

Zarządzenie nr 123

Rektora Zachodniopomorskiego Uniwersytetu Technologicznego w Szczecinie

z dnia 30 października 2023 r.

**w sprawie opisów efektów uczenia się w tłumaczeniu na język angielski
dla kierunków studiów prowadzonych na Wydziale Inżynierii Mechanicznej i Mechatroniki**

Na podstawie art. 23 ustawy z dnia 20 lipca 2018 r. Prawo o szkolnictwie wyższym i nauce (tekst jedn. Dz. U. z 2023 r. poz. 742, z późn. zm.) w związku z § 3 ust. 7 zarządzenia nr 64 Rektora ZUT z dnia 1 października 2019 r. w sprawie zasad sporządzania i wydawania dyplomów ukończenia studiów i suplementów do dyplomu (z późn. zm.) zarządza się, co następuje:

§ 1.

1. W celu wydania na wniosek absolwenta odpisu suplementu do dyplomu w tłumaczeniu na język angielski wprowadza się – uchwalone przez Senat – opisy efektów uczenia się w tłumaczeniu na język angielski dla kierunków studiów prowadzonych na Wydziale Inżynierii Mechanicznej i Mechatroniki.
2. Opis efektów uczenia się w tłumaczeniu na język angielski dla poszczególnych kierunków studiów stanowi integralną część odpisu suplementu do dyplomu.

§ 2.

Opisy efektów w tłumaczeniu na język angielski w wydawanych odpisach suplementów do dyplomu dla kierunków studiów rozpoczynających się:

- 1) od roku akademickiego 2019/2020:
 - a) energetyka, studia pierwszego stopnia – stanowi załącznik nr 1,
 - b) energetyka, studia drugiego stopnia – stanowi załącznik nr 2,
 - c) inżynieria materiałowa, studia pierwszego stopnia – stanowi załącznik nr 3,
 - d) inżynieria materiałowa, studia drugiego stopnia – stanowi załącznik nr 4,
 - e) inżynieria pojazdów bojowych i specjalnych, studia pierwszego stopnia – stanowi załącznik nr 5,
 - f) inżynieria produkcji w przemyśle 4.0, studia pierwszego stopnia – stanowi załącznik nr 6,
 - g) mechanika i budowa maszyn, studia pierwszego stopnia – stanowi załącznik nr 7,
 - h) mechanika i budowa maszyn, studia drugiego stopnia – stanowi załącznik nr 8,
 - i) mechatronika, studia pierwszego stopnia – stanowi załącznik nr 9,
 - j) inżynieria transportu, studia pierwszego stopnia – stanowi załącznik nr 10,
 - k) inżynieria transportu, studia drugiego stopnia – stanowi załącznik nr 11,
 - l) zarządzanie i inżynieria produkcji, studia pierwszego stopnia – stanowi załącznik nr 12,
 - m) zarządzanie i inżynieria produkcji, studia drugiego stopnia – stanowi załącznik nr 13;

2) od roku akademickiego 2022/2023 – energetyka studia drugiego stopnia – stanowi załącznik nr 14.

§ 3.

W zarządzeniu nr 94 Rektora Zachodniopomorskiego Uniwersytetu Technologicznego w Szczecinie z dnia 6 listopada 2019 r. w sprawie opisu efektów uczenia się w tłumaczeniu na język angielski dla poszczególnych kierunków studiów prowadzonych w ZUT (z późn. zm.) uchyla się w §1 pkt 6 oraz załącznik nr 6 – Kierunki Wydziału Inżynierii Mechanicznej i Mechatroniki.

§ 4.

Zarządzenie wchodzi w życie z dniem podpisania.

W zastępstwie Rektora

prof. dr hab. inż. Jacek Przepiórski
prorektor ds. nauki

Programme of studies: *power engineering*

Level of qualification: first cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (85%), environmental engineering, mining and energy (15%)

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
ENE_1A_W01	Knows basic numerical methods and procedures and issues concerning programming and possibilities of numerical calculations
ENE_1A_W02	Has knowledge of mathematics at a higher level necessary for quantitative description and analysis of problems and for solving simple problems in the scope of studied programme of studies
ENE_1A_W03	Has elementary knowledge of the law concerning power industry, intellectual ownership protection, patent law, and basic principles of industrial safety regulations
ENE_1A_W04	Knows principles and tools of engineering graphics allowing solving technical problems concerning power industry
ENE_1A_W05	Knows principles of mechanics, joining techniques, strength testing methods, methods of design calculations of selected basic mechanical structures
ENE_1A_W06	Knows structure and working principle of basic parts of machines and mechanical assemblies as well as hydraulic and pneumatic units
ENE_1A_W07	Knows structure and principle of use of power machines and devices and principles of selection of construction and consumable materials
ENE_1A_W08	Knows basic issues of electrical technology, electronics and functioning of electrical machines
ENE_1A_W09	Knows methods of establishing basic thermal and electrical parameters
ENE_1A_W10	Knows methods of statistical processing of measurement and research results
ENE_1A_W11	Knows methods of linear analysis of dynamic systems and basic structures of control systems
ENE_1A_W12	Knows problems relating to electric power transmission
ENE_1A_W13	Has knowledge of phenomenological and mathematical description of momentum, heat, and mass exchange processes
ENE_1A_W14	Knows basic laws of fluid mechanics in application to power machines and devices
ENE_1A_W15	Knows the basics of technical thermodynamics and laws of heat and mass transfer in application to power machines and devices
ENE_1A_W16	Knows the basics of design, construction and use of power stations, units and systems
ENE_1A_W17	Knows structure and working principle of basic devices of conventional power industry (steam boilers, steam and gas turbines, compressors and ventilators, pumps, pipelines, auxiliary devices, etc.)

Code	Learning outcomes for programme of studies
ENE_1A_W18	Knows selection methods of basic power devices
ENE_1A_W19	Knows methodology of power assessment of technological processes
ENE_1A_W20	Knows sources and principles of waste energy use
ENE_1A_W21	Knows principles of rational use of basic power devices in various branches of national economy
ENE_1A_W22	Knows basic methods of use of recyclable energy resources
ENE_1A_W23	Knows principles and practically used technologies in environmental protection relating to energy processes
ENE_1A_W24	Knows principles of power market operation of power companies functioning
ENE_1A_W25	Knows principles of power and environment management
ENE_1A_W26	Has basic knowledge of nuclear power industry
ENE_1A_W27	Knows latest directions of power industry development
ENE_1A_W28	Knows combustion technologies
ENE_1A_W29	Has basic knowledge necessary to use humanistic sources supplementing technical education
ENE_1A_W30	Has knowledge of physics encompassing mechanics, thermodynamics, solid-state physics, electricity, and magnetism including knowledge necessary to understand basic physical phenomena occurring in power industry
ENE_1A_W31	Knows methods of using professional literature and ways of communication
Skills	
ENE_1A_U01	Can use theoretical laws and experimental methods in analysis of various physical and chemical processes
ENE_1A_U02	Can solve practical engineering issues, in particular concerning power industry, described with mathematical methods, using analytical and numerical methods
ENE_1A_U03	Can use methods of statistical mathematics to assess accuracy of measurements and research
ENE_1A_U04	Can model simple mechanical, hydraulic and pneumatic systems by performing analysis of their operation and using engineering graphics tools
ENE_1A_U05	Can calculate and design simple mechanical elements and structures and simple hydraulic and pneumatic installations, particularly those used in power industry
ENE_1A_U06	Can select construction and consumable materials and joining techniques for a device working conditions or a power system
ENE_1A_U07	Can select typical parts of machines used in power industry and determine their properties
ENE_1A_U08	Can practically use laws of thermodynamics, heat and mass transfer and liquid mechanics for description of industrial processes
ENE_1A_U09	Can analyse thermal diagrams and characteristic parameters of work of power devices and systems
ENE_1A_U10	Can select in designing process power devices used in industry
ENE_1A_U11	Can solve simple issues concerning electrical engineering, electronics, and electrical power engineering
ENE_1A_U12	Can select methods of adjusting and control of simple power systems
ENE_1A_U13	Can assess influence of a device or power system use on environment

Code	Learning outcomes for programme of studies
ENE_1A_U14	Can select instruments, control and measuring equipment, and measurement method of characteristic parameters of work of power device or system
ENE_1A_U15	Can calculate emission of substances produced in power processes
ENE_1A_U16	Can prepare and perform research allowing to determine parameters and indexes characterising power process
ENE_1A_U17	Can determine power indexes for basic power machines and devices as well as power consumption and natural resources rates
ENE_1A_U18	Can analyse influence of selected parameters of a process on its power efficiency
ENE_1A_U19	Can perform economic analysis of various technological solutions concerning power industry
ENE_1A_U20	Can prepare and present design of power device, process, or system
ENE_1A_U21	Can use literature, databases, and other sources; can integrate received information, interpret it, as well as draw conclusions and formulate and justify opinions
ENE_1A_U22	Can use and uses industrial safety principles
ENE_1A_U23	Has skills in a foreign language at B2 level of the Common European Framework of Reference of Council of European, uses professional language concerning the programme of studies
ENE_1A_U24	Can analyse and use legal regulations
ENE_1A_U25	Has a skill of self-education, also for the purpose of qualifications improvement
ENE_1A_U26	Can work individually and in team, can prepare and carry out schedule of work ensuring punctual completion of engineering order in power industry, can communicate in professional and extraprofessional circles using various techniques
ENE_1A_U27	Can draw up documentation concerning completion of engineering task in power industry and prepare presentation of its outcomes
ENE_1A_U28	Can use information and communication techniques appropriate for carrying out tasks typical for engineering activities
Social competences	
ENE_1A_K01	Understands need of lifelong learning – improving professional and competences
ENE_1A_K02	Has awareness of significance of extra-technological aspects and results of engineering activities; including its influence on environment and connected with that responsible for made decisions
ENE_1A_K03	Has awareness of need of acting in professional way and observing principles of professional ethics
ENE_1A_K04	Has awareness of responsibility for mutually completed tasks connected with team work
ENE_1A_K05	Can think and act in entrepreneurial manner
ENE_1A_K06	Understands need of transfer to society - for example via mass media - of information about achievements of technology and other aspects of engineer's activity and can transfers this information in commonly understood manner
ENE_1A_K07	Has awareness of interdisciplinary character of science and technology
ENE_1A_K08	Has habits of healthy life-style
ENE_1A_K09	Has competences in creating attitudes of patriotism, humanism and tolerance, openness and co-operation in multicultural environments

