COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mechatronic drives

Course

Field of study

Mechatronics

Year/Semester

2/4

Area of study (specialization)

-

Profile of study

practical

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

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: Basic knowledge of mechatronics, automation, electrical engineering, electronics, computer control, sensors, drives.

Skills: Defining digital functions, designing switching systems, designing electronic systems

Social competencies: Understanding the importance of electronics for the development of the country's economy. Awareness of necessity for broadening knowledge and skills.

Course objective

Introduction to the design, operation, design basic types of low-power electric drives used in mechatronic devices.

Course-related learning outcomes

Knowledge

1 Construction, basis of operation and the most important parameters of low power electric motors

2 Ways to control DC, BLDC, PMSM and stepper motors

3 The mathematical description of drive systems based on low-power electric motors

4 Measuring elements used in mechatornic drives

Skills

1 Designing mechatronic drives based on low power electric motors

2 Selection of the measuring system and its implementation in the mechatronic drives

3 Control of electric motors with microcontrollers

4 Control of electric motors using PLC controllers

Social competences

1. Understanding the requirement of learning by whole life; ability to inspire and organize learning process of other people.

2. s aware of the role of electronics in modern economy and its importance for the development of society and the environment.

3. Ability to think and act in a creative and enterprising way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

test consisting of open questions

Programme content

1. Basic elements included in the electric drive system: electric motors, gearboxes, clutches, measuring systems (encoders, resolvers), limit sensors and sensors for homing drives, mathematical description

2. Construction of a DC motor, mathematical model, basic characteristics, position, speed and torque regulation, control systems, discrete PID controller

3. Construction of the stepper motor, mathematical model, basic characteristics, control methods, connection with a microcontroller / PLC

4. Construction of asynchronous motor and brushless DC BLDC, control methods, applications

5. Construction of the PMSM engine, mathematical model, control methods, applications

6. Implementation of an electric drive on a PLC controller, advanced functions: drive libraries, CAM-automaton, virtual cam

Lab:

1. Characteristics of a DC motor

2. PID control of DC motor

3. Stepper motor control

4. BLDC motor control (sensor and sensorless)

5. Asynchronous motor control

6. PMSM drive control from the PLC level

Teaching methods

Lecture/Labolatory

Bibliography

Basic

1. Przepiórkowski J. „Silniki elektryczne w praktyce elektronika, wyd. 2”.

2. Deskur Jan, Kaczmarek T., Zawirski K. „Automatyka napędu elektrycznego”.

3. Grzesiak L., Kaszewski A., Ufnalski B. „Sterowanie napędów elektrycznych”.

Additional

1. Technical data on internet, datasheets etc.

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