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Stamp of Faculty / Institute

Name of Faculty / Institute running the study programme: Faculty of Mechatronics

Name of study programme: Mechatronics

Level of study: first-cycle studies, engineering

Educational profile: general academic

LEARNING OUTCOMES FOR THE STUDY PROGRAMME
determined by the Resolution of the Senate of Kazimierz Wielki University
No. 58/2025/2026
of 26 maja 2026

No.	symbol of programme learning outcomes	programme learning outcomes	reference to the second-level characteristics of learning outcomes
			(description component code)
Knowledge			
1	K_W01	Has detailed knowledge of mathematics, encompassing algebra, analysis, and probability theory, including elements of applied mathematics necessary for formulating and solving engineering problems related to mechatronics.	
2	K_W02	Has detailed knowledge of physical phenomena necessary for describing and understanding the operating principles of mechatronic systems, encompassing mechanics and the properties of materials and solids.	
3	K_W03	Has detailed knowledge of materials used in engineering, including basic knowledge of the structure, composition, properties of materials and methods of measuring them, as well as methods of functional and strength-based material selection.	
4	K_W04	Has detailed knowledge of the fundamentals of automation and control theory; knows and understands the construction, operating principles, and applications of basic automation components and controllers; has the knowledge necessary for their application in mechatronics.	
5	K_W05	Has detailed knowledge of the types and construction of robots and their programming languages; knows the basics of robot programming.	

6	K_W06	Has advanced, theoretically grounded general knowledge of the construction and operation of mechatronic systems and their functional components, including knowledge of the role of sensors and actuators in these systems and methods of their functional description; knows and understands the principles of integrating mechanical, hydraulic, pneumatic, electrical, and computer systems into mechatronic systems.
7	K_W07	Has detailed knowledge of the life cycle of mechatronic devices and systems.
8	K_W08	Knows and understands current trends and directions in the development of mechatronics, including the significance of new technologies for the industry.
9	K_W09	Has detailed knowledge of mechanics, encompassing technical mechanics, fluid mechanics, and strength of materials, including knowledge necessary for understanding mechanical phenomena and solving basic engineering problems in the areas of statics, kinematics and dynamics of machine elements, stress analysis, and flow phenomena.
10	K_W10	Has detailed knowledge of computational methods used in the mechanics of deformable solids, including the finite element method.
11	K_W11	Has advanced, theoretically grounded knowledge of the fundamentals of machine design, methods and tools for analysing the kinematics and loads of mechanism elements during operation; knows and understands the principles of construction, operation, and modelling of machines and mechanisms.
12	K_W12	Has detailed knowledge of the construction, operating principles, and applications of mechanical, hydraulic, pneumatic, and electrical drives.
13	K_W13	Has detailed knowledge of methods for preparing technical documentation of mechanical structures and hydraulic, pneumatic, and electrical systems.
14	K_W14	Has detailed knowledge of subtractive machining and other technologies for shaping the geometric form of products, thermal cutting methods, and material joining and bonding; has basic knowledge of coating and plating technologies, thermochemical surface treatment, and technologies for shaping the structure and engineering properties of metal alloys; knows the principles of assembly organisation.
15	K_W15	Has knowledge of designing technological processes used in machine construction, including mechanical machining, assembly, and quality control processes.
16	K_W16	Has advanced, theoretically grounded knowledge of the construction and operating principles of numerically controlled machine tools, their programming methods and control systems, including basic knowledge of CNC machine programming for a selected control system and the use of software supporting the design of technological processes.
17	K_W17	Has advanced, theoretically grounded knowledge of electrical engineering and analogue and digital electronics, including knowledge necessary for understanding the operating principles of electric drives, basic electronic circuits, and modern computers.

P6S_WG: at an advanced level – selected facts, objects and phenomena, and the methods and theories explaining complex relationships between them, constituting the basic general knowledge from scientific or artistic disciplines forming the theoretical foundations, and selected issues of specialist knowledge – relevant to the study programme