Programme of studies: *power engineering*

Level of qualification: second cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (85%), environmental engineering, mining and energy (15%)

Name of qualification (Title conferred): magister inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
ENE_2A_W01	Has extended and in-depth knowledge of mathematics including: elements of applied mathematics, infinitesimal calculus and methods of optimisation, including numerical methods necessary for: 1) Description and analysis power systems operation description and analysis; 2) Mathematical description of the course of physical and chemical processes, including electrochemical ones, and power processes
ENE_2A_W02	Has extended knowledge of physics, including fundamental quantum and nuclear physics, including knowledge necessary to understand physical processes and phenomena occurring in complex electric power systems
ENE_2A_W03	Has detailed knowledge of principles of building, modelling, designing and using electric power components and systems
ENE_2A_W04	Has extended knowledge of electric power metrology and modern measurement systems, in particular in respect of selecting devices and analysis of measurement uncertainty
ENE_2A_W05	Has knowledge of electric power systems used for improving electric power quality and transmission
ENE_2A_W06	Has extended knowledge of mechanical systems modelling, strength analysis of basic mechanical structures
ENE_2A_W07	Has extended and systematic knowledge of hydromechanics, thermodynamics and heat transfer
ENE_2A_W08	Has systematic and based on theory knowledge of computer aided calculations and making decisions in power industry
ENE_2A_W09	Has systematic knowledge of: management of supply and demand of power for processes and plants, as well as of power industry law and power efficiency
ENE_2A_W10	Has extended and systematic knowledge of conventional and unconventional power industry, including renewable sources and nuclear power industry
ENE_2A_W11	Has knowledge of development trends in generation sources operation in an electric power system, including scattered generation and storing power.
ENE_2A_W12	Has extended knowledge of waste management, exhaust fumes treatment, influence of power industry processes on environment
ENE_2A_W13	Has basic knowledge of materials used in power industry, life cycles of power devices and systems

Code	Learning outcomes for programme of studies
ENE_2A_W14	Has elementary knowledge of management, including quality management, conducting business and principles of creating and development of individual entrepreneurship
ENE_2A_W15	Has basic knowledge of intellectual property protection and patent law
Skills	
ENE_2A_U01	Can obtain information from literature, databases and other sources, also in a foreign language, in the field of power industry, can integrate obtained information, interpret and critically assess it, and also draw conclusions and justify opinions
ENE_2A_U02	Can work individually and in a team; can estimate time needed for a task; can lead a small team in a manner ensuring completion of the task in expected time
ENE_2A_U03	Can draw up documentation concerning a technical task completion and prepare a text containing a discussion of the task completion results
ENE_2A_U04	Can prepare and present a presentation on a project or research task completion and make a discussion concerning the presentation
ENE_2A_U05	Uses a foreign language in a sufficient degree to communicate, also in professional matters, for reading with understanding professional literature and for preparation and giving a short presentation on a project or research task completion
ENE_2A_U06	Has a skill of self-education, also for improving professional competences
ENE_2A_U07	Can use learnt mathematical methods and models – modifying them if there is a need – to analyse and design power systems and grids
ENE_2A_U08	Can plan and make an experiment, including computer measurements and simulations, concerning elements and the whole power system and can interpret obtained results
ENE_2A_U09	Can select a calculation method, use appropriate software to solve a given problem taking into consideration new developments in technology
ENE_2A_U10	Can assess usefulness of methods and tools used in measurements, diagnostics and aiding decisions related to power processes
ENE_2A_U11	Is prepared to work in industrial environment and knows principles of industrial safety
ENE_2A_U12	Can make an economic analysis concerning projects in power industry
ENE_2A_U13	Can make a critical analysis and assessment of power technology, suggest an improvement of existing technical solutions
Social competences	
ENE_2A_K01	Can think and act in a creative and entrepreneurial manner, understands the need to transfer to society information and opinions concerning achievements of power industry and related industries
ENE_2A_K02	Identifies and solves dilemmas relating to national power security
ENE_2A_K03	Is aware of significance and understands extra-technological aspects and outcomes of using various power technologies, including their influence on environment and resulting responsibility for decisions made
ENE_2A_K04	Understands the need of life-long learning and improving professional competences and can inspire other persons to learn
ENE_2A_K05	Can co-operate and work in a group, adopting various roles in it, and can set forth appropriate priorities for the completion if a task set forth by themselves or other people

Programme of studies: *materials engineering***Level of qualification:** first cycle studies**Educational profile:** general academic**Fields of science:** Engineering and technology**Discipline of science:** materials engineering (60%), mechanical engineering (40%)**Name of qualification (Title conferred):** inżynier**Description of the planned educational effects**

Code	Learning outcomes for programme of studies
Knowledge	
IM_1A_W01	Has knowledge of mathematics encompassing algebra, analysis, elements of discrete and applied mathematics, including mathematical and numerical methods, as well as statistics, necessary for: 1) Description of basic physical and chemical phenomena 2) Compilation of test results and error analysis 3) Modelling simple physical and chemical phenomena occurring in materials and processes
IM_1A_W02	Has knowledge of physics encompassing mechanics, thermodynamics, optics, electricity, and magnetism, nuclear physics and solid-state physics related to materials and their characterising and materials technologies
IM_1A_W03	Has knowledge of chemistry encompassing: 1) Structure of matter 2) State of matter 3) Elements of chemical thermodynamics 4) Statics and kinetics of chemical reactions 5) Basics of electrochemistry and organic chemistry necessary to understand hierarchical structure and their materials properties and understand mutual influence of material and environment
IM_1A_W04	Has knowledge of fundamentals of materials science encompassing: 1) Structure of materials 2) Physical changes and phase transitions 3) Phase balance systems necessary to understand process of creating material morphology

Code	Learning outcomes for programme of studies
IM_1A_W05	Has knowledge of mechanics and strength of materials encompassing: <ol style="list-style-type: none"> 1) Statics, kinematics and dynamics 2) stresses, deformations, and displacements 3) Strength hypotheses and mechanisms of cracking necessary to understand strength of construction materials
IM_1A_W06	Has knowledge of fundamentals of machines structure encompassing: <ol style="list-style-type: none"> 1) Construction of basic mechanical joints 2) Fundamentals of engineering calculations of structure elements and their recording necessary to design basic structure elements
IM_1A_W07	Has knowledge of electrical engineering encompassing: <ol style="list-style-type: none"> 1) Structure of basic electrical and electronic systems 2) Electrical measurements necessary to understand functioning of electrical systems and methods of measuring of basic electrical quantities
IM_1A_W08	Has knowledge of computer science encompassing knowledge of basic consumer and engineering software necessary to perform basic mathematical and engineering calculations and processing data as well as creating engineering documentation
IM_1A_W09	Has knowledge necessary to understand technological processes of shaping materials structure and properties and forming products by: <ul style="list-style-type: none"> - metallurgy and founding - plastic working - thermal bonding and cutting - removal machining - surface layers technology - thermal working - powder metallurgy - plastics processing - composite production technology - utilisation
IM_1A_W10	Has knowledge of structure and functioning of technological devices and tooling necessary to appropriate selection of conditions for technological processes implementation

Code	Learning outcomes for programme of studies
IM_1A_W11	Has knowledge of chemical structure and morphology of: - metallic - ceramic - polymeric - composite materials, necessary to understand materials properties
IM_1A_W12	Has knowledge of materials physicochemical, mechanical, and operating properties necessary to select materials to specific products taking into consideration their full life cycle
IM_1A_W13	Has knowledge of basic methods of characterising materials chemical structure and morphology necessary to select methods for characterising materials
IM_1A_W14	Has knowledge of basic methods of studying physicochemical, mechanical and operating properties and of methods of geometry measurement necessary to select those methods of products characterising before, during and after operating process
IM_1A_W15	Has elementary knowledge of life cycle of technological devices and tooling
IM_1A_W16	Has basic knowledge necessary for work in industrial environment, understanding extra-technological factors of engineering activities; knows basic principles of work safety
IM_1A_W17	Has elementary knowledge of intellectual property protection and patent law
IM_1A_W18	Has elementary knowledge of management, including quality management and conducting business activities
IM_1A_W19	Knows general principles of creating and development of forms of individual business
Skills	
IM_1A_U01	Can acquire information from literature, databases and other sources; also in a foreign language; can integrate obtained information, interpret them, draw conclusions and formulate and justify opinions
IM_1A_U02	Can work individually and in team; can estimate time needed to complete commissioned task; can prepare and carry out work schedule ensuring keeping deadlines
IM_1A_U03	Can prepare documentation concerning completion of engineering task and prepare text containing discussion on the task completion
IM_1A_U04	Can prepare and present short presentation on results of engineering task completion
IM_1A_U05	Uses English at sufficient level to communicate, as well understand catalogue cards, application notes, operation manuals for devices used in materials engineering and computer tools, and similar documents
IM_1A_U06	Has ability to self-education, for example to improve professional qualifications
IM_1A_U07	Can use learned mathematical methods and models, and computer simulations, for analysis and assessment of materials structure and properties
IM_1A_U08	Can use basic theories of matter structure and quantitative relations characterising operating conditions of a material for formulating and solving simple materials and technological problems
IM_1A_U09	Can select production and/or processing of materials for conditions of a product's use, taking into consideration economic aspects

