a YKy cable. What can be the smallest cross section of this cable's core? How to connect the wires of both cables? 7. What phenomenon in large asynchronous motors can cause a significant current when switching to a standby power source in ATS mode? 8. Draw a connection diagram for two three-wire NPN 24V DC (NO) induction sensors and one four-wire PNP 24V DC (NO / NC) induction sensor to the coil of one auxiliary relay. Mark the standard wire colors. 9. In the presented system T1, T2 and T3 cannot work in parallel. Draw the full manual control diagram (using the buttons) with active and passive electric lock. 	
<p>Work placement</p>	<p>Not applicable</p>	