COURSE DESCRIPTION CARD - SYLLABUS

Course name
Automation and industrial robotics

Course

Field of study
Logistics
Area of study (specialization)

Level of study
First-cycle studies
Form of study
part-time

Year/Semester
3/6
Profile of study
general academic
Course offered in
Polish
Requirements
elective

Number of hours

Lecture
8
Tutorials

Laboratory classes
8
Projects/seminars

Other (e.g. online)

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
Ph.D., D.Sc., Eng., Cezary Jędryczka

Mail to: cezary.jedryczka@put.poznan.pl

Phone: 61 665 23 96

Faculty of Automatic Control, Robotics and Electrical Engineering

ul. Piotrowo 3A, 61-138 Poznań

Responsible for the course/lecturer:
Ph.D., Eng. Mariusz Barański

Mail to: mariusz.baranski@put.poznan.pl

Phone: 61 665 26 36

Faculty of Automatic Control, Robotics and Electrical Engineering

ul. Piotrowo 3A, 61-138 Poznań

Prerequisites

The student starting this subject should have basic knowledge of linear algebra, Boolean algebra, 2 information technology and the basics of programming. He should also have the skills to obtain information from literature and technical documentation, work in a team and use IT tools, be aware of the risks when working with mechanical and electrical devices and have a sense of responsibility for the safety of other people.

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.

Course-related learning outcomes

Knowledge

1. Student knows the basic issues of design and principles of operation of automation and control systems [P6S_WG_01]

2. Student knows the basic issues of mechanics, construction and operation of industrial manipulators [P6S_WG_02]

Skills

1. Student is able to use appropriate experimental and measurement techniques as well as software tools to solve a problem within the scope of automation and control [P6S_UW_03]

2. Student is able to notice their systemic and non-technical aspects, as well as socio-technical, organizational and economic aspects, when formulating and solving engineering tasks [P6S_UW_04]

3. Student is able to identify changes in requirements, standards, regulations, technical progress in the field of automation and control and, based on them, determine the need to supplement knowledge [P6S_UU_01]

Social competences

1. Student is aware of the initiation of activities related to the formulation and transfer of information and cooperation in society [P6S_KO_02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: The knowledge acquired during the lecture is verified by the 45-minute final test consists of 25-30 questions. Passing threshold 50% of points.

Laboratory: Skills acquired as part of the laboratory classes are verified on the basis of completed laboratory tasks and prepared protocols.

Programme content

Lecture: The concept of automation, automatic control system, example systems. Controllers: tasks of controllers, types and properties of controllers, continuous PID controllers. Basic concepts of robotics, types and general construction of robots, tasks of industrial robots, coordinate systems, location representation, manipulator kinematics, manipulator programming and languages. Construction and operation principle of programmable logic controllers (PLC), Construction and principle of operation PLC, input and output of controllers, programming languages, basics of programming in ladder language. Construction and operation of selected sensors and measuring devices used in automation and robotics.

Laboratory: PLC programming languages. Introduction to ST language. Programming in Automation Studio environment. 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. Working with real industrial controller.

Teaching methods

Lecture: multimedia presentation (including: figures, photos, animations, films) supplemented with examples given on the board.

Laboratory: performing laboratory exercises in teams (preparing the stand, building measuring systems, performing experiments) with the help and under the control of the instructor.

Bibliography

Basic

1. Dokumentacja techniczna wybranych sterowników PLC

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, WKŁ, Warszawa 2009.

5. Sałat R., Korpysz K., Obstawski P., Wstęp do programowania sterowników PLC, WKŁ, Warszawa 2014.

6. Craig J.J., Wprowadzenie do robotyki: mechanika i sterowanie, WNT, Warszawa 1995.

7. Kostro J., Elementy, urządzenia i układy automatyki, WSiP, Warszawa 1998.

8. Tadeusiewicz R., Piwniak G.G., Tkaczow W.W., Szaruda W.G., Oprzędkiewicz K., Modelowanie komputerowe i obliczenia współczesnych układów automatyzacji, AGH, Kraków 2004.

Additional

1. Springer Handbook of Automation, S.Y. Nof (Edytor), Springer, Cham 2009.

2. Kozłowski K., Dutkiewicz P., Wróblewski W., Modelowanie i sterowanie robotów, PWN, Warszawa 2003.

3. Gilewski T.,Tworzenie wizualizacji na panele HMI firmy Siemens, Helios, Gliwice, 2019

4. Regulski R., Czarnecka-Komorowska D., Jędryczka C., Sędziak D., Rybarczyk D., Netter K., Barański M., Barczewski M., Automated test bench for research on electrostatic separation in plastic recycling application, Bulletin of the Polish Academy of Sciences. Technical Sciences, vol. 69, no. 2, 2021, s. e136719-1-e136719-10.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	16	1,0
Student's own work (literature studies, reports preparation, project preparation, preparation of final essay, preparation for test, preparation for test) [1]	34	1,0

[1] delete or add other activities as appropriate