Code	Learning outcomes for programme of studies
IM_1A_U10	Can select conditions/parameters of technological process of material and product
IM_1A_U11	Can control process of product's use
IM_1A_U12	Can specify characteristics of material for condition of its use
IM_1A_U13	Can select and use material for conditions of its exploitation taking into consideration economic aspects
IM_1A_U14	Can use catalogue cards and application notes in order to select appropriate product design components
IM_1A_U15	Can use properly selected methods and devices for characterising material or product
IM_1A_U16	Can select methods and devices for characterising material or product
IM_1A_U17	Can specify characteristics and indicate their scope necessary for assessment of material and product state for the need of design, processing and use
IM_1A_U18	Can use specialised software for servicing and interpretation of results
IM_1A_U19	Can present obtained results in numerical and graphic form, interpret them and draw appropriate conclusions
IM_1A_U20	Can use regulations and laws in force at work or study place
IM_1A_U21	Can language skills in Materials Engineering and related fields according to requirements of level B2 of the Common European Framework of Reference
Social competences	
IM_1A_K01	Understands the need and knows possibilities of life-long learning (second and third cycle studies, postgraduate studies, courses) – improving professional, personal and social competences
IM_1A_K02	Has awareness of significance and understands extra-technological aspects and results of actions of an engineer-material technologist, including its influence on environment and connected with this responsibility for made decisions
IM_1A_K03	Has awareness of significance of professional conduct, observing professional ethics and respect for variety of opinions and cultures
IM_1A_K04	Has awareness of responsibility for own work and readiness to submit to principles of team work and taking responsibility for jointly performed tasks
IM_1A_K05	Can think and act in entrepreneurial way
IM_1A_K06	Has awareness of social role of a graduate of a technical school and in particular understands the need to formulate and transmit to society – e.g. via mass media – information and opinions concerning achievements of materials engineering and other aspects of a materials technologist's activities, makes efforts to transmit such information and opinions in commonly understood way
IM_1A_K07	Can communicate within a team performing interdisciplinary tasks

Programme of studies: *materials engineering*

Level of qualification: second cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: materials engineering (65%), mechanical engineering (35%)

Name of qualification (Title conferred): magister inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
IM_2A_W01	Has extended and in-depth knowledge of modelling and optimising necessary to design modern and advanced materials and/or technological processes and/or products
IM_2A_W02	Has extended and in-depth knowledge of structure and morphology of materials necessary to design modern and advanced materials, including biomaterials and/or products
IM_2A_W03	Has knowledge of modern and advanced methods of characterising necessary for selection of research methods and interpretation of results
IM_2A_W04	Has knowledge of modern technologies of production and processing materials necessary for designing technological process and/or product
IM_2A_W05	Has knowledge of development trends and the most significant new achievements in materials engineering necessary for understanding advanced technological processes
IM_2A_W06	Has knowledge necessary for understanding social, economic, legal and other extra-technological aspects of engineering activities and their application in practice
IM_2A_W07	Knows general principles of creating and development of individual entrepreneurship forms using knowledge of engineering pertinent to programme of studies
Skills	
IM_2A_U01	Can acquire information from literature, databases and other sources; also in a foreign language; can integrate obtained information, interpret and critically assess it, and draw conclusions as well as formulate and exhaustively justify opinions
IM_2A_U02	Can work individually and in team in a way ensuring completion of a task in planned time; can estimate how much time a task requires and its economic aspects
IM_2A_U03	Can prepare detailed documentation of results of an experiment, project or research, can prepare paper with discussion of the results
IM_2A_U04	Can prepare and present a presentation on a project or research completion and lead a discussion of the presentation

Code	Learning outcomes for programme of studies
IM_2A_U05	Uses English at a level sufficient to communicate, also in professional matters, to read professional literature with comprehension, and to prepare and deliver a short presentation on completion of a project or research
IM_2A_U06	Can use learned mathematical methods and models - appropriately modifying them if needed – for analysis, design and optimisation of materials and/or technological processes and/or products
IM_2A_U07	Can assess and compare a product for indicated use criteria taking into consideration extra-technological aspects
IM_2A_U08	Can plan and carry out a simulation and measurement of appropriate materials and/or technological processes and/or products
IM_2A_U09	Can plan a process of product examination for its use properties and life cycle and extra-technological aspects
IM_2A_U10	Can assess modernity of technological and material solution of a product from the point of view of intellectual property and environmental protection and also taking into consideration other extra-technological aspects.
IM_2A_U11	Can design a product taking into consideration indicated use criteria and taking into consideration extra-technological aspects
IM_2A_U12	Can operate selected technological and measurement devices
IM_2A_U13	Can determine directions of further learning and carry out self-education
IM_2A_U14	Has language skills in studied discipline in accordance with requirements of level B2+ of the Common European Framework of Reference
IM_2A_U15	Can analyse dangers in workplace and determine remedial measures
IM_2A_U16	Can - in accordance with an indicated specification, design a complex tool, object, system, or process, relating to the programme of studies taking into consideration extra-technological aspects, and carry out that design - at least partly - using appropriate methods, techniques and tools, including adapting existing tools or preparing new ones
Social competences	
IM_2A_K01	Can think and act in creative and entrepreneurial manner
IM_2A_K02	Understands the need of formulating and transmitting to society – e.g. via mass media – information and opinions concerning achievements of materials engineering and other aspects of activities of an engineer – materials technologist; makes efforts to transmit such information and opinions in commonly understood way, presenting various points of view
IM_2A_K03	Properly identifies and solves dilemmas connected with practising the profession and has awareness of significance and understanding of extra-technological aspects and results of engineering activities, including influence on environment and connected with it responsibility for made decisions; understands need and knows possibilities of life-long learning
IM_2A_K04	Can co-operate and work in team taking various roles and can appropriately set forth priorities serving the completion of a task determined by him/herself and others

Inżynieria pojazdów bojowych i specjalnych studia pierwszego stopnia (na podstawie uchwały nr 33 Senatu ZUT z dnia 26 kwietnia 2019 r.)

Programme of studies: *combat and special vehicles engineering***Level of qualification:** first cycle studies**Educational profile:** general academic**Fields of science:** Engineering and technology**Discipline of science:** mechanical engineering (85%), automation, electronic and electrical engineering (15%)**Name of qualification (Title conferred):** inżynier**Description of the planned educational effects**

Code	Learning outcomes for programme of studies
Knowledge	
IPBiS_1A_W01	has knowledge of mathematics necessary for description and analysis of problems as well as for solving simple problems in the scope of the programme of studies.
IPBiS_1A_W02	Has knowledge of physics necessary to understand basic physical phenomena occurring in mechanical elements and systems and in their environment.
IPBiS_1A_W03	Has systematised knowledge of technical mechanics and mechanics of materials, theory of machines and drives movement and of materials science necessary for modelling mechanical systems and endurance analysis of mechanisms structures of combat and special vehicles and related machines and devices.
IPBiS_1A_W04	Has basic knowledge of designing, structure and principles for vehicles and machines parts and subassemblies functioning, including combat and special vehicles.
IPBiS_1A_W05	Has systematised knowledge of consumables for combat and special vehicles and machines.
IPBiS_1A_W06	Has detailed knowledge of combat and special vehicles, mechatronics and diagnostics, computer techniques in mechanical engineering
IPBiS_1A_W07	Has basic knowledge of electrical engineering and electronics necessary to select and use basic electrical elements and systems in construction of combat and special vehicles and basic mechatronic systems.
IPBiS_1A_W08	Has systematised knowledge of manufacturing techniques of elements and assemblies and installation technology in combat and special vehicles.
IPBiS_1A_W09	Has basic knowledge of fluids mechanics and technical thermodynamics in a scope necessary for the programme of studies.
IPBiS_1A_W10	Has basic knowledge of methodology and basic programming techniques.
IPBiS_1A_W11	Has basic knowledge of environment protection, technology of limiting emission of harmful agents, waste management and using renewable sources of Energy when using combat and special vehicles.
IPBiS_1A_W12	Has basic knowledge of automatics necessary to operate adjustment systems used in mechanical and mechatronic devices of combat and special vehicles.
IPBiS_1A_W13	Has systematised knowledge of metrology and measurement systems, knows and understands measurement methods and basic quantities characterising mechanical and electrical elements and systems of combat and special vehicles.

Code	Learning outcomes for programme of studies
IPBiS_1A_W14	Has knowledge of basic logistic processes and systems, including logistic processes accompanying using combat and special vehicles.
IPBiS_1A_W15	Knows typical engineering technologies, has knowledge of present state and latest development trends of combat and special vehicles structure and technical devices.
IPBiS_1A_W16	Has basic knowledge of structure and functioning of hydraulic and pneumatic devices and systems that are parts of combat and special vehicles.
IPBiS_1A_W17	Has basic knowledge of life cycle of combat and special vehicles.
IPBiS_1A_W18	Has basic knowledge necessary to understand social, economic, legal and other extra-technological conditions of engineering work; knows basic principles of occupational safety and hygiene in using combat and special vehicles
IPBiS_1A_W19	Knows and understands basic notions and principles concerning industrial property protection and copyright, can use patent information resources.
IPBiS_1A_W20	Has basic knowledge of management, including quality management and conducting business activities.
IPBiS_1A_W21	Has knowledge of organising the use of combat and special vehicles and their combat equipment.
IPBiS_1A_W22	Knows general principles of creating and development of individual forms of entrepreneurship.
IPBiS_1A_W23	Has basic knowledge of social and humanistic sciences.
Skills	
IPBiS_1A_U01	Can obtain information from literature, databases and other sources, also in a foreign language, can relate obtained information, interpret it, draw conclusions as well as formulate and justify opinions
IPBiS_1A_U02	Can communicate using various techniques: oral, written, visual, technical, teamwork in a professional circle and other.
IPBiS_1A_U03	Can prepare, in Polish and in a foreign language, documentation concerning completing an engineering task with a discussion of the results.
IPBiS_1A_U04	Has an ability of self-education, also to improve professional qualifications.
IPBiS_1A_U05	Has language skills in accordance with requirements for level B2 of the European Framework of Reference for Languages in a sufficient degree to communicate and read technical texts with understanding.
IPBiS_1A_U06	Can use mathematical methods and models and make computer simulations to complete typical tasks, analysis and assessment of functioning of combat and special vehicles components.
IPBiS_1A_U07	Can plan and execute experiments, including measurements of physical, mechanical, pneumatic, hydraulic and electrical values and conduct computer simulations of changes of values in a function of assumed variables, present obtained results in a numerical and graphic form, interpret obtained results and draw conclusions.
IPBiS_1A_U08	Can use analytical, simulation and experimental methods for formulating and solving engineering tasks concerning combat and special vehicles mechanics and structure.
IPBiS_1A_U09	Can analyse design solutions of mechanical components and systems of combat and special vehicles according to adopted usage criteria.
IPBiS_1A_U10	Can act in an IT environment and use tools for computer assisted design, operation simulation and verification of a combat and special vehicle systems.
IPBiS_1A_U11	Can appropriately chose methods and devices allowing to measure basic values characterising components and systems of combat and special vehicles.
IPBiS_1A_U12	Can plan and conduct an experiment of operation of a combat and special vehicle systems and in case of finding irregularities, can make a diagnostic test.

