COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modeling in mechatronics

Course

Field of study
Mechatronics

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
Second-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
0

Projects/seminars
0

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

Fundamentals of machine construction, fundamentals of automation, machine dynamics, drives and sensors. Designing mechanical and electronic systems. Description of the automated elements. Understands the importance of mechatronics for the development of the country's economy.

Course objective

Acquiring the ability to formulate equations describing mechatronic devices and developing their simulation models. Expanding the knowledge and skills of designing mechatronic devices with the use of modeling techniques.

Course-related learning outcomes

Knowledge

Knows how to describe theoretically the static and dynamic properties of mechanical, electrical and electronic elements.

Has knowledge of computer modeling software: Matlab / Simulink, Scilab, Octave.

Knows how to build a simulation model of a mechatronic device and conduct its research and design.

Skills

He/She can describe theoretically and model components and the entire mechatronic device

He/She can conduct simulation tests of a mechatronic device

Is able to use the simulation results to design mechatronic devices

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 electronics in the modern engeneering and its importance for society and the environment

He/She can think and act creatively, especially in the field of designing mechatronic devices

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

1. Construction of mechatronic devices. Basic elements of the mechatronic device and their description, i.e .: typical structural elements, guides, gears, joints, springs, bearings, mass-friction-spring elements, etc.

2. Mathematical description of selected electric and electronic elements and circuits. Description and modeling of friction and the most important nonlinearities

3. Description and modeling of electric and hydraulic drives.

4. Getting to know the possibilities of functional blocks of the Simulink system. Simulation parameters. Other software: Scilab, Octave.

5. Modeling of regulators and drivers. Examples of models of various devices. Simulation tests of the influence of construction parameters, drives, measurements and the controller on the properties of the entire device.

6. Examples of using simulation to design mechatronic devices.

Teaching methods

Lecture with presentations, examples. Demonstration of model building and simulation. Explanations on the board

Bibliography

Basic

1. Heimann B., Gerth W., Popp K. Mechatronik, Carl Hanser Verlag, 1998 .

2. Mechatronic Systems Design Methods, Models, Concepts, Janschek, Klaus 2012

Additional

Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, W. Bolton, 2015

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	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]	20	1,0

[1] delete or add other activities as appropriate