COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of automatics [N1Mech1>PA]

Course

Field of study	Year/Semester
Mechatronics	2/4
Area of study (specialization)	Profile of study
–	general academic
Level of study	Course offered in
first-cycle	Polish
Form of study	Requirements
part-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
16	12	0

Tutorials	Projects/seminars	
8	0	

Number of credit points

5,00

Coordinators	Lecturers

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:

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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.

Course topics

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	125	5,00
Classes requiring direct contact with the teacher	65	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,00