Code	Learning outcomes for programme of studies
IPBiS_1A_U13	Can, while formulating and solving engineering tasks including designing mechanical components, systems of combat and special vehicles, notice their extra-technological aspects, including environmental, economic and legal ones.
IPBiS_1A_U14	Is prepared to work in industrial and other companies dealing with manufacturing, using, designing and testing machines and devices, including combat and special vehicles and uses principles of occupational safety and hygiene appropriate for executed work.
IPBiS_1A_U15	Can make an initial economic analysis of taken engineering activities, in particular those concerning combat and special vehicles engineering.
IPBiS_1A_U16	Can identify and prepare specification of simple engineering tasks of practical nature concerning structure and use of combat and special vehicles.
IPBiS_1A_U17	Can use catalogue cards, standards and application notes for selecting appropriate components of designed or modernised system of a combat and special vehicle.
IPBiS_1A_U18	Can assess usefulness commonly applied methods and tools used for solving simple engineering problems, typical for combat and special vehicles, for their appropriate selection.
IPBiS_1A_U19	Can, according to an adopted specification, make a design and a simple device, item, system or process in combat and special vehicles engineering and can make an initial economic analysis of actions taken.
IPBiS_1A_U20	Can make an observation and interpretation of humanistic, legal and social issues.
Social competences	
IPBiS_1A_K01	Is aware of the need and possibility of life-long learning in order to improve professional, personal and social competences
IPBiS_1A_K02	Has awareness of significance and understands extratechnological aspects and results of engineering activities, including its influence on environment and connected with this responsibility for made decisions.
IPBiS_1A_K03	Is aware of responsibility for own and team work and observing team work principles in order to complete a task set forth by him/herself or others
IPBiS_1A_K04	Has awareness of significance of professional behaviour, including observing principles of occupational ethics and respect for variety of opinions and cultures.
IPBiS_1A_K05	Understands need of mobility and can think and act in an entrepreneurial manner
IPBiS_1A_K06	Has awareness of a social role of a technical University graduate, understands the need to formulate and transfer to society, e.g. by social media, information and opinions on achievements in his/her own and team engineering activity, and he/she can do it in generally comprehensible manner

Programme of studies: *production engineering in industry 4.0*

Level of qualification: first cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (100%)

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
IPP4_1P_W01	Knows and understands basic processes occurring in a life cycle of machines, devices, items and technical systems in various branches of industry, in particular relating to their integration and creating networks in accordance with the idea of Industry 4.0.
IPP4_1P_W02	Knows and understands basic notions, phenomena and methods and theories explaining complex interrelation among those phenomena, constituting basic general knowledge in the field of mechanical engineering at a higher level, necessary to understand, describe, analyse and for practical solution of problems in production engineering in Industry 4.0.
IPP4_1P_W03	Has knowledge of structure, operation and diagnostics, supervision, usage, durability and reliability of production systems in accordance with the concept of Industry 4.0.
IPP4_1P_W04	Has knowledge of standards and legal, social, economic and ethical rules and other extra-technological conditions of engineering activities, organising economic structures and institutions in various branches of industry, including basic notions and principles concerning industrial property and copyright protection and understands complex interrelations among them.
Skills	
IPP4_1P_U01	Has an ability of self-education, i.e. can obtain information from literature, databases and other sources, also in a foreign language, can relate obtained information, interpret it, draw conclusions as well as formulate and justify opinions.
IPP4_1P_U02	Can effectively use any forms of communication, work in a group, use specialised terminology of mechanical engineering, take active part in debates, prepare in Polish and in a foreign language documentation concerning a solved engineering problem with a discussion of the results.
IPP4_1P_U03	Has language skills in accordance with requirements for level B2 of the European Framework of Reference for Languages in a sufficient degree to communicate and read technical texts with understanding.
IPP4_1P_U04	Can plan and execute experiments, including measurements of physical, mechanical, pneumatic, hydraulic and electrical values and conduct numerical and simulation experiments of physical processes, present obtained results in a numerical and graphic form, interpret obtained results and draw conclusions.

Code	Learning outcomes for programme of studies
IPP4_1P_U05	Can create and use mathematical models for analysis and assessment of production systems operation in various branches of industry, use analytical, simulation and experimental methods for formulating and solving problems in the field of mechanical engineering, and also analyse design solutions of mechanical mechatronic components of production systems using adopted usage criteria.
IPP4_1P_U06	Can, while formulating and solving engineering problems, including designing mechanical and mechatronic elements, components and systems, notice their extra-technological aspects, such as environmental, economic and legal ones.
IPP4_1P_U07	Can make an initial economic analysis of suggested solutions, designs and engineering actions taken appropriate for production engineering.
IPP4_1P_U08	Can describe and make a critical analysis of functioning of existing technical solutions and assess, within mechanical engineering, devices, items, systems, processes and services.
IPP4_1P_U09	Is prepared to work in an industrial environment, can plan and organise individual and team work.
IPP4_1P_U10	Is prepared to work in industrial companies dealing with manufacturing, using, designing and research and uses principles of occupational safety and hygiene relevant to conducted work, can solve practical engineering problems requiring using engineering standards, using environment acquired in an engineering environment, environment of technical devices, items and systems maintenance typical for production engineering.
IPP4_1P_U11	Can act in IT environment and use computer aided design, simulation of operation and verification of production systems.
Social competences	
IPP4_1P_K01	Is aware of significance of knowledge in solving cognitive and practical problems, can critically assess possessed knowledge and supplement and improve it, is aware of significance and understanding extra-technological aspects and results of engineering activities, including the influence of environment and responsibility for decisions made.
IPP4_1P_K02	Is prepared to independent making decisions and to set forth priorities for completing a task set forth by him/herself and others, and also to cooperation and group work, taking various roles in it, can participate in preparing economic projects and for the public interest taking into consideration knowledge of legal and economic aspects, is ready to take responsibility for outcomes of those actions.
IPP4_1P_K03	Properly identifies and solves dilemmas connected with practising the profession, is ready to observe the principles of occupational ethnics and to demand this from others, takes care of achievements and tradition of the profession.
IPP4_1P_K04	Has awareness of the social role of a technical school graduate as well as of meeting social obligations and of co-organising activities in favour of social environment, can think and act in an entrepreneurial and creative manner.

Programme of studies: *mechanical engineering*

Level of qualification: first cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (100%)

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
MiBM_1A_W01	has knowledge of mathematics at a higher level necessary for quantitative description and analysis of problems as well as for solving simple problems in the scope of the programme of studies
MiBM_1A_W02	has knowledge of physics and chemistry necessary for understanding phenomena relating to: materials working, bonding, functioning of measurement apparatuses, wear and corrosion, environmental protection, thermal processes, construction materials protection
MiBM_1A_W03	has basic knowledge of related programmes of studies, such as: materials engineering, automatic control engineering and robotic, electrical engineering and electronics, computer science, production management and engineering
MiBM_1A_W04	has systematic and based on theory knowledge of key issues of programme of studies Mechanics and Machine Structures, such as: machine structures, production techniques, metrology, machine operation, power industry, and knows notions in a foreign language at B2 level+B11
MiBM_1A_W05	has detailed knowledge concerning structures and calculations of machines and devices with medium degree of complexity
MiBM_1A_W06	has detailed knowledge of engineering graphics, preparation of construction and technological documentation with the aid of CAx systems
MiBM_1A_W07	has detailed knowledge of designing processes of machine parts creation and assembly of machines with medium degree of complexity
MiBM_1A_W08	has detailed knowledge of programming numerically controlled machine tools, in particular using CAD/CAM systems in designing technological operations for parts with medium degree of complexity
MiBM_1A_W09	has basic knowledge and knows development trends in the fields of: machine design, technology, machines operation, power industry and management
MiBM_1A_W10	has basic knowledge of product life cycles (technical, marketing and environmental ones) in relation to machines and manufacturing systems

Code	Learning outcomes for programme of studies
MiBM_1A_W11	knows basic methods and techniques of: <ul style="list-style-type: none"> - constructing elements of machines and devices in CAx systems environment, - machine parts measurement, measurement analysis, - designing technological processes for conventional and CNC machine tools, - designing machining systems, - designing heat and surface treating, and basic joining technologies, - techniques of renovation of used machine elements and machine overhauls
MiBM_1A_W12	has knowledge allowing to understand extra-technological factors of an engineer's work: <ul style="list-style-type: none"> - has knowledge of influence of selected manufacturing processes of machine industry on natural environment, - knows dangers and knows principles of OHS in a workplace, - knows elements of labour law and issues concerning employment
MiBM_1A_W13	has basic knowledge concerning management, including quality management and operating a business
MiBM_1A_W14	knows and understands basic notions and principles concerning industrial property protection and copyright; can use patent information resources: <ul style="list-style-type: none"> - knows fundamentals of patent systems and patent law, and can use patent resources, - knows the Act on Copyright and Related Rights and safety techniques in WWW
MiBM_1A_W15	knows general principles of creating and developing forms of individual entrepreneurship, using acquired knowledge in manufacturing organisation, procedures of starting companies and obtaining funds for business activities
Skills	
MiBM_1A_U01	knows principles of functioning of library system, can find source materials using computer bases and library systems, can gather source materials on indicated subjects, interpret them, draw conclusions, formulate and justify opinions
MiBM_1A_U02	can communicate in the circles of mechanical engineers using technical English, information bases on engineering graphics, using computer networks
MiBM_1A_U03	can prepare in Polish and in a foreign language a study of indicated issue concerning mechanical engineering in a communicative and well documented according to principles of preparing technical documentation
MiBM_1A_U04	can prepare in Polish or in a foreign language an oral presentation concerning mechanical engineering using technical vocabulary
MiBM_1A_U05	has skills of self-education - independent search for information and analysing of learned issues
MiBM_1A_U06	can formulate in a foreign language oral and written texts concerning manufacturing techniques, justify his/her opinion during discussion, consider disadvantages and advantages of alternative solutions at level B2 of the Common European Framework of Reference
MiBM_1A_U07	can use information and communication techniques appropriate for performing tasks typical for engineering activities
MiBM_1A_U08	can plan and conduct experiments, including computer simulations, interpret obtained results and draw conclusions
MiBM_1A_U09	can use analytical, simulation and experimental methods for formulating and solving engineering problems
MiBM_1A_U10	can, while formulating and solving engineering problems, notice their system and extratechnological aspects

