COURSE DESCRIPTION CARD - SYLLABUS

Course name
SCADA systems

Course

Field of study
Electrical Engineering

Year/Semester
1/2

Area of study (specialization)
Electrical Systems in Industry and Vehicles

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Faculty of Control, Robotics and Electrical Engineering

Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of electrical engineering, electronics and computer science. Has elementary knowledge about the construction, operation, selection and programming of PLC controllers. Basics of programming in C, Pascal or other high-level language. Can formulate the process control algorithm and choose project assumptions. Is aware of the importance of own and team work, is able to take over responsibility for implemented project tasks.

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 expanded knowledge in the use of IT tools in SCADA systems, design and programming algorithms of PLC controllers used in industrial process control,

2. has systematic knowledge about current achievements and development trends in the field of control theory and visualization of industrial processes.

Skills

1. is able to lead and supervise the work of the project team in the pursuit of efficient task implementation,

2. can develop complete project documentation,

3. knows how to formulate the assumptions and specifications for the project of device cooperation with the PLC and SCADA system in accordance with applicable rules and norms.

Social competences

1. makes efforts to present honestly and comprehensively the achievements in the field of cooperation of SCADA systems with PLC controllers, presenting several possible potential design solutions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified by passing the last lecture lasting about 45-60 minutes, consisting of 10-15 questions (open and closed questions), variously scored. Passing threshold: 50% of points. The issues on the basis of which questions are prepared will be sent to students by e-mail using the university's e-mail system.

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

Programme content

Lecture:

Characteristics of SCADA systems with particular emphasis on practical aspects of the principles of operation, configuration and operation of selected system components. The emphasis is on presenting the possibilities, principles and universality of information exchange between the SCADA system and any PLC. Introducing modern application solutions used in practice.

Laboratories:

Configuration of communication with external devices, creation of synoptic screens, defining variables, configuration of: alarms, charts (trends), logs, programming elements, configuration of users and the authorization system, handling of events, reports, hotkeys, work with a real industrial controller and familiarization with other selected elements of the SCADA system. Introducing modern application solutions used in practice.

Projects:

Implementation of an individual / team project based on the cooperation of the PLC controller and SCADA software. Preparation of a study for the project. Within the design classes, the topics covered in this course during 1st degree full-time studies are expanded, mainly with the cooperation of the system with a real PLC controller and the use of an object-oriented approach and / or other programming environment. Using students' knowledge of other subjects, initiating discussions, asking questions to increase student activity and independence. The result is the implementation of a team project with the current presentation of assumptions and progress in implementation.

Teaching methods

Lecture: multimedia presentations containing drawings, diagrams, photos, supplemented with practical examples on the board, slides and computer programs, which makes it easy to link theory and practice. The lecture supplemented with additional materials provided to students for independent study.

Projects: The use of computer hardware with dedicated software for software implementation in SCADA systems. Using software that allows students to perform tasks at home (DEMO mode with virtual controllers and simulation of real PLCs). Classes at the university supplemented with materials for independent performance of tasks on the provided free software packages. Work on the latest verified version of Citect SCADA software, introduction of modern application solutions used in practice.

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: System pomocy środowiska CitectSCADA., 2006-2012

12. Internet: specialist subject literature, datasheets, standards.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory and project classes and lecture completion, preparation for the presentation of projects, implementation of design works, preparation of project documentation) [1]	45	1,5

[1] delete or add other activities as appropriate