Industrial automation and programmable logic controllers - course description

General information

Course name	Industrial automation and programmable logic controllers
Course ID	06.2-WE-ELEKTP-IAPLC-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2019/2020

Course information

Semester	6
ECTS credits to win	5
Course type	optional
Teaching language	english
Author of syllabus	• dr hab. inż. Jacek Kaniewski

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Laboratory	30	2	-	-	Credit with grade
Project	15	1	-	-	Credit with grade

Aim of the course

- familiarize students with the issues of automation and PLC controllers

- shaping basic skills in the design of industrial automation systems

- familiarize students with the PLC programming principles

Prerequisites

Mathematical analysis, algebra, methods and programming techniques

Scope

Introduction. Basic terms. Control principles. Compensation principle. The principle of open regulation. The principle of feedback. The input-output description. Laplace transformations. Block diagrams and their transformation. Time characteristics of linear systems. Impulse characteristics. Step characteristics. Frequency characteristics. Amplitude-phase characteristic. Amplitude characteristic. Phase characteristic. Logarithmic characteristics. Stability of continuous systems. Hurwitz criterion. Routh Criterion. Michajlov Criterion. Nyquist criterion. Logarithmic stability criterion. Phase plane method. Controlling and observability of dynamic systems. Quality of control systems. Static and astatic systems. Evaluation of dynamic properties of the adjustment system. Regulators. Proportional controller. Integral controller. Proportional-Integral Controller. Derivative controller. Proportional-derivative controller. Proportional-Integral-Derivative Regulator. Regulator with inertia. Proportional regulator in automatic control system. Integral regulator in automatic adjustment system. Regulator with saturation. Asymmetric regulators. binary and tri-state regulators. Design of industrial adjustment systems. PLCs. Introduction. Building PLCs. Programming PLCs. PLCs from SIEMENS (S7-1200, Logo), ALLEN BRADLEY, MITSUBISHI (FX series, Alpha). Visualization of industrial processes. Communication in distributed industrial systems with PLCs.

Teaching methods

Lecture: problem lecture, conventional lecture

Laboratory: laboratory exercises

Project: consultations

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
He is aware of PLC driver development trends. Can analyze the dynamics of automation systems		• an exam - oral, descriptive, test and other	• Lecture
He knows the structure and methods of PLC programming. He knows the basics of industrial automation and the construction of PLCs.		• an observation and evaluation of activities during the classes • an observation and evaluation of the student's practical skills	• Laboratory

Outcome description	Outcomesymbols	Methods of verification	The class form
It can design control system based on PLC. Can adjust parameters of regulators.		• a preparation of a project • a project	• Project

Assignment conditions

Lecture - getting a positive grade from the exam

Laboratory - get positive grades from all lab exercises.

Project - getting positive partial evaluations from all project tasks

Composition of the final grade = lecture: 40% + laboratory: 30% + project: 30%

Recommended reading

1. Farid Golnaraghi, Benjamin C. Kuo "Automatic Control Systems", John Wileys and sons, 2015

2. Kaczorek T. "Teoria sterowania i systemów", WN PWN, Warszawa, 1993

Further reading

1. Neal Babcock "Beginner’s Guide To PLC Programming. How to Program a PLC (Programmable Logic Controller)"

Notes

Modified by dr hab. inż. Radosław Kłosiński, prof. UZ (last modification: 27-10-2019 18:37)