18	K_W18	Has detailed knowledge of the construction, operating principles, and application areas of electric drives and electronic circuits in mechatronics, including knowledge of power, microprocessor, switching, and protection circuits, data transmission, and A/D and D/A conversion.	
19	K_W19	Has detailed knowledge of programming and artificial intelligence, including knowledge necessary for programming simple control systems.	
20	K_W20	Has detailed knowledge of computer system and network architecture and operating systems, including knowledge necessary for: installing, operating, and maintaining IT tools used for simulation and design of mechatronic elements, systems, and management of IT components; configuring network devices in local networks; knows communication protocols used in distributed control and manufacturing systems.	
21	K_W21	Has detailed knowledge of metrology; knows and understands methods of measuring and determining the basic quantities characterising mechanical, electrical, and electronic elements and systems; knows the computational methods and IT tools necessary for analysing experimental results.	
22	K_W22	Has detailed knowledge of the construction, operation, and use of interfaces of basic measuring instruments and systems, including knowledge of virtual measuring instrument programming.	
23	K_W23	Has detailed knowledge necessary for understanding the non-technical conditions of engineering activity; knows the basic health and safety rules applicable in industry.	P6S_WK: fundamental dilemmas of modern civilisation
24	K_W24	Has detailed knowledge of intellectual property protection and patent law.	P6S_WG: basic economic, legal, ethical and other conditions of various types of professional activity related to the study programme, including basic concepts and principles of industrial property protection and copyright law, basic principles of creating and developing various forms of entrepreneurship
25	K_W25	Has general knowledge of management, including quality management and running a business; knows the general principles of creating and developing forms of individual entrepreneurship.	
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Skills			
1	K_U01	Is able to use catalogues and databases of structural material properties, perform basic calculations of the effect of material structure or composition on its properties, and select an appropriate material for a designed structure.	
2	K_U02	Is able to apply acquired mathematical methods and models, as well as computer simulations, to analyse and evaluate the operation of automation and control elements and their simple systems.	

3	K_U03	Is able to design, implement, and commission basic elements and simple control and automation systems (regulation, supervision, protection), evaluate their functionality and suitability for production processes and for assessing the condition of machines and devices.
4	K_U04	Is able to formulate an operational specification for elements and simple mechatronic systems.
5	K_U05	Is able to design simple mechatronic systems intended for various applications, including defining the structural and technical requirements for their implementation.
6	K_U06	Is able to use data sheets and application notes to select appropriate components for a designed mechatronic system.
7	K_U07	Is able to apply acquired concepts, principles, methods, and mathematical models, as well as computer simulations, to analyse and evaluate the state and operation of a simple mechanical system.
8	K_U08	Is able to simulate the deformation and stress state of simple structural elements and assess their strength.
9	K_U09	Has skills in using computer-aided design tools for simulation, design, and the creation of technical documentation.
10	K_U10	Is able to plan the implementation process of a simple mechatronic system and make a preliminary cost estimate.
11	K_U11	Is able to design, build, commission, and test a simple mechatronic system containing automation and control elements.
12	K_U12	Is able to examine a mechatronic system through diagnostics, monitoring, and condition forecasting, and to supervise its operation process.
13	K_U13	Is able to select an appropriate type of electric, hydraulic, or pneumatic drive for selected applications, taking into account its advantages, disadvantages, and purchase and operating costs.
14	K_U14	Is able to assess the suitability of selected types of material processing methods, including subtractive, surface, and plastic forming, as well as joining and hardfacing.
15	K_U15	Is able to write programs for turning and milling processes on numerically controlled machine tools, simulate the machining process on a simulator, and generate code for a selected numerical machine tool.
16	K_U16	Is able to design a technological manufacturing process for simple machine parts, and select appropriate technologies for shaping their form, structure, and properties.
17	K_U17	Is able to analyse simple electrical circuits and determine the limitations resulting from the type of components used and the voltages applied.
18	K_U18	Is able to design and commission a simple microprocessor system together with the control software.
19	K_U19	Is able to use data sheets and application notes to select appropriate components for a designed electronic circuit.
20	K_U20	Is able to configure communication devices in local (wired and wireless) telecommunications networks and communication interfaces of control devices in a mechatronic system.

P6S_UW: apply possessed knowledge – formulate and solve complex and atypical problems and perform tasks in not fully predictable conditions by:

- appropriate selection of sources and information derived from them, evaluation, critical analysis and synthesis of this information,
- selection and application of appropriate methods and tools, including advanced information and communication techniques

21	K_U21	Is able to formulate an algorithm; uses high-level programming languages and appropriate IT tools to develop computer programs controlling mechatronic systems.	
22	K_U22	Is able to use an ERP-class system for planning and managing the production process, including the execution of production orders and analysis of production capacity.	
23	K_U23	Is able to use appropriately selected methods, instruments, and devices for measuring basic electrical and geometric quantities characterising mechanical, electrical, and electronic elements and systems; is able to record and process measurement signals, perform data processing and visualisation, and develop virtual measuring instrument software.	
24	K_U24	Identifies hazards in the technical and industrial environment and applies appropriate protective measures and safety regulations applicable in professional engineering activity.	
25	K_U25	Is able to acquire information from literature, databases, and other sources; is able to integrate the obtained information, interpret it, draw conclusions, and formulate and justify opinions.	P6S_UK: communicate with the environment using specialist terminology participate in debate – present and evaluate different opinions and positions and discuss them
26	K_U26	Has skills in oral and written presentation of own work results and literature data; is able to formulate a plan, write a paper, use technical language, and has the ability to produce drawings, diagrams, tables, etc.	
27	K_U27	Is able to prepare and deliver a short presentation on the results of an engineering task.	
28	K_U28	Is able to work individually and in a team; can estimate the time needed to complete an assigned task; is able to develop and implement a work schedule ensuring deadlines are met, and perform a preliminary economic analysis of the actions undertaken.	P6S_UO: plan and organise individual and team work cooperate with others in the context of team activities (also of an interdisciplinary nature)
29	K_U29	Plans own professional development and is able to use various forms of continuing education, including technical literature, specialist courses, and digital learning tools.	P6S_UU: independently plan and implement lifelong learning and guide others in this regard
30	K_U30	Uses the English language to a sufficient degree to communicate, and also to read with understanding data sheets, application notes, device and IT tool manuals, and other similar documents.	P6S_UK: use a foreign language at B2 level of the Common European Framework of Reference for Languages
Σ			
Social competences			

