GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Adamowicz	
	Teachers		

Lesson types and methods of instruction

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
[K7_U04] has the ability for self-directed learning in order to improve his/her professional qualifications, and is able to identify directions for further learning	The student finds a scientific article on the subject matter.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K7_W08] has in-depth knowledge of program development and design of complex systems automation systems using PLC and SCADA, transmission and processing of signals occurring in a variety of physical objects	The student designs, configures and programs a SCADA network interface enabling mutual communication between devices of a virtual technological process, production process or a system for generating and storing energy from renewable sources.	[SW3] Assessment of knowledge contained in written work and projects
[K7_U03] is able to prepare and deliver a presentation on the results of an engineering task and own research	The student prepares and presents a presentation of the results	[SU5] Assessment of ability to present the results of task

Subject contents

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.

Prerequisites and co-requisites

Basic knowledge of automation, information technology and computer networks.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Final test</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Project</td><td>100.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>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.</td></tr>
<tr><td>Supplementary literature</td><td>1. H. Osterloh: TCP/IP Szkoła programowania, Helion
2. W.R. Stevens: Biblia TCP/IP, tom i-III, ReadMe, Warszawa 1998</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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