



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elective course C: SCADA systems and PLCs in the industry

### Course

Field of study

Electrical Engineering

Area of study (specialization)

Electromobility and electrical systems in vehicles and industry

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

practical

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

30

Tutorials

Projects/seminars

15

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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### Prerequisites

Basic knowledge of electrical engineering, electronics and computer science. Basics of programming in C, Pascal or other high-level language. Is aware of the need to expand their competences, readiness to cooperate within a team.

### Course objective

The objective of the course is to familiarize students with the principles of designing, constructing and operation of a control and a visualization system, configuration of the elements of a system and



capabilities of SCADA environments. Another objective is getting familiar with the possibility to work in simulation mode and with a real object monitored by PLC driver. Design his own visualization and control project. Presentation of solution.

### Course-related learning outcomes

#### Knowledge

1. has elementary knowledge in the field of using IT tools in SCADA systems, programming in dedicated languages, designing signal transmission networks and using databases,
2. has elementary knowledge about the construction, operation principles and selection of PLC controllers (including simulated ones) cooperating with SCADA visualization and control systems,
3. has basic and systematic knowledge in the field of design and programming of microprocessor systems and PLC controllers used in industrial process control.

#### Skills

1. is able to formulate a process control algorithm and implement it using appropriate programming languages,
2. can simulate real working conditions and industrial process parameters using the SCADA system,
3. knows how to correctly select design assumptions and make presentations showing the characteristics of the designed SCADA system.

#### Social competences

1. is aware of the importance of own and team work, can be responsible for implemented project tasks.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Skills acquired as part of the laboratory are verified on the basis of: assessing activity, rewarding the increase in the ability to use known principles and methods, verification of skills during the completion of the project. The final grade is proposed by the company in accordance with the criteria adopted by the employer.

Project classes are assessed on the basis of: implementation and presentation of the project visualization and control of the selected process along with project documentation, cooperation skills within the team that practically implements the project task, presentation of current progress in project implementation.

### Programme content

#### Laboratories:

Activities in the field of design, implementation and operation of the sample visualization and control systems SCADA visualization and monitoring in vehicles and manufacturing processes. Introduction of new application solutions are used in practice.



## Projects:

Implementation of an individual / team project with current presentation of assumptions and progress in implementation, in the field of visualization and control of industrial processes. Utilizing students' knowledge of other subjects, initiating discussions, asking questions to increase students' activity and independence.

## Teaching methods

Laboratories: practical familiarization with the functionality and capabilities of the SCADA system, computer classes covering the scope of the topic. Individual work and team work at physical positions and equipment related to SCADA systems.

Projects: The use of computer and multimedia equipment with dedicated software to present current progress in the implementation of final projects.

## Bibliography

### Basic

1. Cupek R., Metody wizualizacji rozproszonych procesów przemysłowych. Praca doktorska, PŚ, Gliwice, 1998.
2. Marciniak P., Wprowadzenie teoretyczne do systemów SCADA, Self Publishing, 2013.
3. Jakuszewski R., Programowanie systemów SCADA., Gliwice, 2006.

### Additional

1. Kościelny J. M., Systemy nadzorowania i wizualizacji procesów przemysłowych ? wymagania, kryteria oceny, PW, Warszawa, 1998.
2. Kasprzyk J., Programowanie sterowników przemysłowych., WNT, Warszawa, 2006.
3. Schneider Electric, Vijeo Citect 7.1, 7.2 - Pierwsze kroki, Instytut Szkoleniowy Schneider Electric, Warszawa.
4. Broel-Plater B., Układy wykorzystujące sterowniki PLC. Projektowanie algorytmów sterowania, Wydawnictwo Naukowe PWN SA, Warszawa, 2008.
5. Kwaśniewski J., Sterowniki PLC w praktyce inżynierskiej, Wydawnictwo BTC, Legionowo, 2008.
6. Kamiński K., Programowanie układów sterowania z PLC, Wydawnictwo Krzysztof Kamiński, Gdynia 2009.
7. Nowak R., Pietrasz A., Trzmieł G., The control and visualisation system in an intelligent building, ITM Web Conf., vol. 19 (01041), 2018, <https://doi.org/10.1051/itmconf/20181901041>.



8. Trzmiel G., Control and visualisation of the selected industrial processes with the application of SCADA system, Monograph Computer Applications in Electrical Engineering, Poznan University of Technology 2015, vol. 13, pp. 161 - 177.
9. Kurz D. Łopaska M., Trzmiel G., The use of the SCADA system in the monitoring and control of the performance of an autonomous hybrid power supply system using renewable energy sources, E3S Web of Conferences, vol. 44, 2018 (00180), <https://doi.org/10.1051/e3sconf/20184400180>.
10. Głuchy D., Possibilities of use of the SCADA system for control and visualization of the RES operation, Post-conference Monograph „Computer Applications in Electrical Engineering”, vol. 14, 2016, Poznań, Polska, str. 340-351.
11. CiTechnologies: System pomocy środowiska CitectSCADA., 2006-2012.
12. Internet: specialist subject literature, datasheets, standards.

#### Breakdown of average student's workload

|  | Hours | ECTS |
|--|-------|------|
| Total workload   | 85    | 3,0  |
| Classes requiring direct contact with the teacher  | 55    | 2,0  |
| Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for project and presentation) <sup>1</sup> | 30    | 1,0  |

<sup>1</sup> delete or add other activities as appropriate