



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of automation

Course

Field of study

Biomedical engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

english

Requirements

compulsory

Number of hours

Lecture

15

Tutorials

Laboratory classes

15

Projects/seminars

Other (e.g. online)

Number of credit points

2

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 of automation, in particular with digital and analog automation systems



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 Laplace transfer functions, step responses of basic elements. He/She knows what a classic PID controller is

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 Laplace 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).

Programme content

Basic concepts and definitions. History of automation. Open and closed systems. Static and dynamic properties of elements and linear systems of automation. Laplacea transfer functions of basic linear elements.

Creating and transforming block schemas of automation systems. Regulators PID and their selection. Evaluation of the operation of the automatic control system - quality of control.

Frequency characteristics. Stability.

Basics of nonlinear systems. Two-position adjustment. Basics of Boolean algebra. Functions of two variables. Implementation of two-state systems (binary). Realization of any logical functions. 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	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	30	1,0

¹ delete or add other activities as appropriate