STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
SCADA systems and PLCs	**1010324391010326004**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**5 / 9**
Elective path/specialty: **Electrical and Computer Systems in**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **part-time**	

No. of hours	No. of credits
Lecture: **-** Classes: **-** Laboratory: **18** 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:

Dr inż. Grzegorz Trzmiel
email: grzegorz.trzmiel@put.poznan.pl
tel. 616652693
Elektryczny
Piotrowo 3A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of electrical engineering, electronics and computer science.
2	**Skills**	Basics of programming in C, Pascal or other high-level language.
3	**Social competencies**	He is aware the need to expand his competence, ready to to cooperate within a team.

Assumptions and objectives of the course:

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. Characteristics of solutions in the form of project documentation or multimedia presentation.

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

Knowledge:

1. it has an elementary knowledge of the use of IT tools in SCADA systems in programming with dedicated languages, design of signal transmission network and use of databases - [K_W11++]
2. it has an elementary knowledge of the structure, operation and selection of the PLC (including simulated) cooperating with the visualization and control SCADA systems - [K_W22++]
3. it has a basic and systematic knowledge of the design and programming of microprocessor and PLC used in industrial process control - [K_W07+]

Skills:

1. he can formulate a process control algorithm and implement it using appropriate programming languages - [K_U04+++]
2. he is able to simulate real operating conditions and parameters of an industrial process using SCADA system - [K_U02++]
3. he knows how to correctly select the design objectives and make the description or presentation showing the characteristics of the proposed SCADA system - [K_U12+]

Social competencies:

1. he is aware importance of their own work and teamwork, can be responsible for implemented design tasks - [K_K03++]

Assessment methods of study outcomes

Laboratories:

? continuous evaluation for each course - rewarding growth of skills in using the rules and methods,

? evaluate the knowledge and skills under the project first completion.

Projects:

? implementation and presentation of the project visualization and control of the process,

? ability to cooperate within a team implementing practically design task,

? presentation of the final design solution in the form of descriptive or multimedia.

Course description

Applied methods of education: laboratories: 18 h., projects: 9 h.

Topics concerning the laboratory 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. Each project is additionally presented in the form of a presentation.

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.

Laboratory: practice using of functionality and possibilities of the system, computer classes covering a range of topic.

Designing: Individual project / team with the current presentation of the objectives and progress in the implementation.

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 laboratory classes	18
2. participation in project activities	9
3. the consulting	4
4. preparation for active participation in laboratory classes	12
5. implementation of projects	20
6. preparation for pass the project, including the implementation of the description and presentation of multimedia	10
7. reckoning projects	2

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	75	3
Contact hours	33	1
Practical activities	71	3