Code	Learning outcomes for programme of studies
MiBM_1A_U11	has skills necessary to work in industrial environment and knows and uses principles of safety connected with that work
MiBM_1A_U12	can make initial economic analysis of taken engineering actions
MiBM_1A_U13	can make critical analysis of manner of functioning and assess from the point of view of mechanical engineering existing technical solutions and in particular machines, systems, processes and services
MiBM_1A_U14	can determine working conditions of designed elements of machines and formulate requirements which designed elements must meet
MiBM_1A_U15	can identify and formulate specification of simple engineering tasks of practical character, characteristic of the field of mechanical engineering
MiBM_1A_U16	can assess suitability of routine methods and tools used for solving simple engineering problem of practical character in the scope appropriate for mechanical engineering and choose and use appropriate method and tools
MiBM_1A_U17	can - according to specification - design and supervise making simple devices, prepare technological process using appropriate methods and techniques of CAx computer aid
MiBM_1A_U18	can select kind of construction material from the point of view of chemical composition, microstructure and properties meeting previously formulated requirements; consider possibility of substitution of construction materials with consideration of costs
Social competences	
MiBM_1A_K01	understands need of life-long learning; can inspire and organise process of learning by other people
MiBM_1A_K02	has awareness of significance and understands extratechnological aspects and results of engineering activities, including its influence on environment and connected with this responsibility for made decisions
MiBM_1A_K03	can co-operate and work in team, taking various roles in it
MiBM_1A_K04	can properly set forth priorities serving completion of a task indicated by him/herself or others
MiBM_1A_K05	properly identifies and solves dilemmas connected with conducting his/her profession
MiBM_1A_K06	can think and act in entrepreneurial manner
MiBM_1A_K07	has awareness of social role of a technical school graduate and in particular understands the need to formulate and transmit to society, in particular via mass media, information and opinions concerning achievements of technology and other aspects of engineering activities; makes efforts to transmit such information and opinions in commonly comprehensible manner

Programme of studies: *mechanical engineering*

Level of qualification: second cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (100%)

Name of qualification (Title conferred): magister inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies <i>mechanical engineering</i>
Knowledge	
MiBM_2A_W01	has advanced and in-depth knowledge of mathematics at a higher level necessary to solve problems in mechanics, structure and operation of machines
MiBM_2A_W02	has advanced knowledge of physics and chemistry necessary to understand phenomena relating to construction materials properties, materials processing, bonding, wear and corrosion, thermal processes, environmental protection, measurement equipment functioning
MiBM_2A_W03	has detailed knowledge of selected related issues from related programmes of studies in the field of studied speciality
MiBM_2A_W04	has systematic, and based on theory, knowledge of key issues of programme of studies Mechanics and Machine Structure, such as: machine construction, manufacturing techniques, automation, metrology, machine operation, power industry
MiBM_2A_W05	has detailed knowledge concerning structure, operation and calculations concerning machines with various degree of complexity
MiBM_2A_W06	has detailed knowledge of preparing construction, technological and operational documentation
MiBM_2A_W07	has detailed knowledge of designing technological processes in the field of his/her speciality, as well as in the scope of machine assembly processes and systems with high degree of complexity
MiBM_2A_W08	has advanced knowledge and knows development trends and main scientific achievements in his/her speciality, the field of construction, technology and operation of machines and devices, as well as power industry and management
MiBM_2A_W09	has basic knowledge of product life cycles (technical, marketing and environmental ones) in relation to devices and systems of different degree of complexity
MiBM_2A_W10	knows basic methods and techniques, tools and materials used in solving complex problems in constructing, measurements, technology design and operation

Code	Learning outcomes for programme of studies <i>mechanical engineering</i>
MiBM_2A_W11	has knowledge allowing to understand and apply in engineering practice extratechnological factors of engineer's job: <ul style="list-style-type: none"> - has knowledge of influence of selected manufacturing processes on natural environment, - knows threats and OHS principles at a workplace, - knows legal conditions of engineering activities, - is knowledgeable about labour law and employment issues in machine industry
MiBM_2A_W12	has basic knowledge concerning management, including quality management and conducting business activities
MiBM_2A_W13	knows and understands basic notions and principles concerning industrial property protection and copyright. Understands necessity of intellectual property recourses management. Can use patent information resources: <ul style="list-style-type: none"> - knows fundamentals of patent systems and patent law, and can use patent resources, - knows the Act on Copyright and Related Rights and safety techniques in WWW
MiBM_2A_W14	knows general principles of creating and developing forms of individual entrepreneurship, using acquired knowledge of management organisation, procedures of starting companies and acquiring funds for business activities
Skills	
MiBM_2A_U01	knows principles of library system functioning, can search source materials using computer databases and library systems. Can gather source materials on indicated subject, also in a foreign language, interpret them and critically assess, draw conclusions, formulate in-depth and justified opinions.
MiBM_2A_U02	can communicate in mechanical engineers circle and other technical circles, also in a foreign language. Can use various information transfer techniques, including CAx systems.
MiBM_2A_U03	can prepare a scientific study in Polish and a short scientific report in a foreign language presenting results of own research in his/her speciality using conventions and standards of communication adopted in his/her specialisation
MiBM_2A_U04	can prepare and present in Polish and in a foreign language an oral presentation about detailed issues of mechanical engineering
MiBM_2A_U05	can determine directions of further learning, has a skill of self-education in his/her and related specialisations
MiBM_2A_U06	can formulate oral and written statements about his/her speciality justifying his/her opinion in a discussion, consider disadvantages and advantages of alternative solutions at level B2+ of the Common European Framework of Reference
MiBM_2A_U07	can use information and communication techniques appropriate for completion tasks typical for engineering activities
MiBM_2A_U08	can plan and conduct experiments, including computer simulations, interpret obtained results and draw conclusions
MiBM_2A_U09	can use analytical, simulation and experimental methods to formulate and solve engineering problems and simple research problems
MiBM_2A_U10	can, while formulating and solving engineering problems, integrate knowledge of construction, technology, automation and operation, use systematic approach and take into consideration extratechnological aspects
MiBM_2A_U11	can formulate and test hypotheses relating to engineering problems and simple research problems in his/her specialisation
MiBM_2A_U12	can assess usefulness and possibility of use of new engineering achievements in constructions, technology, automation and organisation
MiBM_2A_U13	has qualifications to work in industrial environment and knows principles of safety connected with this work

Code	Learning outcomes for programme of studies <i>mechanical engineering</i>
MiBM_2A_U14	can make initial economic analysis of taken engineering actions
MiBM_2A_U15	can make critical analysis of functioning manner and assess existing technical solution, in particular of a machine, system, process, and service in mechanical engineering and related fields
MiBM_2A_U16	can suggest improvements and streamlining of existing technical solutions taking into consideration issues of construction, technology and operation in mechanical engineering and related fields
MiBM_2A_U17	can identify and formulate specification of complex engineering tasks of practical character, characteristic for his/her speciality, including untypical tasks, taking into consideration extratechnological aspects
MiBM_2A_U18	can assess usefulness of methods and tools used for solving engineering tasks noticing their limitations. Can create new concepts of solving complex problems in his/her specialisation including untypical interdisciplinary ones, using results of scientific research in mechanical engineering and related fields
MiBM_2A_U19	can, taking into consideration extratechnological aspects, design and implement complex devices and technological processes in his/her specialisation, using appropriate methods, materials and tools, also working out own methods and tools.
Social competences	
MiBM_2A_K01	understands need of life-long learning; can inspire and organise process of learning by other people
MiBM_2A_K02	has awareness of significance and understands extratechnological aspects and results of engineering activities, including its influence on environment and connected with this responsibility for made decisions
MiBM_2A_K03	can co-operate and work in team, taking various roles in it
MiBM_2A_K04	can properly set forth priorities serving completion of a task indicated by him/herself or others
MiBM_2A_K05	properly identifies and solves dilemmas connected with conducting his/her profession
MiBM_2A_K06	can think and act in entrepreneurial manner
MiBM_2A_K07	has awareness of social role of a technical school graduate and in particular understands the need to formulate and transmit to society, in particular via mass media, information and opinions concerning achievements of technology and other aspects of engineering activities; makes efforts to transmit such information and opinions in commonly comprehensible manner

Programme of studies: *mechatronics*

Level of qualification: first cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (85%), automation, electronic and electrical engineering (15%),

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
ME_1A_W01	Has knowledge of mathematics, physics and chemistry at a higher level necessary for quantitative description and analysis of problems and solving simple problems in the studied programme of studies.
ME_1A_W02	Has knowledge of physics, electronics, automation and computer science necessary for description and understanding of working principles, structure, manufacturing technology and machine programming.
ME_1A_W03	Has, based on theory, general knowledge of mechanics, strength of mechanical structures, electronics, electrical engineering, computer science, artificial intelligence, control systems and drives as well as metrology and measurement systems enabling description and understanding of technical issues in the field of mechatronics.
ME_1A_W04	Has detailed knowledge enabling description of issues and formulation of conclusions in: <ul style="list-style-type: none"> • designing (structures strength, engineering graphics, dynamic systems, statistics, computer simulations, materials science), • programming techniques of: personal computers, microcontrollers, PLC's, CNC systems for machine tools and robots, vision and picture recognition systems, • rapid prototyping, • measuring electrical and mechanical values, selection of measurement systems.
ME_1A_W05	Is aware of present state and development trends in electronics, computer science and machines structure.
ME_1A_W06	Has basic knowledge of mechatronic devices' life cycle, diagnostic methods of their failure, degree of wear and maintenance.
ME_1A_W07	Has knowledge enabling selection of methods, techniques, materials and tools necessary for solving simple problems and engineering tasks in the field of designing mechatronic systems, programming techniques, control selection, measurement systems and rapid prototyping as well as technology of mechatronic devices manufacturing.
ME_1A_W08	Has basic knowledge necessary to understand extratechnological factors of engineering activities.

