# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Automation of the production processes in electromobility [S2Elmob1-SSP>APPwE2]

## Course

Field of study
Electromobility

Year/Semester
2/3

Area of study (specialization)
Car Onboard Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
0

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

## Number of credit points

2,00

## Coordinators

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## Lecturers

## Prerequisites

Basic knowledge of electrical engineering, electronics, computer science and automation. Has elementary knowledge about the construction, operation, selection and programming of PLC controllers. Programming in C, Pascal or other high-level language. He can formulate a process control algorithm and select design assumptions. He is aware of the importance of his own and team work, and is able to take responsibility for the project tasks.

## Course objective

Getting acquainted with the principles of designing, constructing and operating the control and visualization system, configuration of system components and the possibilities of SCADA environments, in particular in the area of automation of production processes. Familiarization with the possibility of working in the simulation mode and especially with the real object supervised by the PLC. Making your own project and documentation using a PLC.

## Course-related learning outcomes

Knowledge:
1. has extensive knowledge in the use of IT tools in SCADA systems, designing algorithms and

programming PLC controllers used in production processes in leektromobility
2. has systematic knowledge of current achievements and development trends in the field of control theory and visualization of industrial processes

Skills:
1. is able to develop complete project documentation
2. can formulate the assumptions and specification of the project of cooperation of the device with the PLC and the SCADA system in accordance with the applicable rules and standards

Social competences:
1. is aware of the importance of the latest scientific and technical achievements in solving research and practical problems and, if necessary, being supported by expert opinions

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Design and laboratory classes are assessed on the basis of: the implementation of a visualization project and control of a selected production process using cooperation with a PLC controller, assessment of the ability to cooperate within a team practically implementing the design task, as well as project documentation and final presentation.

## Programme content

The module program includes issues related to practical learning of design, programming and practical use of SCADA systems (visualization, control and data acquisition) and PLC controllers in production and service processes in the area of electromobility.

## Course topics

The laboratory program includes the following issues:
Configuring communication with external devices, creating synoptic screens, defining variables, configuring: alarms, charts (trends), logs, programming elements, configuring users and the authorization system, handling events, reports, keyboard shortcuts, working with a real industrial controller and getting acquainted with other selected elements of the SCADA system. Introducing modern application solutions used in practice in production processes.
The project class program covers the following topics:
Implementation of an individual/team project based on the cooperation of a PLC controller and SCADA software. Preparation of a study for the project. Design classes expand the topic of system cooperation with a real PLC controller and the use of an object-oriented approach and/or another programming environment in applications in production processes. Using students' knowledge from other subjects, initiating discussions, asking questions to increase students' activity and independence. The result is the implementation of a team project with ongoing presentation of assumptions and progress in implementation.

## Teaching methods

Wykorzystanie sprzętu komputerowego z dedykowanym oprogramowaniem do implementacji oprogramowania w systemach SCADA. Korzystanie z oprogramowania umożliwiającego studentom wykonanie zadań w domu (tryb DEMO ze sterownikami wirtualnymi oraz symulacja rzeczywistych PLC). Zajęcia na uczelni uzupełnione materiałami do samodzielnego wykonywania zadań na udostępnionych darmowych pakietach oprogramowania. Praca na najnowszych zweryfikowanych wersjach oprogramowania typu SCADA, wprowadzanie nowoczesnych rozwiązań aplikacyjnych wykorzystywanych w praktyce.

## 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.
4. Burt G. Look, Handbook of SCADA/Control Systems Security, CRC Press, 2016.

5. Stuart A. Boyer, SCADA: Supervisory Control and Data Acquisition, Fourth Edition, ISA - International Society of Automation, 2016.

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., Trzmiel 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. Łopatka 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: CitectSCADA environment help system., 2006-2012
12. Internet: specialist literature, catalog cards, standards.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 56 | 2,00 |
| Classes requiring direct contact with the teacher | 30 | 1,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 26 | 1,00 |