



Subject card

Subject name and code	SCADA Interface Programming, PG_00069142						
Field of study	Electrical Engineering, Automation, Robotics and Control Systems						
Date of commencement of studies	February 2026	Academic year of realisation of subject				2026/2027	
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery				at the university	
Year of study	1	Language of instruction				Polish	
Semester of study	2	ECTS credits				3.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Electric Drives and Energy Conversion -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Marek Adamowicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	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		5.0		25.0	75
Subject objectives	The aim of the course is for the student to acquire the skills necessary to create and configure network interfaces in SCADA systems using virtual models of industrial production processes as well as virtual models of renewable energy generation systems integrated with energy storage and distribution system operators. The student further develops their proficiency in using dedicated software for creating virtual processes, within which they analyze the properties and capabilities of network interfaces in terms of ensuring communication and data exchange. The student describes the structure of a SCADA system, explains multithreaded programming and methods of communication with actuators, and discusses issues of functional safety in SCADA systems.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> Basics of SCADA systems definitions and components, PLC, RTU, IED, Internet of Things, Edge Computing Network interface function and tasks in a SCADA system PLC programming languages overview of the IEC 61131-3 standard, organizational units of a programmable controller: POU Program Organization Unit, FB function block OSI, TCP/IP, and EPA models overview of model layers TCP and UDP protocols establishing and maintaining connections MODBUS and DNP3 protocols Python network socket interface (socket, bind, listen) SCADA Gateway description of operation, role in a SCADA system protocol translation. <p>Course content – laboratory</p> <p>Configuration of virtual processes: virtual production process in an industrial plant and virtual process of generating and storing energy from renewable sources. Discussion of the virtual process as a key element of the digital twin and the role and tasks of the network interface in virtual processes and digital twins. Design, configuration and programming of the network interface of the SCADA system of an industrial plant or a system of generating and storing energy from renewable sources. Programming multithreaded network applications in the client-server architecture - network protocols - priorities of data transmission and customer service, - communication with devices operating in the industrial network (PLC controllers), SCADA system programming environments - functional safety in SCADA systems.</p>						
Prerequisites and co-requisites	Basic knowledge of automation, information technology and computer networks.						
Assessment methods and criteria	Subject passing criteria		Passing threshold			Percentage of the final grade	
	Project		100.0%			50.0%	
	Final test		50.0%			50.0%	

Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. S. Plamowski A. Wojtulewicz: "Systemy DCS i SCADA", Wydawnictwo PW, 2022 2. S. A. Boyer: Scada : Supervisory Control and Data Acquisition. 3. Alani, Mohammed M. "Guide to OSI and TCP/IP models." (2014). 4. Loshin, Peter. TCP/IP clearly explained. Elsevier, 2003.
	Supplementary literature	<ol style="list-style-type: none"> 1. H. Osterloh: TCP/IP Szkoła programowania, Helion 2. W.R. Stevens: Biblia TCP/IP, tom i-III, ReadMe, Warszawa 1998
	eResources addresses	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Creating a virtual technological process/virtual energy generation and storage process in the OpenPLC Runtime environment 2. Investigating the properties of the MODBUS protocol 3. Programming the network interface of the ScadaBR web application 4. Creating your own OpenPLC + Scada BR demo application 5. Elements of creating a client-server application in Python 6. Investigating the SCADA network interface in the event of cyberattacks. Vulnerabilities in the MODBUS protocol 	
Practical activities within the subject	Not applicable	

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