Code	Learning outcomes for programme of studies
ME_1A_W09	Knows legal and economic conditions of engineering activities. Knows basic principles of OHS. Has basic knowledge concerning management, including quality management, and conducting business activities.
ME_1A_W10	Knows and understands basic notions and principles of industrial property protection and copyright law. Can use information resources.
ME_1A_W11	Knows general principles of creation and development of various forms of individual entrepreneurship.
Skills	
ME_1A_U01	Can acquire information from literature, databases and other sources. Can integrate obtained information, interpret it, draw conclusions and formulate and justify opinions.
ME_1A_U02	Can communicate in professional circle and other circles using technical language, engineering graphics and modern means of recording and transmission of information.
ME_1A_U03	Can prepare in Polish and in a foreign language a study of an issue in mechatronics according to principles adopted in creating technical documentation, oral and multimedia presentations.
ME_1A_U04	Has ability of independent enhancing acquired knowledge and seeking solutions of engineering problems appearing in professional work.
ME_1A_U05	Has skills in a foreign language at level B2 of the Common European Framework of Reference of the Council of Europe.
ME_1A_U06	Can use software supporting design processes, simulations and research of mechanical, electrical and mechatronic systems.
ME_1A_U07	Can prepare simple computer programmes, programmes for CNC machines, PLC's and other selected microchip systems.
ME_1A_U08	Can select measurement tools, plan and conduct experimental research and interpret and assess obtained results.
ME_1A_U09	Can solve engineering tasks using analytical and simulation methods and by means of experiment.
ME_1A_U10	Can, while formulating and solving tasks in the field of mechatronics, notice their systemic and extratechnological aspects.
ME_1A_U11	Is prepared for work in industrial environment and knows principles of OHS.
ME_1A_U12	Can make initial economic analysis of taken engineering actions in the field of mechatronics.
ME_1A_U13	Can formulate simple engineering tasks and appropriately assess usefulness of various methods and tools for their solution.
ME_1A_U14	Can use appropriate objective methods in order to assess technical and organisational solutions and service processes in the field of mechatronics.
ME_1A_U15	Can design and make simple mechatronic device and assess obtain result using appropriate methods, techniques and tools.
Social competences	
ME_1A_K01	Understands need of life-long learning in order to maintain the level and improve professional, personal and social competences.
ME_1A_K02	Has awareness of significance and understands extratechnological aspects and results of an engineer's actions, including influence on environment and related responsibility for decisions made.
ME_1A_K03	Can work and co-operate in a team.
ME_1A_K04	Can act professionally and in accordance with principles of occupational ethics.
ME_1A_K05	Can think and act in entrepreneurial way.
ME_1A_K06	Has awareness of social role of a technical university graduate.

Inżynieria transportu studia pierwszego stopnia (na podstawie uchwał nr 88 Senatu ZUT z dnia 26 czerwca 2017 r. oraz nr 22 Senatu ZUT z dnia 25 marca 2019 r.)

Programme of studies: *transport engineering*

Level of qualification: first cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (85%), civil engineering and transport (15%),

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
IT_1A_W01	has knowledge of mathematics at a higher level necessary to quantitative description and analysis of problems and solving simple problems in the field of studied programme of studies
IT_1A_W02	has knowledge of physics, including mechanics, thermodynamics, solid-state physics, electricity and magnetism, including knowledge necessary to understand basic physical phenomena occurring in motor vehicles and their environment
IT_1A_W03	has systematic and based on theory knowledge of mechanics, thermodynamics and electrical engineering necessary to understand processes occurring in an internal combustion engine, mechanical influences occurring in mechanisms of motor vehicles, electrical phenomena and processes in vehicle units, influence of environment on a vehicle
IT_1A_W04	has knowledge of materials used in motor industry
IT_1A_W05	has systematic knowledge of means of transport
IT_1A_W06	has systematic knowledge of construction vehicles technology and operation of drive, mechanisms and subassemblies of motor vehicles
IT_1A_W07	has basic knowledge of fundamentals of control and automation, appropriate for motor vehicles
IT_1A_W08	has systematic and based on theory knowledge of working principles of engines and mechanical elements of motor vehicles
IT_1A_W09	has systematic and based on theory knowledge of working principles of electrical and electronic elements of a car
IT_1A_W10	has basic knowledge of metrology, knows and understands methods of measurement of basic values characterising elements and systems of a vehicle, knows calculation methods and information technology tools necessary for analysis of measurements and experiments
IT_1A_W11	knows and understands processes of elements manufacturing, knows typical engineering technologies
IT_1A_W12	knows and understands processes of constructing and manufacturing of machine elements, including a motor vehicle and its assemblies
IT_1A_W13	knows and understands methodology of a vehicle elements design and manufacturing
IT_1A_W14	is aware of present state of knowledge and latest development trends of vehicles and their assemblies

Code	Learning outcomes for programme of studies
IT_1A_W15	has basic knowledge of cars' and transport devices' life cycles
IT_1A_W16	has basic knowledge of logistics, transport systems as well as role of transport and storing in logistics
IT_1A_W17	has systematic knowledge of motor vehicles operation
IT_1A_W18	has basic knowledge of technical diagnostics of motor vehicles
IT_1A_W19	has basic knowledge of transport infrastructure objects structure
IT_1A_W20	has basic knowledge of safety in road transport
IT_1A_W21	has systematic knowledge of influence of means of transport on surroundings and natural environment
IT_1A_W22	has basic knowledge necessary to understand extra-technological aspects of engineering activities, knows basic principles of OHS in motor industry
IT_1A_W23	has elementary knowledge of law concerning transport, intellectual property protection and patent law
IT_1A_W24	has elementary knowledge of management, including quality and environment management, and conducting business activities
IT_1A_W25	knows general principles of creating and development of forms of individual entrepreneurship using knowledge of scientific fields and disciplines pertinent to programme of studies TRANSPORT
IT_1A_W26	has knowledge of grammar, vocabulary and phonetics of a selected foreign language at level B2, and basic knowledge necessary to understand social, economic, legal and other extra-technological factors
Skills	
IT_1A_U01	can acquire information from literature, databases and other available sources; can connect obtain information, interpret it, draw conclusions and formulate and justify opinions
IT_1A_U02	can work individually and in team, can prepare and implement work schedule ensuring timely completion of ordered engineering task, can communicate in professional circle and beyond it using various techniques
IT_1A_U03	can prepare documentation concerning completion of an engineering task in transport and prepare a presentation of its completion results
IT_1A_U04	has ability of self-learning, e.g. in order to improve professional qualifications
IT_1A_U05	uses foreign languages in a sufficient degree to communicate and read with understanding of user manuals for devices, articles and similar technical documents in the field of transport, according to requirements stipulated for level B2 of the Common European Framework of Reference
IT_1A_U06	can use information and communication techniques pertinent for completion of tasks typical for engineering activities
IT_1A_U07	can use learned methods, mathematical models and computer for analysis and assessment of a vehicle and its assemblies functioning
IT_1A_U08	can analyse signals using analogue and digital techniques and appropriate hardware and software tools
IT_1A_U09	while formulating and solving engineering tasks can notice their extra-technological aspects, including environmental, economic and legal ones
IT_1A_U10	can compare design solutions of vehicles and their elements according to indicated operational and economic criteria (power, fuel consumption, exhaust emission, etc.)
IT_1A_U11	can use properly selected tools of computer aided design for simulation, design and verification of motor vehicles elements and their systems
IT_1A_U12	can use properly selected methods and devices for measuring basic values characterising vehicles elements and systems

Code	Learning outcomes for programme of studies
IT_1A_U13	can plan and conduct measurements and simulations and determine characteristics of motor vehicles elements and their systems, present results in numerical and graphic form, interpret them and draw appropriate conclusions
IT_1A_U14	can plan and conduct a process of diagnosing and testing of motor vehicles elements and systems
IT_1A_U15	can formulate specification of simple logistic processes and transport systems
IT_1A_U16	can formulate specification of simple operational processes of a vehicle
IT_1A_U17	can design simple systems, elements, assemblies and vehicles systems taking into consideration of ordered working, economic and ecological criteria, using appropriate methods, techniques and tools
IT_1A_U18	can plan a process of completion of elements and assemblies of a motor vehicle and initially estimate costs of completion
IT_1A_U19	while formulating and solving design tasks and completion of an element or assembly of a vehicle, can notice their extra-technological aspects (environmental, economic, legal ones, etc.)
IT_1A_U20	can use and uses principles of occupational hygiene and safety
IT_1A_U21	can assess usefulness of routine methods and tools used for solving simple engineering tasks typical for means of transport and logistic process, and choose and apply appropriate method and tools
Social competences	
IT_1A_K01	understands the need and knows possibilities of gaining supplemental education and improving professional, personal and social skills
IT_1A_K02	has awareness of significance and understands extra-technological aspects and results of transport engineer's activities, including their influence on environment and relating to it responsibility for decisions taken
IT_1A_K03	has awareness of responsibility for own work and compliance with principles of team work and taking responsibility for jointly completed tasks
IT_1A_K04	has awareness of significance of professional conduct, observing principles of occupational ethics and respect for various opinions and cultures
IT_1A_K05	can think and act in entrepreneurial way
IT_1A_K06	has awareness of social role of a technical school graduate, understands need of formulating and transmitting to society (e.g. via mass media) information and opinions concerning achievements in transport and means of transport and other aspects of a transport engineer's activities, can transmit information in a commonly comprehensible form
IT_1A_K07	understands the need of mobility
IT_1A_K08	has habits of a healthy lifestyle

Inżynieria transportu studia drugiego stopnia (na podstawie uchwał nr 88 Senatu ZUT z dnia 26 czerwca 2017 r. oraz nr 22 Senatu ZUT z dnia 25 marca 2019 r.)

