COURSE DESCRIPTION CARD - SYLLABUS

Course name
Programmable logic controllers and SCADA systems [N2Elenerg1>PSLiS]

Course

Field of study
Electrical Power Engineering

Year/Semester
2/3

Area of study (specialization)
Electric Energy Exploitation

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
20

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Knowledge - the student beginning this course should have basic knowledge of the basics of digital electronics, programming and automation, should also have the ability to obtain information from indicated sources and have the willingness to cooperate in a team. Skills - the ability to effectively self-educate in the field related to the chosen field of study; the ability to make appropriate decisions in solving simple tasks and formulating problems in the field of PLC programming. Competences - the student is aware of extending his competences, demonstrates readiness to work in a team, ability to comply with the rules binding during lectures and laboratory classes.

Course objective

To acquire knowledge and skills about real-time systems and programmable logic controllers (PLCs), to become familiar with PLC architecture, to become familiar with PLC programming languages, to acquire the ability to operate and configure PLCs, and to develop and implement algorithms that perform selected functions, with particular emphasis on industrial applications. Learning concepts of SCADA management and data acquisition systems. Acquire practical skills of creating SCADA applications.

Course-related learning outcomes

Knowledge:
1. the student has elementary knowledge of construction, operation principle and selection of plcs (including simulated ones) cooperating with scada visualization and control systems.
2. the student should have knowledge of selected programming languages used to implement the developed control algorithms.
3. the student should know basic concepts connected with designing, configuration and operation of hmi (human machine interface) and scada systems.

Skills:
1. the student will be able to apply his knowledge in the construction and principles of operation of plcs and peripheral devices.
2. the student will be able to develop control algorithms in selected plc programming languages.
3. the student will be able to program various hmi interfaces and configure them.

Social competences:
1.the student understands the importance of knowledge in solving problems and improving professional, personal and social competences.
2.the student is aware that in technology knowledge and skills become obsolete very quickly.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lectures:
- evaluation of knowledge and skills presented in the written exam,
- frequent appraisal during exercise classes (the awarding student activity).
Laboratory classes:
- test and awarding knowledge during realization of laboratory classes,
- evaluation of student activity and appraisal both of increase of his knowledge, skills and social competences connected withvactivities in teamwork,
- evaluation of knowledge and skills related to the individual laboratory class, appraisal of the report.

Programme content

Lecture:
The definition of a PLC and its use in industrial applications, PLC programming languages, timer and counter support in PLCs including the so-called fast counters (dedicated to work with various types of encoders), interrupt system support in PLCs, pulse output support in PLCs, closed-loop control systems (regulator algorithms in PLCs). Timers and counters in PLCs including the so called fast counters (dedicated to work with various types of encoders), interrupt system operation in PLCs, impulse outputs operation in PLCs, closed-loop control systems (regulator algorithms in PLCs), servo drives operation control, HMI (Human Machine Interface) based on PC platforms as well as dedicated hardware platforms (e.g. operator panels), SCADA systems (definition, PLC programming languages), SCADA systems (definition, PLC programming languages), HMIs (Human Machine Interface) based on PC platforms as well as dedicated hardware platforms (e.g. HMIs). SCADA systems (definition, requirements, tools), network communication in SCADA systems, network topologies and transmission media used in control systems. Visualization methods used in PLC-based control systems. Creating screens and sub-screens and navigating between them. Configuration of communication with external devices, creating synoptic screens, defining variables, configuring alarms, charts (trends), recording events - logs, elements of programming, securing the system from unauthorized access (configuring users and the system of authorization), handling events, reports, keyboard shortcuts, working with real industrial controller, and learning about other selected elements of SCADA system.

Teaching methods

Lecture: multimedia presentation (including: figures, photos, animations, films) supplemented with examples given on the board.
Laboratory: working in teams, using provided instructions and tools that enable students to perform tasks at home developing project documentation.

Bibliography

Basic
1. Dokumentacja techniczna wybranych sterowników PLC oraz serwonapędów
2. Kwaśniewski J., Sterowniki PLC w pracy inżynierskiej, PTC, Kraków 2008.
3. Legierski T., Programowanie sterowników PLC, WPKJS, Gliwice 1998.
4. Zieliński T.P., Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, Wydawnictwa Komunikacji i Łączności, Warszawa 2009.
5. Sałat R., Korpysz K., Obstawski P., Wstęp do programowania sterowników PLC, WKŁ,2014.
Additional
1. Normy dotyczące języków programowania sterowników PLC
2. Dokumentacja standardu PLC Open Motion Control
3. Internet: specialist subject literature, datasheets, standards.

Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50