

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Industrial Computer Networks, PG_00038099							
Field of study	Automation, Robotics and Control Systems							
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 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	4		ECTS credits			2.0		
Learning profile	general academic profile		Assessment form			assessment		
Conducting unit	Department of Control Systems Engineering -> Faculty Of Electrical And Control Engineering -> Wydziały Politechniki Gdańskiej							
Name and surname	Subject supervisor	dr inż. Jarosław Tarnawski						
of lecturer (lecturers)	Teachers		dr inż. Jarosław Tarnawski					
			mgr inż. Tomasz Karla					
			dr inż. Tomasz Rutkowski					
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
of instruction	Number of study hours	15.0	0.0	15.0	0.0		0.0	30
	E-learning hours inclu	ided: 0.0						
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	didactic Participation in ed in study consultation hou		n ours	Self-study		SUM
	Number of study hours	30		2.0		18.0		50
Subject objectives	Understanding of importance of communication in control systems. Knowledge of industrial conditions and requirements for industrial communication devices. Knowledge of media (transmission channels) and hardware for industrial networks. Understanding of importance of real-time transmission and real-time media access. Redundant methods of increasing reliability in industrial networks. Practical skills in wired and wireless communication. Skills in security of computer networks and access authorization.							
Learning outcomes	Course outcome		Subject outcome			Method of verification		
	[K6_U05] can use analytical and simulation methods to solve tasks in the field of automation and robotics and use various techniques to carry out engineering tasks related to automation and robotics devices and systems		The student is able to build an information exchange flow for the synthesis of the control system			[SU1] Assessment of task fulfilment		
	[K6_W09] has knowledge in the field of security of ICT systems and networks		The student knows the basic security methods in PSI issues.			[SW1] Assessment of factual knowledge		
	[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 knows the individual elements of the control system, can use them and communicate using IT networks.			[SW1] Assessment of factual knowledge		
	[K6_K02] can work in a group taking on different roles in it		The student is able to work in a group to communicate a dozen or so devices and build a distributed control system.			[SK2] Assessment of progress of work		

Subject contents	The information structure of the control systems. Importance of communication in automation. Requirements for industrial communication devices. Basic ideas of industrial fieldbus. Norm IEC 61158 and IEC 61784. Transmission channels: copper cables (2 wires, coaxial, twisted), fiber cable, radio waves. Serial communications and applications (RS232, RS422, RS485). Routers and managed switches as basic industrial network infrastructure. Network topologies (bus, ring, star, tree, mesh) also with redundancy. Medium access mechanisms. Real-time medium access requirement as the important factor in control systems. Ethernet as native non-industrial network and mechanisms of improvements for Ethernet industrial applications. Profibus as the example of real-time industrial network. CAN, EIB and LonWorks general-purpose industrial networks. Wireless networking radiomodems, WiFi, Bluetooth, ZigBee. Communication communications data exchange system. Network and protocol tunneling. Virtual private networks. Network security methods of hardware and software protection of industrial networks.						
Prerequisites and co-requisites	Computer Networks and Internet Technologies						
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Colloquium	50.0%	50.0%				
	Practical exercise	50.0%	50.0%				
Recommended reading	Basic literature	Douglas E. Comer, Sieci komputerowe i intersieci, WNT, 2000 Andrew Tanenbaum, Sieci komputerowe, Helion, 2004 Krzysztof Nowicki, Ethernet sieci, mechanizmy, Infotech, 2006 Kwiecień Andrzej, Analiza przepływu informacji w komputerowych sieciach przemysłowych, Pracownia Komputerowa Jacka Skalmierskiego, 2004 Włodzimierz Solnik, Zbigniew Zajda, Komputerowe sieci przemysłowe Profibus DP i MPI, Oficyna Wydawnicza Politechniki Wrocławskiej, 2007					
	Supplementary literature	Rafał Pawlak, Okablowanie strukturalne sieci, Helion, 2006 Pendergast, Brekke, Modemy, Mikom, 1996 Mielczarek, Szeregowe interfejsy cyfrowe, Helion, 1993					
	eResources addresses	Adresy na platformie eNauczanie:					
Example issues/ example questions/ tasks being completed	 Make a comparison of communication interfaces RS232C and RS485. Characterize the types and features of Profibus network. Specify industrial version of Ethernet Specify the types and characteristics of OPC communication technology. List and describe the mechanisms for protection against transmission errors in the CAN network. Describe the wireless communication technologies, depending on the range. Describe data exchange model (with figures of frames) in the MODBUS protocol. 						
Work placement	Not applicable						

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