Programme of studies: *transport engineering*

Level of qualification: second cycle studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (85%), civil engineering and transport (15%),

Name of qualification (Title conferred): magister inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
IT_2A_W01	has advanced and in-depth knowledge of mathematics at a higher level necessary to solve problems in road transport
IT_2A_W02	has advanced knowledge of physics, chemistry and materials engineering necessary to understand phenomena related to properties of construction materials, materials processing, joining, wear and corrosion, thermal processes, environmental protection, functioning of measuring equipment
IT_2A_W03	has detailed knowledge of selected issues of related programmes of studies connected with studied specialty
IT_2A_W04	has systematic, based on theory, knowledge of key issues of transport, such as: structure and use of vehicles, manufacturing techniques, automation, metrology, use of machines, power industry
IT_2A_W05	has detailed knowledge concerning structure, use and calculations concerning transport systems and means of transport
IT_2A_W06	has detailed knowledge of preparing construction, technological and operational documents
IT_2A_W07	has detailed knowledge of designing processes in one's specialty and in issues concerning transport and systems of high degree of complexity
IT_2A_W08	has advanced knowledge and knows development trends and main scientific achievements in one's specialty, in fields of construction, technology and operations of motor vehicles and equipment connected with road transport
IT_2A_W09	has basic knowledge of product life cycles (technical, marketing and environmental ones) in relation to devices and systems of various degrees of complexity
IT_2A_W10	knows basic methods and techniques, tools and materials used in solving complex problems in constructing, measuring, designing technology and operations

Code	Learning outcomes for programme of studies
IT_2A_W11	has knowledge allowing to understand and take extra-technological aspects of a transport engineer's work into consideration: - has knowledge of influence of transport processes on environment - knows dangers and principles of industrial safety at work stations, - knows legal aspects of engineering activities - has some knowledge of labour law and issues of employment in road transport
IT_2A_W12	has basic knowledge of management, including quality management and operating a business
IT_2A_W13	knows and understands notions and principles of industrial property and copyright protection. Understands necessity of intellectual property management. Can use patent information resources: - knows fundamentals of patent systems and patent law and can use patent resources, - knows the Act on Copyright and Related Rights and safety techniques on WWW
IT_2A_W14	knows general principles of creating and development of forms of individual entrepreneurship using acquired knowledge of production organisation, procedures of starting companies and acquiring funds for businesses
Skills	
IT_2A_U01	knows principles functioning of libraries system, can search source materials using computer bases and library systems. Can collect source materials on a given topic, also in a foreign language, interpret and critically assess them, draw conclusions, formulate exhaustive and justified opinions.
IT_2A_U02	can communicate in an environment of mechanical engineers and in technical circles, also in a foreign language. Can use various techniques of information transfer.
IT_2A_U03	can prepare a scientific paper in Polish and a short scientific communication in a foreign language presenting results of own scientific research in one's specialty, using communication conventions and standards established in one's specialty
IT_2A_U04	can prepare and present in Polish and a foreign language an oral presentation in detailed issues of transport
IT_2A_U05	can establish directions of further learning, has a skill of self-learning in one's and related specialties
IT_2A_U06	can formulate oral and written texts concerning one's specialty in a foreign language, justifying one's opinion in a discussion, consider advantages and disadvantages of alternative solutions at level B2+ of the Common European Framework of Reference
IT_2A_U07	can use information and communication techniques appropriate to fulfil tasks typical for engineering activities
IT_2A_U08	can plan and carry out experiments, including computer simulations, interpret obtained results and draw conclusions
IT_2A_U09	can use analytical, simulation and experimental methods for formulating and solving engineering and simple research problems
IT_2A_U10	can, while formulating and solving engineering problems, integrate knowledge of construction, technology, planning, automation and operation, use system approach and take extra-technological aspects into consideration
IT_2A_U11	can formulate and test hypotheses connected with engineering problems and simple research problems in one's specialty
IT_2A_U12	can assess usefulness and possibility to use new engineering achievements in construction, technology, automation and organisation
IT_2A_U13	has necessary training to work in industrial environment and knows principles of safety connected with this work

Code	Learning outcomes for programme of studies
IT_2A_U14	can make initial economic analysis of performed engineering activities
IT_2A_U15	can make critical analysis of functioning and assess existing technical solutions concerning motor vehicles, transport systems and processes and services in the field of transport and road traffic
IT_2A_U16	can suggest improvements and streamlining of existing technical solutions taking into considerations issues of construction, technology and operations in motor transport and related areas
IT_2A_U17	can identify and formulate specification of complex engineering tasks of practical character, characteristic for one's specialty, including untypical tasks taking into consideration extra-technological aspects
IT_2A_U18	can assess usefulness of methods and tools used for solving engineering problems noticing their limitations. Can create new concepts solving complex problems in one's specialty, including untypical interdisciplinary problems, using results of scientific research in motor transport and related areas
IT_2A_U19	can, taking into consideration extra-technological aspects, design and implement complex technological processes in one's specialty, using appropriate methods, materials and tools, also preparing own methods and tools.
Social competences	
IT_2A_K01	understands the need of life-long learning; can inspire and organise learning process of other persons
IT_2A_K02	is aware of significance and understands extra-technological aspects and results of engineering activities, including their influence on environment and connected with it responsibility for made decisions
IT_2A_K03	can co-operate and work in group taking different roles in it
IT_2A_K04	can properly establish priorities for fulfilling a task set forth by oneself or others
IT_2A_K05	properly identifies and solves dilemmas connected with performed profession
IT_2A_K06	can think and act in an entrepreneurial manner
IT_2A_K07	is aware of a social role of a technical university graduate and in particular understands need of formulating and transmitting to society, in particular via mass media, of information and opinions concerning achievements of technology and other aspects of engineering activities; makes efforts to transmit such information in a commonly comprehensible way

Programme of studies: *management and production engineering*

Level of qualification: first cycle studies

Educational profile: general academic

Fields of science: Engineering and technology, Social sciences

Discipline of science: mechanical engineering (85%), management and quality studies (15%),

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
ZIIP_1A_W01	has knowledge of mathematics at a higher level necessary for quantitative description, understanding and modelling problems
ZIIP_1A_W02	has knowledge of physics at a higher level necessary for quantitative description, understanding and modelling problems
ZIIP_1A_W03	knows basic methods, techniques, tools and technologies in selected area of production engineering with particular focus on computer aided design and manufacturing
ZIIP_1A_W04	has knowledge of planning and conducting simple research experiment (including computer simulations)
ZIIP_1A_W05	has knowledge of fundamentals of processes automation
ZIIP_1A_W06	has knowledge of metrology
ZIIP_1A_W07	has basic knowledge of materials science
ZIIP_1A_W08	has knowledge of environmental protection
ZIIP_1A_W09	has knowledge of basic principles of occupational hygiene and safety
ZIIP_1A_W10	knows legal factors for production engineering and business activities
ZIIP_1A_W11	has knowledge of customary and ethical factors relating to production engineering
ZIIP_1A_W12	knows and understands basic notions and principles concerning industrial property protection and copyright; can use patent information resources
ZIIP_1A_W13	has basic knowledge of life cycles of technical devices, objects and systems
ZIIP_1A_W14	has detailed knowledge relating to some areas of represented engineering discipline
ZIIP_1A_W15	has basic knowledge of development trends in the area of represented engineering discipline
ZIIP_1A_W16	has knowledge of economics and production and services management, including quality management, and of conducting business activities
ZIIP_1A_W17	has basic knowledge necessary to use humanistic and other texts supplementing technical education

Code	Learning outcomes for programme of studies
Skills	
ZIIP_1A_U01	has skills in operation, supervision and management, at operational level, of existing production objects, processes and systems in a selected area of production engineering
ZIIP_1A_U02	has skills in technical and technological counselling in a selected area of production engineering
ZIIP_1A_U03	has skills in measuring and analysing basic physical phenomena relating to production processes and systems in a selected area of production analysis
ZIIP_1A_U04	has skills in completing and implementing research and development projects concerning production organisation, technological innovations
ZIIP_1A_U05	has skills in management of various forms of occupational activities
ZIIP_1A_U06	has skills in conducting quality-focused activities in a selected area of production
ZIIP_1A_U07	has skills in conducting marketing projects relating to production
ZIIP_1A_U08	can use basic principles of finances and accountancy for proper functioning of enterprises
ZIIP_1A_U09	has skills in individual and team work
ZIIP_1A_U10	has skills in a foreign language at level B2 of the Common European Framework of Reference of the Council of European using specialist language relating to the programme of studies
ZIIP_1A_U11	has skills in using principles of legal regulations
ZIIP_1A_U12	has skills in taking into consideration ecological and environmental protection aspects in technological processes and in taking decisions
ZIIP_1A_U13	has skills in communicating with people around and can obtain information from various sources, integrate and interpret it, draw conclusions and formulate and justify opinions
ZIIP_1A_U14	has skills in carrying out analysis of problems directly relating to acquired knowledge
ZIIP_1A_U15	can plan, conduct experiments (including measurements and computer simulation), interpret obtained results and draw conclusions from experiments
ZIIP_1A_U16	can identify and solve basic technical, technological or organisational problem connected with production process
ZIIP_1A_U17	has qualifications necessary to work in industrial environment and knows principles of safety connected with this work
ZIIP_1A_U18	has skills of self-education
ZIIP_1A_U19	can use analytical, simulation and experimental methods in engineering tasks
ZIIP_1A_U20	can obtain information from literature, databases and other sources, integrate and interpret it, and draw conclusions and formulate opinions
ZIIP_1A_U21	has skills in engineering design of technical objects and processes using computer aid
ZIIP_1A_U22	has skills in understanding and using acquired knowledge in practice
ZIIP_1A_U23	has skills in understanding basic economic processes and principles of controlling them
ZIIP_1A_U24	has skills in staff management and co-ordinating work of employee teams
ZIIP_1A_U25	has skills in preparing documentation relating to production process
ZIIP_1A_U26	has skills in selecting simple systems of systems of improvement and automation of production processes

