COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of automation

Course

Field of study
Mechatronics
Year/Semester
3/4
Area of study (specialization)
-
Profile of study
general academic
Level of study
First-cycle studies
Course offered in
English
Form of study
full-time
Requirements
compulsory

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)
0
Tutorials
15
Projects/seminars
0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
prof. DSc. PhD. Eng. Andrzej Milecki
Responsible for the course/lecturer:
PhD. Eng. Dominik Rybarczyk

Prerequisites

Mathematics in the field of set theory, complex numbers, differential equations, Boolean algebra, Laplace and Fourier transforms.

Ability to operate on complex variables, solve simple differential equations and apply transformations.

Course objective

Acquainting with the basics and methods of automation, in particular with digital and analog automation systems in mechatronics

Course-related learning outcomes

Knowledge

Know what statics and dynamics of automation systems are and know the basic concepts, structure, construction and operation of automation systems

He/She knows the Laplacea transfer functions, step responses of basic elements. He/She knows what a classical PID controller is and how are their descriptions nad step responses

He/She knows what frequency characteristics are and how to determine them.

He/She knows the concept and methods of stability testing

Knows what are binary functions, combinational and sequential circuits

He/She knows the methods of implementing binary functions on contact elements and using logic gates

He/She knows the basic digital blocks / circuits

Skills

Can describe the statics and dynamics of basic linear objects

Is able to define Laplacea transfer functions of basic automatics elements and determine their step responses

Is able to use the PID controller and determine the stability of the system

He/She can determine the frequency characteristics of basic elements

Is able to implement a given combinational and sequential binary function

Social competences

Understands the need for lifelong learning; can inspire and organize the learning process of other people

He/She is aware of the role of automation in the modern economy and its importance for society and the environment

Can define priorities for the implementation of a specific task

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

EXAM: Passed on the basis of an examination consisting of 5 general questions (for a correct answer to each question - 1 point. Grading scale: less than 2.6 points - 2, 2.6 ÷ 3.0 - 3.0, 3.1 ÷ 3.5 points - 3.5, 3.6 ÷ 4.0 points - 4.0, 4.1 ÷ 4.5 points - 4.5, 4.6 ÷ 5.0 points - 5.0 very good)

Laboratory: Credit based on the correct implementation of exercises and reports on each laboratory exercise according to the instructions of the laboratory teacher. Before the exercises, short entrance tests, and after the exercises, a written final test. In order to pass the laboratories, all exercises must be passed (positive grade from the answers and the report).

Classes: Assessment based on the final test.

Programme content

1. Basic concepts and definitions. History of automation. Open and closed systems. Static and dynamic properties of elements and linear systems of automation.

2. Laplacea transformation. Transfer functions of basic linear elements. Creating and transforming block schemas of automation systems.

3. Regulators PID and their selection. Evaluation of the operation of the automatic control system - quality of control. Frequency characteristics.

4. Stability. Two-state control. Basics of nonlinear systems.

5. Basics of Boolean algebra. Functions of two variables. Implementation of two-state systems (binary). Realization of any logical functions.

6. Sequential systems. Basic digital elements.

Teaching methods

Lectures and presentations of models and simulations performed in the Matlab-Simulink environment

Bibliography

Basic

Modern Control Engineering (5th Edition) by Katsuhiko Ogata.

Additional

Control Systems Engineering By Norman S. Nise

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	4,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	45	2,0

[1] delete or add other activities as appropriate