COURSE DESCRIPTION CARD - SYLLABUS

Course name
Control theory

Course

Field of study
Mechatronics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

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

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Fundamentals of automation: description of automation systems, formulation of operator Laplacea transfer functions, selection of PID regulators, automation elements and systems

Understandnes the importance of automation.

Course objective

Learning the principles of control: selection of regulators, evaluation of the quality of regulation, servo drive regulation, state description, description of a nonlinear system, description in the state space, state control, frequency analysis, impulse systems, differential equations, Z-transformation, digital controllers

Course-related learning outcomes

Knowledge

Knows which controller to choose and how to choose its parameters

Knows how to describe an automation object in the state space and knows the methods of regulation into the state space

He knows how to write a difference equation, knows the Z transformation and knows how to apply it to the description of a system, knows how pulse control works

He knows the basic nonlinearities of automation systems.

He knows what frequency characteristics are

Skills

Can choose the setting of the PID controller

Can describe the object in the state space and design the state control of the 3rd order object

Can describe a discrete circuit and can choose a discrete regulator

Is able to design a simple, non-linear control system

Can determine the frequency characteristics of an object and analyze them

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 control theory the in the modern engeneering 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

1. Tests of a two-position regulator

2. Selection of PID controller settings by the Z-N method

3. Modeling of objects in the state space

4. State control study

5. Research on impulse systems

6. Studies of nonlinear systems.

7. Pass a subject

Programme content

1. Basics of dynamics description and object identification

2. PID controllers, selection and their setting. Regulator configurations. Autoset.

3. Quality of regulation. Stability. Frequency characteristics. Designing the controller

4. Description in the state space. State regulator. Control with an observer

5. Discrete and impulse signals. Principles of operation of impulse and discrete systems. Zero order extrapolator. Sampling theorem

6. Z transform. Discrete transmittance. Discrete regulator.

7. Nonlinearities of systems. Linearization. Nonlinear control. Nonlinearity compensation.

Teaching methods

Lecture with presentations and examples, explanations using the blackboard. Models in Matlab-Simulink environment

Bibliography

Basic

1. Modern Control Engineering, Ogata K., 2020

2. Modern Control Theory, Brogan W., 1974

Additional

Control System Design: An Introduction to State-Space Methods, Bernard Friedland

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	32	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	18	1,0

[1] delete or add other activities as appropriate