STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
SCADA systems		**1010314491010324972**

Field of study	Profile of study (general academic, practical)	Year /Semester
Power Engineering	**(brak)**	**5 / 9**

Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Ecological Source of Electrical Energy	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**part-time**

No. of hours				No. of credits
Lecture: **9**	Classes: **-**	Laboratory: **-**	Project/seminars: **9**	**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**
Technical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of electrical engineering, electronics, computer science and automation. It has an elementary knowledge of the structure, operation, selection and PLC programming.
2	**Skills**	Basics of programming in C, Pascal or other high-level language. He can formulate process control algorithm and select design objectives.
3	**Social competencies**	He is aware importance of their own work and teamwork, he can take over responsibility for the performed design tasks.

Assumptions and objectives of the course:

Introduction to the principles of design, construction and operation of the control and visualization system, configuration of system components and the possibility of SCADA environments. Knowing with the possibility of simulation mode and particularly with the real object controlled by the PLC.

Implementation of own project and documentation using a PLC.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. he has extended knowledge in the use of IT tools in SCADA systems, designing and programming the PLC algorithms used in industrial process control, in particular with the use of RES - [K_W20+++]

2. he has a systematic knowledge of current achievements and trends in the development of the theory of control and visualization of industrial processes in renewable energy - [K_W08+, K_W09++]

Skills:

1. he can lead and supervise the work of the project team in the quest for effective implementation of the task - [KU_02+++]

2. he can develop a complete documentation of the project - [KU_01++]

3. he can formulate objectives and specification of the project cooperation of the device with PLC and SCADA systems in accordance with current rules and regulations - [KU_10++]

Social competencies:

1. he takes efforts to accurately and clearly present the achievements in the field of SCADA systems with PLCs in RES systems, presenting several possible potential design solutions - [K_K02++, K_K04+]

Assessment methods of study outcomes

Lecture:

- verification of knowledge necessary during the course of the project during the semester,
- passing the written test in the last lecture.

Design classes:

- execution of the visualization and control design of the selected process utilizing the cooperation with the PLC,
- ability to cooperate within the team practically performing the project task.

Course description

Applied methods of teaching: lectures: 9 h., projects: 9 h.

The lecture is characteristic of SCADA systems with a special focus the practical aspects of the principles of operation, configuration, and operation of selected components. Within the course of project cooperation will SCADA system with real PLC in the energy system. The focus is directed to present possibilities, principles and universality of exchange of information between the SCADA system and any PLC.

Project: Individual/team project based on PLC and SCADA software cooperation. Performing the design for the project.

Topics concerning the project part of the course include: configuration of the communication with external devises, creation of synoptic screens, defining variables, configuration of alarms, charts (trends), recording events, elements of programming, securing the system from unauthorized access (configuration of users and systems of privileges), servicing of events, reports, keyboard shortcuts, work with actual driver and familiarizing with other chosen elements of SCADA system. As part of the project activities are carried out projects of visualization and control of real processes in the simulation mode.

Use students' knowledge of other subjects, initiate discussions, ask questions to increase student activity and autonomy.

Use of software to enable students to perform home tasks (DEMO mode with virtual drivers and real simulation). Classes at the university supplemented by materials for self-employment on free software packages.

Updated 2017: Working on the latest version of Citect SCADA 2016 software, introducing modern application solutions used in practice.

Basic bibliography:

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 bibliography:

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., Control and visualisation of illumination and irrigation processes, Monograph Computer Applications in Electrical Engineering, Poznan University of Technology 2016, vol. 14, pp. 469 ? 484.
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. Głuchy D., Kurz D., Trzmiel G., Wykorzystanie systemu SCADA w sterowaniu pracą elektrociepłowni, Computer applications in electrical engineering vol. 82/2015, Poznan University of Technology Academic Journals ? Electrical Engineering, Poznań, 2015, str. 21 ? 30.
10. CiTechnologies: System pomocy środowiska CitectSCADA., 2006-2012
11. Prace dyplomowe.
12. Internet.

Result of average student's workload

Activity	Time (working hours)
1. participation in lectures	9
2. participation in project activities	9
3. the consulting	10
4. analysis of the literature exploring the topics of lectures	10
5. preparation for the pass of the lecture	8
6. preparation for the pass the project	20
7. reckoning of projects	2

Student’s workload

Source of workload	hours	ECTS
Total workload	68	3
Contact hours	30	1
Practical activities	31	1