1	K_K01	Understands the need for and knows the possibilities of continuous professional development, improving professional, personal, and social competences.	P6S_KK: critical evaluation of possessed knowledge and received content
2	K_K02	Is aware of the importance and understands the non-technical aspects and effects of the activity of a mechatronics engineer, including its impact on the environment, and the associated responsibility for decisions made,	P6S_KK: recognising the importance of knowledge in solving cognitive and practical problems, and seeking expert opinion when having difficulty solving a problem independently,
3	K_K03	Is aware of the responsibility for own work and is willing to comply with team work principles and bear responsibility for jointly performed tasks,	P6S_KO: fulfilling social obligations, co-organising activities for the social environment, initiating actions in the public interest
4	K_K04	Is aware of the importance of behaving professionally, adhering to the principles of professional ethics, and respecting diversity of views and cultures.	P6S_KR: responsible performance of professional roles, including: <ul style="list-style-type: none"> • Adhering to professional ethics and requiring this of others, • Caring for the achievements and traditions of the profession
5	K_K05	Is able to think and act entrepreneurially, including identifying market opportunities, taking professional initiatives, and making a preliminary economic assessment of engineering actions undertaken.	P6S_KO: thinking and acting entrepreneurially
6	K_K06	Is aware of the social role of a technical university graduate, and in particular understands the need to formulate and communicate to society – including through the mass media – information and opinions on the achievements of mechatronics and other aspects of engineering activity; makes efforts to communicate such information and opinions in a generally understandable manner.	
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The learning outcomes for the programme were developed on the basis of the Regulation of the Minister of Science and Higher Education on the second-level characteristics of learning outcomes for qualifications at levels 6–8 of the Polish Qualifications Framework of 14 November 2018 (Journal of Laws of 2018, item 2218)

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date and signature
Deputy Rector for Education

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data i podpis
Dean / Institute Director

The outcome symbol consists of:

- letter K – to indicate that these are programme-level outcomes,
- the character _ (underscore),
- one of the letters W, U or K – to indicate the category of outcomes (W – knowledge, U – skills, K – social competences),
- the number of the outcome within a given category, written as two digits (numbers from 1 to 9 must be preceded by 0).

In the column referring to the second-level characteristics of learning outcomes, the codes of description components of learning outcomes taken from the description of learning outcomes should be indicated, in accordance with the Act on the Integrated Qualifications System and the Regulation of the Minister of Science and Higher Education on the second-level characteristics of learning outcomes for qualifications at levels 6–8 of the Polish Qualifications Framework of 14 November 2018 (Journal of Laws of 2018, item 2218). The description component codes appearing in the characteristics consist of the following elements:

- one letter P – to denote the word level;
- one of the digits 6, 7, 8 – to indicate the level number (6 – sixth, 7 – seventh, 8 – eighth);
- one letter S – to denote the word studies;
- the character _ (underscore),
- one of the letters W, U or K – to indicate the category of outcomes (W – knowledge, U – skills, K – social competences),
- jedna z liter:
 - G – occurring in the knowledge category, which defines the scope and depth/completeness of the cognitive perspective and relationships,
 - K – occurring in the knowledge category, which defines the context/conditions, effects,
 - W – occurring in the skills category, which defines the use of knowledge/problems solved and tasks performed,
 - K – occurring in the skills category, which defines communication/receiving and creating statements, disseminating knowledge in the scientific environment and using a foreign language,
 - O – occurring in the skills category, which defines work organisation/planning and teamwork,
 - U – occurring in the skills category, which defines learning/planning own development and the development of others,
 - K – occurring in the social competences category, which defines assessment/critical approach,
 - O – occurring in the social competences category, which defines responsibility/fulfilment of social obligations and action in the public interest,
 - R – occurring in the social competences category, which defines the professional role/independence and ethos development.