Subject card

Subject name and code	SCADA Interface Programming, PG_00044104
Field of study	Automation, Robotics and Control Systems

Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
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 Controlled Electric Drives -> Faculty of Electrical and Control Engineering

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	15.0	0.0	15.0	0.0	0.0	30
	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	30	10.0	35.0	75

Subject objectives	The aim of the course is to acquire by the student the ability to create SCADA network interfaces with the use of virtual models of industrial and production processes. The student deepens his skills in using dedicated software for creating virtual processes, in which he analyzes the properties and capabilities of network interfaces. The student describes the structure of the SCADA system, explains multithreaded programming and methods of communication with actuators, describes the issues of functional safety in SCADA systems.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_W08	Is capable of describing and analyzing the operation of complex SCADA systems with PLC controllers communicating over an Ethernet network using the MODBUS protocol, measuring parameters, examining technical characteristics, interpreting the obtained results, and drawing conclusions	[SW3] Assessment of knowledge contained in written work and projects
	K7_U04	Is aware of the need for continuous training in connection with the emerging new solutions in the field of automation systems and devices	[SU3] Assessment of ability to use knowledge gained from the subject
	K7_U07	He can use a specialized programming environment to create SCADA network interfaces of a virtual technological or production process.	[SU4] Assessment of ability to use methods and tools
	K7_W11	The student describes the communication protocols in SCADA systems, explains the influence of transmission delay in the remote control system, describes the requirements of virtual measuring instruments,	[SW1] Assessment of factual knowledge
	K7_W06	The student is able to design and program a SCADA network interface enabling mutual communication between devices of a virtual technological or production process.	[SW3] Assessment of knowledge contained in written work and projects
	K7_U03	Can prepare and present the results presentation	[SU5] Assessment of ability to present the results of task

Subject contents	Configuration of a virtual industrial process. Designing and programming the network interface of the SCADA system. Programming multithreaded network applications in the client-server architecture - network protocols - data transmission and customer service priorities, - communication with devices operating in the industrial network (PLC drivers), SCADA systems programming environments - functional safety in systems SCADA.
Prerequisites and co-requisites	Basic knowledge of automation, computer science and computer networks

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final test	50.0%	50.0%
	Projectt	100.0%	50.0%

Recommended reading	Basic literature	1. R. Jakuszewski: Programowanie systemów Scada - iFix 4.0 PL. 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	1. H. Osterloh: TCP/IP Szkoła programowania, Helion 2. W.R. Stevens: Biblia TCP/IP, tom i-III, ReadMe, Warszawa 1998.
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Creating a virtual technological process in the OpenPLC Runtime environment
	2. Examination of the MODBUS protocol properties
	3. Programming the web interface of the ScadaBR web application
	4.Creating your own OpenPLC + Scada BR demo application
	5. Elements of client-server application development in Python
	6. Examination of the SCADA network interface in case of cyber attacks. Vulnerabilities in the MODBUS protocol
Work placement	Not applicable