COURSE DESCRIPTION CARD - SYLLABUS

Course name
Industrial control engineering and robotics

Course

Field of study
Engineering Management
Area of study (specialization)

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

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

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)

Tutorials
Projects/seminars

Number of credit points

2

Lecturers

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

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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

The student defines and explains key concepts in the field of automatic control systems and manipulator kinematics, in the context of basic methods, techniques, tools, and materials used in engineering [P6S_WG_16].

The student identifies and describes various industrial technologies used in automation and robotics, including PID controllers and manipulator programming systems [P6S_WG_17].

Skills

The student analyzes technological processes in machine production, identifying key elements of automation and robotics systems and suggesting potential areas for optimization [P6S_UW_13].

The student designs and implements simple automation and robotics systems, including control systems and PLC programming, based on requirements analysis and specifications [P6S_UW_14].

The student demonstrates the ability to apply sensors and measuring devices in practical applications of automation and robotics, based on standard engineering methods and practices [P6S_UW_15].

Social competences

The student assesses applications of automation and robotics from the perspective of their impact on production efficiency, considering technical, economic, and organizational aspects [P6S_KO_02].

The student considers the ethical and environmental consequences of implementing automation and robotics technologies, focusing on responsible engineering decision-making [P6S_KR_01]..

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified by the 45-minute final test consists of 25-30 questions. Passing threshold 50% of points. Skills acquired as part of the laboratory classes are verified on the basis of completed laboratory tasks and prepared protocols.

Programme content

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.

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, Wydawnictwa Komunikacji i Łączności, Warszawa 2009.

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

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

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

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

Additional

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

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, reports preparation, project preparation, preparation of final essay, preparation for test, preparation for test) [1]	20	1,0

[1] delete or add other activities as appropriate