Code	Learning outcomes for programme of studies
Social competences	
ZIIP_1A_K01	has awareness of need supplement knowledge with particular focus on self-education
ZIIP_1A_K02	has competence in application of law and observing principles of occupational ethics
ZIIP_1A_K03	has competence in conscious responsibility for jointly completed tasks
ZIIP_1A_K04	understands need of mobility
ZIIP_1A_K05	has habits of healthy lifestyle
ZIIP_1A_K06	has awareness of significance and understands extra-technological aspects and results of engineering activities, including their influence on environment and related responsibility for taken decisions
ZIIP_1A_K07	can think and act in a creative and entrepreneurial way, is able to take responsibility of further development of science and economy
ZIIP_1A_K08	has awareness of social role of a technical school graduate, and in particular understands need of formulating and transmitting to society, in particular via mass media, information and opinions concerning achievements of technology and other aspects of engineering activities; makes efforts to transmit such information and opinions in commonly comprehensible way
ZIIP_1A_K09	has competences in creating patriotic, humanistic and tolerant attitudes, openness and co-operation in multicultural environments

Programme of studies: *management and production engineering*

Level of qualification: second cycle studies

Educational profile: general academic

Fields of science: Engineering and technology, Social sciences

Discipline of science: mechanical engineering (85%), management and quality studies (15%),

Name of qualification (Title conferred): magister inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
ZIIP_2A_W01	has advanced and in-depth knowledge of mathematics necessary for formulating and solving complex problems in production engineering
ZIIP_2A_W02	has general knowledge concerning theory and research methods in technical sciences and production engineering
ZIIP_2A_W03	knows advanced methods, techniques, tools and technologies in a selected area of production engineering, with particular focus on modern methods of production management methods
ZIIP_2A_W04	has systematic knowledge of planning, optimisation, assessment and forecasting of results
ZIIP_2A_W05	has detailed, based on theory, knowledge of management and production engineering, with particular focus on management of technical functions at strategic level
ZIIP_2A_W06	has knowledge of development trends and most important new achievements in production engineering and management
ZIIP_2A_W07	knows basic methods, techniques and materials used in solving complex engineering problems related to production engineering, including methods of creative thinking
ZIIP_2A_W08	has knowledge necessary to understand extra-technological determinants of engineering activities and allowing to take them into consideration in engineering practice
ZIIP_2A_W09	has knowledge of economics and management of production and services, knowledge, projects and innovations, and conducting a business
ZIIP_2A_W10	knows and understands basic notions and principles of industrial property and copyright protection, and necessity of intellectual property management
ZIIP_2A_W11	has knowledge of integrated information systems and decision support systems.
ZIIP_2A_W12	has knowledge of simulations of production processes, life cycles of devices, objects and technical systems

Code	Learning outcomes for programme of studies
Skills	
ZIIP_2A_U01	can obtain information from literature, databases and other sources, also in a foreign language, can analyse obtained information, interpret and critically assess it, and also draw conclusions and exhaustively justify opinions
ZIIP_2A_U02	can work individually and in a team, lead teams of creative work in production and teams in economic field or in administration
ZIIP_2A_U03	can prepare a scientific paper in Polish and a short communication in a foreign language presenting results of own scientific research
ZIIP_2A_U04	can prepare and present an oral presentation concerning detailed issues of production engineering
ZIIP_2A_U05	can set a direction and implement a process of self-learning
ZIIP_2A_U06	has language skills in production engineering according to requirements stipulated for level B2+ of the Common European Framework of Reference
ZIIP_2A_U07	can use information and communication techniques appropriate for tasks typical for engineering activities
ZIIP_2A_U08	can plan and conduct experiments, including computer measurements and simulations, interpret obtained results and draw conclusions
ZIIP_2A_U09	can use analytical, simulation and experimental methods to formulate and solve engineering and simple research problems
ZIIP_2A_U10	can connect knowledge of production engineering and use system approach taking into consideration also extra-technological aspects
ZIIP_2A_U11	can formulate and test hypotheses relating to engineering problems and simple research problems
ZIIP_2A_U12	can assess usefulness and possibility to use new techniques and technologies in production engineering and management
ZIIP_2A_U13	knows principles of safety relating to work in industrial environment
ZIIP_2A_U14	has a skill of making initial economic analysis of performed engineering activities
ZIIP_2A_U15	can make an analysis of functioning and assess existing technical and technological solutions, in particular devices, objects, systems, processes, services
ZIIP_2A_U16	can make an analysis and suggest an improvement of existing technical or technological solution
ZIIP_2A_U17	can identify and formulate specification of complex engineering tasks, characteristic for production engineering, including untypical tasks, taking into consideration their extra-technological aspects
ZIIP_2A_U18	can use and search techniques, methods and concepts of creative solutions of problems characteristic for production engineering
ZIIP_2A_U19	has a skill of designing and implementing technological and organisational innovations based on information technologies, artificial intelligence, etc.
ZIIP_2A_U20	has a skill of organising and conducting research and development work
ZIIP_2A_U21	can select methods of optimisation, simulation, forecasting, disquisition and support of activities by information technologies
ZIIP_2A_U22	has a skill of making innovative initiatives and decisions, and conducting independent activities in production in small, medium and large companies
ZIIP_2A_U23	has a skill of consulting in technical and organisational consultancy in the area of production
ZIIP_2A_U24	has a skill of creative activities in production engineering and management of production and innovations

Code	Learning outcomes for programme of studies
Social competences	
ZIIP_2A_K01	is aware of the need of further learning, can inspire and organise process of learning of other people
ZIIP_2A_K02	is aware of observing principles of professional ethics and bearing responsibility for made decisions
ZIIP_2A_K03	can co-operate and work in group taking various roles in it and set priorities for fulfilling a task established by oneself or others
ZIIP_2A_K04	can think and act in a creative and entrepreneurial manner
ZIIP_2A_K05	understands the need to formulate and transmit to society, in commonly comprehensible way, information and opinions about development and achievements of science in production engineering

Programme of studies: *Power Engineering*

Level of qualification: first second studies

Educational profile: general academic

Fields of science: Engineering and technology

Discipline of science: mechanical engineering (85%), environmental engineering, mining and energy (15%)

Name of qualification (Title conferred): inżynier

Description of the planned educational effects

Code	Learning outcomes for programme of studies
Knowledge	
ENE_2A_W01	Has extended and in-depth knowledge of mathematics, including elements of applied mathematics, differential calculus, and optimisation method, as well as numerical methods necessary for: 1) Description and analysis of power industry elements and systems; 2) Mathematical description of physical and chemical processes, including electrochemical processes, and energy processes
ENE_2A_W02	Has extended knowledge of physics, including fundamentals of quantum and nuclear physics, including knowledge necessary to understand physical processes and phenomena taking place in complex electric power systems
ENE_2A_W03	Has detailed knowledge of the principles of construction, modelling, design, and use of electric power elements and systems
ENE_2A_W04	Has extended knowledge of electric power measurements and modern measuring systems, in particular in selecting devices and analysis of uncertainty in measuring
ENE_2A_W05	Has knowledge of electric power systems used for quality improvement and electric power transmission
ENE_2A_W06	Has knowledge of applied methods of economic efficiency assessment of new electric power construction projects and modernisation of existing ones
ENE_2A_W07	Has extended and organised knowledge of hydromechanics, thermomechanics, and heat transmission
ENE_2A_W08	Has theory-based organised knowledge of computer aided calculations and decision making in power industry
ENE_2A_W09	Has organised knowledge of supply and consumption of power by processes and facilities, and of power industry law, as well as of power efficiency
ENE_2A_W10	Has extended and organised knowledge of power industry, in particular in respect of nonconventional power industry, including renewable, nuclear, and hydrogen energy
ENE_2A_W11	Has knowledge of development trends in the work of generating sources in electric power system, including distributed generation and energy storage
ENE_2A_W12	Has extended knowledge of waste management, flue gas treatment, influence of power processes on environment
ENE_2A_W13	Has basic knowledge of materials used in power industry, life cycle of devices, and power systems

Code	Learning outcomes for programme of studies
ENE_2A_W14	Has elementary knowledge of management, including quality management, conducting a business, and principles of creating and development of individual entrepreneurship
ENE_2A_W15	Has basic knowledge of intellectual property protection and patent law
Skills	
ENE_2A_U01	Can acquire information from literature, databases, and other sources, also in a foreign language, concerning power industry; can integrate acquired information, make its interpretation and critical assessment, and draw conclusions and formulate and justify opinions
ENE_2A_U02	Can work individually and in a team; can estimate task time-consumption; can lead a small team in way assuring task execution in assumed time
ENE_2A_U03	Can prepare documentation concerning a technical task execution and prepare a text discussing the results of the task execution
ENE_2A_U04	Can prepare and deliver a presentation on a project or research execution, and lead a discussion concerning the presentation
ENE_2A_U05	Can use a foreign language in a sufficient degree to communicate, also in professional matters, read and understand professional literature, and to prepare and deliver a short presentation on a project or research execution
ENE_2A_U06	Has a skill of self-education to improve professional competence
ENE_2A_U07	Can use learned mathematical methods and models, modifying them when necessary, to analyse and design power industry systems
ENE_2A_U08	Can plan and execute an experiment, including computer measurements and simulations in respect of power industry elements and entire system, and interpret obtained results
ENE_2A_U09	Can select a calculation method, use appropriate software relevant to solve a given problem, taking into consideration new developments of technology
ENE_2A_U10	Can assess usefulness of methods and tools used in measurements, diagnostics, and decision support relating to power industry processes
ENE_2A_U11	Is sufficiently prepared to work in industrial environment and knows principles of industrial safety
ENE_2A_U12	Can make economic analysis relating to investments in power industry
ENE_2A_U13	Can make critical analysis and assessment of power technology, suggest improvements of existing technical solutions
Social competences	
ENE_2A_K01	Can think and act in a creative and entrepreneurial way, understands the need to formulate and transfer information and opinions concerning achievements of power industry and related branches of industry to society
ENE_2A_K02	Identifies and resolves dilemmas relating to energy safety of the state
ENE_2A_K03	Is aware of significance and understands non-technical aspects and effects of using various power technologies, including their impact on environment and related responsibility for decisions
ENE_2A_K04	Understands the need of constant learning and improving professional skills and can inspire other persons' learning process
ENE_2A_K05	Can co-operate and work in group adopting various roles and can appropriately determine priorities serving the execution of a task set by themselves or others