

**Learning outcomes of the programme:**

|    |                                |  |
|----|--------------------------------|--|
| 1. | Field of study                 | <b>Mechatronics</b>                              |
| 2. | Academic year of entry         | 2017/2018 (winter term), 2018/2019 (winter term) |
| 3. | Level of qualifications/degree | first-cycle studies (in engineering)             |
| 4. | Degree profile                 | general academic                                 |

| Code of the learning outcome of the programme | Learning outcomes<br>The graduate:  | Codes of the learning outcomes of the areas of education to which the learning outcome of the programme is related |
|---|---|--|
| <b>KNOWLEDGE</b>                              |   |  |
| K_W01   | has knowledge in a scope of mathematics, including algebra, an analysis, a theory of probability and elements of discrete and applied mathematics, with mathematical and numerical methods, needed to formulate and solve simple problems connected with designing, making and operating of objects, equipment, systems or processes typical for mechatronics | T1A_W01  |
| K_W02   | has knowledge in a scope of physics, including mechanics, thermodynamics, optics, electricity and magnetism, nuclear physics and solid-state physics, with knowledge needed to understand basic physical phenomena present in the elements and systems of mechatronics and in their environment.  | T1A_W01  |
| K_W03   | has basic knowledge in a scope of chemistry needed to understand phenomena and processes present at making of mechatronic elements, operating of mechatronic equipment  | T1A_W01  |
| K_W04   | understands chemical changes and their importance for making and shaping properties of engineering materials  | T1A_W01, T1A_W02   |
| K_W07   | has knowledge in a scope of mechanics which allows solving technical problems connected with designing, constructing and operating of mechatronic equipment   | T1A_W02, T1A_W03   |
| K_W09   | has basic knowledge in a scope of technical thermodynamics required to understand a structure and operating of mechatronic equipment  | T1A_W02  |
| K_W11   | has ordered theoretically founded general knowledge needed to make visualizations used in science and technology  | T1A_W03, T1A_W04   |
| K_W16   | is knowledgeable in the present state and most modern development trends in the field of mechatronics   | T1A_W05  |
| K_W19   | knows and understands basic concepts and principles in a scope of protection of industrial and intellectual property, he/she can use patent information resources   | T1A_W10  |
| K_W21   | knows general principles of making and developing forms of individual entrepreneurship, using knowledge from the field of mechatronics  | T1A_W11  |
| <b>SKILLS</b>                                 |   |  |
| K_U01   | can obtain information from literature, databases and other sources; he/she can integrate the obtained information, make its interpretation, and also draw conclusions and formulate and justify his/her opinions   | T1A_U01  |
| K_U02   | can work individually and in a team; he/she can estimate time needed to perform the task ordered; he/she can develop and implement work schedule providing meeting deadlines  | T1A_U02  |
| K_U03   | can draw up documentation on an implementation of an engineering task in the Polish and a foreign language and prepare the text containing a discussion of the results of the implementation of this task   | T1A_U03, T1A_U06   |
| K_U04   | can prepare and give an oral presentation in the Polish language and a foreign language devoted to the results of the engineering task implementation   | T1A_U03, T1A_U04   |
| K_U05   | can use different types of computer technologies to present visualizations of stages of the engineering task implementation   | T1A_U03, T1A_U04   |
| K_U06   | uses English in a sufficient degree to communicate, and also to read and understand index cards, application notes, manuals of mechatronic equipment and IT tools and similar documents   | T1A_U01, T1A_U06   |
| K_U07   | has the ability of self-education   | T1A_U05  |
| K_U08   | can make a mathematical description of phenomena; he/she can formulate mathematical models and their solutions  | T1A_U07, T1A_U08, T1A_U09  |
| K_U09   | can make a measurement of basis physical quantities, an analysis of physical phenomena and he/she can solve problems on basis of the laws of physics in the technology  | T1A_U07, T1A_U08, T1A_U09  |
| K_U10   | has an ability of understanding chemical changes and their importance for industrial processes  | T1A_U07, T1A_U08, T1A_U09  |
| K_U11   | can use information and communication technologies appropriate for an implementation of the tasks in a scope of designing, making and operating of mechatronic equipment  | T1A_U07  |

|                           |   |                  |
|---------------------------|---|------------------|
| K_U19                     | is prepared to work in the industrial environment and he/she knows safety rules connected with this work  | T1A_U11          |
| K_U25                     | can — in accordance with the specifications set— design and make the simple mechatronic equipment, object, system, using proper methods, technologies and tools   | T1A_U16          |
| <b>SOCIAL COMPETENCES</b> |   |                  |
| K_K01                     | understands and knows possibilities of continuing education (the studies of the second and third degree, post-graduate studies, courses) — improving professional, personal and social competences  | T1A_K01          |
| K_K03                     | is aware of importance of professional conduct, compliance with the principles of the professional ethics and respecting a diversity of views and cultur  | T1A_K05          |
| K_K04                     | is aware of responsibility for his/her own work and he/she is ready to comply with the rules of teamwork and to be responsible for the task performed jointly; he/she can determine properly priorities for the task specified by himself/herself or others   | T1A_K03, T1A_K04 |
| K_K06                     | is aware of a social role of a graduate of a technical university, in particular he/she understands a need for formulating and conveying to the public— among other things by the mass media - information and opinions on achievements of mechatronics and other aspects of activities of an engineer of mechatronics; he/she makes efforts to convey such information and opinions in a commonly understood way | T1A_K07          |

