COURSE DESCRIPTION CARD - SYLLABUS

Course name
Devices of automation and actuators [S1AiR1>EiUA]

Course

Field of study
Automatic Control and Robotics

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

The student starting this course should have basic knowledge of electrical engineering, physics, and automation. He should have the ability to solve basic problems in the field of automation, analysis of electrical circuits, and the ability to obtain information from the indicated sources. He should also understand the need to expand his competences as well as be ready to cooperate within the team. Moreover, in terms of social competences, the student must present such attitudes as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, and respect for other people.

Course objective

Acquaintance with the basic knowledge of the: construction, principles of operation, and control of the special electrical, electromechanical, pneumatic, and hydraulic converters used in automation systems. Development of students' skills in areas of construction, design, and analysis tasks as well as measurement verification in the laboratory. Creation of the awareness of the need for a professional approach to technical issues, scrupulous reading of the documentation of drives used in automation. Learning the students to set goals and priorities, leading to solving computational tasks and practical implementation of problem solutions.

Course-related learning outcomes

Knowledge
Knowledge in the fields of metrology, methods of measuring electrical and non-electrical quantities, computational methods, and IT tools necessary to analyze the results of the experiment. Structured knowledge in the field of construction, application, and control of automation and robotics actuators. Typical engineering technologies, rules, and techniques for constructing simple automation and robotics execution systems, rules for the selection of executive systems, computing units as well as measuring and control elements and devices. Knowledge of the life cycle of devices and selected security systems used in automation and robotics
Skills
Reading and understanding technical documentation and simple technological diagrams of automation and robotics systems, using models of simple electromechanical systems and selected industrial processes, using them for the purposes of analysis and design of automation and robotics systems, using properly selected methods and measuring instruments for measuring relevant signals, determining static and dynamic characteristics of automation elements and obtaining information about their essential properties. Ability to build, run, and test simple actuator systems.
Social competences
Understands the need and knows the possibilities of continuous training, improving professional, personal, and social competences. Is aware of the need for a professional approach to technical issues and scrupulous study of the issues raised. Understands the need and the possibility of further transferring the acquired knowledge and skills.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes of lectures can be verified in the problem-based written exam assessing the knowledge and skills.
Learning outcomes of laboratory exercises can be verified by continuous assessment at each class (oral answers, reports), and also by assessing the acquired knowledge and skills through one or two tests per semester.

Programme content

Presentation of the basic phenomena in the actuation elements of automation, e.g. relays, pneumatic elements, PLC controllers. Study of the basic properties of a DC drive. Derivation of object models. Presentation of the basic operational properties, determination of mechanical and control characteristics of an asynchronous motor. Determination of motion properties of a stepper motor. Brushless motor overview. Discussion of field phenomena in electromagnetic devices. Presentation of the principle of operation of pneumatic devices. Presentation of intelligent materials as an alternative to typical electromagnetic devices.

Laboratory classes are conducted in the form of seven 3-hour exercises, with a break, in the laboratory, preceded by a 3-hour training session containing OHS elements at the beginning of the semester. Exercises are carried out by an average of 4 student teams. The laboratory program covers the issues presented in the lecture.
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Laboratory classes are conducted in the form of fifteen 2-hour exercises held in the laboratory, preceded by a 2-hour instructional session at the beginning of the semester. Classes are carried out by 3-person teams of students. The laboratory program covers the issues presented in the lecture.
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During the laboratories, students learn how to connect individual electrical and pneumatic elements and how to program PLC controllers. At the station, a group of students solves successive (with increasing difficulty levels) tasks, while analyzing subsequent modifications, and learn about the functions of the blocks used. During the course of the exercises, no solution is muttered, students can come to a solution in many ways and each is discussed individually.

Students will test the properties of pneumatic actuators, research basic electromagnetic properties in particular brushless, DC, AC, permanent magnet stepper, reluctance step motor, and linear drive, program the trajectory of motion for a stepper motor. Program the trajectory of motion and test the torque of the BLDC motor. Verify the positioning accuracy of the PM stepper motor.
Additional contents of the lectures are the interesting and inspiring issues proposed by students during the semester, which are then discussed in the form of a presentation at the last lecture in the semester.

Teaching methods

1. The lecture: multimedia lecture with examples supported by explanations on the blackboard and a discourse.
 2. Laboratories: connecting the real automation elements, numerical implementation, and task analysis, discussion.

Bibliography

Basic
1. Urządzenia i systemy mechatroniczne Część I i II, Praca zbiorowa, REA, Warszawa, 2009
2. Elementy, urządzenia i układy automatyki , Kostro Jerzy, WsiP, Warszawa, 2008
3. Regulatory wielofunkcyjne, Trybus Leszek, WNT, Warszawa, 19921.
Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50