



Subject card

Subject name and code	Computer Control Systems, PG_00038129						
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		Optional subject group 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Jarosław Tarnawski				
	Teachers		dr inż. Tomasz Rutkowski				
			dr hab. inż. Robert Piotrowski				
			dr inż. Jarosław Tarnawski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		8.0		57.0	125
Subject objectives	Presentation of centralized and distributed / decentralized control structures.The introduction of advanced adaptive, predictive control methods.Acquainted with the infrastructure of computer control systems - DCS and SCADA / PLC systems.The integration of knowledge from different fields to the needs of a computer control system synthesis.Introduction to methods of decision support - multi-purpose and multi-attribute-approach.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_W07		The student is able to classify control systems. The student is able to build centralized and distributed control systems. The student builds a hierarchical predictive control system.		[SW3] Assessment of knowledge contained in written work and projects		
	K6_K02		The student during laboratory classes on the synthesis of advanced control system performs tasks in groups by changing roles within the team.		[SK2] Assessment of progress of work		
	K6_U07		The student is able to set up a control system in a hardware loop with a model of the object simulated in real time and PLC control devices and SCADA class software.		[SU1] Assessment of task fulfilment		

Subject contents	Control systems structures: classical, centralized, multilayer, decentralized, distributed. Implementation of centralized/decentralized with/without data exchange with communication aspects (time relationships, data loss, stability). Multilayer and distributed control systems based on real large scale systems: drinking water distribution systems, sewer system, oil refinery. Requirements for computer controlled systems. Information structure of CCS. Software and hardware selection for practical implementation of CCS. Implementation of selected complex control algorithms in computer-like devices: microcontrollers, PLCs, PACs and industrial computers. SCADA system realization supervisory control with coordination among all control layers. Process data acquisition and archivisation. Realization of optimization layer. Solver selection for optimization purposes.		
Prerequisites and co-requisites	Finished courses: - Dynamic Systems - Real Time Systems - Programmable Logic Controllers - Industrial Communication Networks		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	40.0%
	Midterm colloquium	50.0%	30.0%
	Practical exercise	50.0%	30.0%
Recommended reading	Basic literature	1. Korbicz J., Kościelny J., Modelowanie, diagnostyka i sterowanie nadrzędne procesami Implementacja w systemie DiaSter, WNT, 2009 2. Tatjewski P. Sterowanie zaawansowane obiektów przemysłowych, Akademicka Oficyna Wydawnicza EXIT, 2002 3. Grega W. Metody i algorytmy sterowania cyfrowego w układach scentralizowanych i rozproszonych, Wydawnictwo AGH, 2004 4. Niederliński A. Systemy komputerowe automatyki przemysłowej, tom 1, Sprzęt i oprogramowanie, WNT, 1984. 5. Niederliński A. Systemy komputerowe automatyki przemysłowej, tom 2, Zastosowania, WNT, 1985.	
	Supplementary literature	1. Trybus L. Regulatory wielofunkcyjne, WNT, 1992 2. Astrom K., Wittenmark B., Computer-Controlled Systems: Theory and Design (3rd Edition), Prentice Hall, 1996	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	What are the differences between centralized and distributed control systemOutline the main features and benefits of predictive controlEnter the difference between direct and indirect adaptive controlIntroduce hierarchicznego structure of the control system and specify the tasks of each layerWhat is the method of AHP?What are the principles of the design of the control system		
Work placement	Not applicable		