COURSE DESCRIPTION CARD - SYLLABUS

Course name
PLC controllers and PLD programmable logic devices [S1Eltech2>PO12-SPLC]

Course

Field of study
Electrical Engineering

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Students beginning this course should have a basic understanding of digital electronics and programming. They should also be able to obtain information from designated sources and be willing to collaborate within a team..

Course objective

Familiarization with the operating principles, operation, and broadly defined programming of PLCs and PLDs. Acquisition of skills in designing industrial automation systems and complex digital systems..

Course-related learning outcomes

Knowledge:
1. Student has knowledge of development trends, new achievements and dilemmas of modern engineering.
2. The student has knowledge of the implementation of algorithms in selected programming languages of PLC controllers and PLD systems.

Skills:

1. Is able to obtain information from literature, databases, and other sources, interpret, evaluate, critically analyze, and synthesize it, as well as draw conclusions and formulate and comprehensively justify opinions. 2. Is able to formulate and test hypotheses related to engineering and research problems, develop detailed documentation of the results of an experiment or design task, interpret the obtained results, and draw conclusions.

Social competences:
1. Recognizes the importance of knowledge in solving cognitive and practical problems and understands that in technology knowledge and skills quickly become obsolete and therefore require constant updating.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
- assessment of knowledge and skills demonstrated in a problem-solving written test,
- continuous assessment, rewarding activity and substantive content of the statements.
Laboratory:
- skills acquired during laboratory classes are verified on the basis of reports prepared and answers given during classes.
Project:
- skills acquired during project classes are verified on the basis of a project for the course; teamwork is possible in the considered case.

Programme content

Application possibilities of PLCs, architecture of programmable industrial controllers and their classification, characteristics of the program cycle of programmable logic controllers, programming languages (including LAD, FBD, STL, SFC), characteristics of basic PLC expansion modules, communication protocols, HMI, the concept of a cyclogram, the concept of programmable electronic devices (PLDs), PLD programming languages, commissioning tools, optimization processes in PLDs.

Course topics

The concepts of real-time systems and programmable logic controllers (PLCs), application capabilities of PLCs, architecture of programmable industrial controllers and their classification, characteristics of the program cycle of programmable logic controllers, PLC development tools, programming languages (including LAD, STL, FBD, SFC), characteristics of basic PLC expansion modules, simulation tools dedicated to PLCs, communication protocols, visualization and control of automation processes from a PC, support for pulse and analog inputs/outputs, principles of designing digital electronic systems, the ORCAD/PSpice software package and the use of electronic circuit libraries created by their manufacturers, the concept of programmable electronic PLDs, PLD programming languages (text and graphical) and development tools, combinational and sequential circuits in PLDs, optimization processes in PLDs.

Teaching methods

Lectures - presentation of topics using multimedia, illustrated with examples provided on the electronic board, and discussion of problem-solving issues. Laboratory - presentation of topics using experimental stations and simulation tools. Project - group work using experimental stations and simulation tools to solve specific tasks.

Bibliography

Basic:
1. Technical documentation of selected PLC controllers
2. Technical documentation of selected programmable logic systems
3. Krzysztof Korpysz, Robert Sałat, Paweł Obstawski, Wstęp do programowania sterowników PLC, Wydawnictwa Komunikacji i Łączności WKŁ, 2021.
4. Jerzy Hawrylak, Języki programowania sterowników PLC: LAD, FBD, SCL, STL, Helion, 2023.
5. Tomasz Gilewski, Szkoła programisty PLC. Język LAD w programowaniu sterowników przemysłowych,

Helion,2023Pawluczuk: A. Układy programowalne dla początkujących, BTC, Warszawa 2007
6. Zbysiński P., Pasierbiński J.: Układy programowalne, pierwsze kroki, BTC, Warszawa 2004
7.Tietze U., Schenk Ch., Układy półprzewodnikowe, Warszawa, WNT 2015.

Additional:
1. Jerzy Hawrylak, Język GRAFCET w przykładach. Programowanie sterowników PLC, Helion, 2022.
2. Witold Krieser, Sterowanie programowalne. Od mikrokontrolera do sterownika PLC, Helion, 2022.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00