COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design project [N1Mech2>PP]

Course

Field of study
Mechatronics

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
24

Number of credit points

4,00

Coordinators

Lecturers

Prerequisites

Knowledge: Knowledge of the basics of machine construction and drive systems, basics of electrical engineering, basics of computer science, elements of the mechatronic system. Skills: Ability to independently formulate a technical problem, develop a construction record in accordance with the principles of technical drawing, calculate the strength of machine elements and shape the design features of machine components. Social competences: Understanding the need to expand one's competences, readiness to cooperate within a team.

Course objective

The aim of the course is to become acquainted with the tools for designing mechatronic devices with mechanical components and simple controls, as well as their layout for the implementation of engineering work and work as a constructor of mechatronic machines and devices.

Course-related learning outcomes

Knowledge:
Knows the individual stages of designing mechatronic devices and understands the relationships between the mechanical system and the control system.
Knows contemporary trends used in the design of mechatronic devices.

Skills:
Is able to carry out the complete process of designing a mechatronic device, from developing the solution concept to the finished design.
Is able to critically analyze the developed structure and introduce modifications to the structure in order to improve it.
Is able to use computer-aided methods in designing the structures of mechatronic devices.

Social competences:
Understands the need for lifelong learning; can inspire and organize the learning process of other people.
Able to cooperate and work in a group, taking on various roles.
Is able to set priorities for the implementation of tasks specified by himself or others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Project: Design of a special-purpose machine (automated mechatronic device) implementing a given technological process, in accordance with the guidelines and design data received by the teacher during the first class. The project is carried out in groups of 3 people. Ongoing verification of the progress of design work.
Assessment criteria: the project is presented to the group during the last class (max. 15 minutes per group) and submitted to the teacher in paper form. The final grade is the result of the grade from the project presentation (25% of the grade) and the substantive grade from the completed project (75% of the grade).

Programme content

Stages of designing mechatronic devices, application of computer-aided design, analysis of the technological process, development of a solution concept, preparation of documentation for a mechatronic device, contemporary trends in the design of mechatronic devices.

Course topics

Projects:
Project 1 (3) - Discussion and distribution of specialized machine project topics
Project 2 (3) - Analysis of the obtained technological process, review of the state of the art
Project 3 (3) - Presentation of the solution concept with discussion
Project 4 (3) - Kinematic and dynamic calculations of the designed machine
Project 5 (3) - Design of specialized tools
Project 6 (3) - Calculations and selection of device drives
Project 7 (3) - Selection of sensors and measuring elements
Project 8 (3) - Design of frames and supporting structures
Project 9 (3) - Presentation of the structure of the designed device
Project 10 (3) - FEM strength and stiffness analysis of selected structural elements and nodes
Project 11 (3) - Development of executive and assembly documentation
Project 12 (3) - Design of a control system and development of a work algorithm
Project 13 (3) - Development of complete documentation of a mechatronic device (electrical, pneumatic, hydraulic diagrams, control program, project description, etc.)
Project 14 (3) - Project consultations
Project 15 (3) - Presentation of the final project

Teaching methods

Project: Workshop methods of practical construction classes at computer workstations. Project methods.

Bibliography

Basic:
1. Heimann B., Gerth W., Popp K.: Mechatronika. Komponenty. Metody. Przykłady, PWN, Warszawa 2001.

2. Gawrysiak M.: Mechatronika i projektowanie mechatroniczne, Wyd. Politechniki Białostockiej, Białystok 1997.
3. Olszewski M.: Podstawy mechatroniki, wyd. REA, Warszawa 2006.
4. Kosmol J.: Napędy mechatroniczne, wyd. Politechniki Śląskiej, Gliwice 2013.
5. Jaskulski A., Autodesk Inventor Professional 2024 PL / 2024+ / Fusion 360. Metodyka efektywnego projektowania, wyd. Helion, Gliwice 2023.

Additional:
1. Uhl T. Projektowanie mechatroniczne zagadnienia wybrane, Kraków 2007
2. Gawrysiak M.: Analiza systemowa urządzenia mechatronicznego, Wyd. Politechniki Białostockiej, Białystok 2003.
3. Dietrich T., Podstawy konstrukcji maszyn, tom 1, 2 i 3, Wyd. Naukowe PWN, 2017.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	24	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	76	3,00