| Code of the learning outcome of the programme | <b>Learning outcomes leading to the acquisition of engineering competences</b><br>The graduate:   | Codes of the learning outcomes of the areas of education to which the learning outcome of the programme is related |
|---|---|--|
| <b>KNOWLEDGE</b>                              |   |  |
| K_W05   | has knowledge on basic engineering materials and manufacturing technologies and changes in their applied properties   | InzA_W02, T1A_W02, T1A_W07   |
| K_W06   | has knowledge in a scope of automatic control engineering and robotics with a control theory which allows solving engineering tasks connected with designing, making, constructing and operating of mechatronic equipment   | InzA_W05, T1A_W02, T1A_W03   |
| K_W08   | has knowledge in a scope of the architecture of systems and computer networks and operating systems   | InzA_W02, T1A_W02, T1A_W07   |
| K_W10   | has knowledge on electrical engineering and electronics which allows solving engineering tasks connected with designing, making, constructing and operating of mechatronic equipment  | InzA_W05, T1A_W03, T1A_W04   |
| K_W12   | has ordered and theoretically founded knowledge in a scope of mechanical engineering and operating  | InzA_W05, T1A_W03, T1A_W04   |
| K_W13   | has knowledge in a scope of metrology, he/she knows and understands methods of measurement and extraction of base quantities characterizing elements and mechatronic systems of different types, he/she knows computing methods and IT tools needed to analyze experiment results | InzA_W02, T1A_W03, T1A_W04, T1A_W07  |
| K_W14   | knows and understands processes of constructing and making of elements and simple mechatronic equipment   | InzA_W02, T1A_W04, T1A_W07   |
| K_W15   | knows and understands methodology of designing of mechatronic elements, mechatronic systems, and also methods, technologies and tools used in designing   | InzA_W02, T1A_W03, T1A_W04, T1A_W07  |
| K_W17   | has basic knowledge on a lifecycle of mechatronic equipment, objects and systems  | InzA_W01, T1A_W06  |
| K_W18   | has general knowledge needed to understand social, economic, legal and other non-technical conditions of engineering activities   | InzA_W03, T1A_W08  |
| K_W20   | has elementary knowledge in a scope of management, including quality management and conducting a business activity  | InzA_W04, T1A_W09  |
| <b>SKILLS</b>                                 |   |  |
| K_U12   | can use known methods and mathematical models, and also computer simulations to analyze and evaluate of operating of elements and mechatronic systems   | InzA_U01, InzA_U02, T1A_U08, T1A_U09   |
| K_U13   | can analyze mechatronic systems using appropriate hardware and software tools   | InzA_U01, InzA_U02, T1A_U08, T1A_U09   |
| K_U14   | can compare design solutions of mechatronic elements and systems considering the given applied and economic criteria  | InzA_U02, T1A_U09, T1A_U12   |
| K_U15   | can uses properly selected programming environments, simulators and computer aided design tools for simulation, designing and verification of mechatronic elements and systems  | InzA_U01, InzA_U02, T1A_U07, T1A_U08, T1A_U09  |
| K_U16   | can use properly selected methods and equipment which enable to measure base quantities characterizing elements and mechatronic systems   | InzA_U01, InzA_U02, T1A_U08, T1A_U09   |

|                           |  |                                      |
|---------------------------|--|--------------------------------------|
| K_U17                     | can plan and make a simulation and measurements of characteristics, and also extraction of basic parameters characterizing materials, elements and mechatronic systems; he/she can present the obtained results in a numerical and graphic form, make their interpretation and draw proper conclusions | InzA_U01, T1A_U07, T1A_U08           |
| K_U18                     | can — while formulating and solving tasks including designing of mechatronic elements and systems – notice their non-technical aspects, including environmental, economic and legal ones   | InzA_U03, T1A_U10                    |
| K_U20                     | can make a preliminary economic analysis of engineering activities undertaken  | InzA_U04, T1A_U12                    |
| K_U21                     | can design testing processes of simple elements and mechatronic systems — in case of finding irregularities – make their diagnosis   | InzA_U01, InzA_U05, T1A_U08, T1A_U13 |
| K_U22                     | can identify and formulate specificity of simple engineering tasks of a practical character , specific for mechatronics  | InzA_U06, T1A_U14                    |
| K_U23                     | can evaluate usefulness of routine methods and tools for solving simple engineering tasks, typical for mechatronics and select and use proper methods and tools  | InzA_U07, T1A_U15                    |
| K_U24                     | can design mechatronic elements and systems considering the applied and economic criteria set, using proper methods, technologies and tools  | InzA_U04, InzA_U08, T1A_U12, T1A_U16 |
| K_U26                     | can plan a process of implementation of an element or simple mechatronic equipment   | InzA_U04, InzA_U08, T1A_U12, T1A_U16 |
| <b>SOCIAL COMPETENCES</b> |  |                                      |
| K_K02                     | is aware of importance and he/she understands non-technical aspects and effects of activities of an engineer of mechatronics, including their impact on the environment, and responsibilities for the decisions undertaken connected with them   | InzA_K01, T1A_K02                    |
| K_K05                     | can think and act in an enterprising way   | InzA_K02, T1A_K06                    |