**ZARZĄDZENIE NR 121**

**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 Budownictwa i Inżynierii Środowiska**

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 Budownictwa i Inżynierii Środowiska.
2. Opis efektów uczenia się w tłumaczeniu na język angielski dla poszczególnych kierunków studiów stanowi integralną cześć 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:
2. budownictwo, studia pierwszego stopnia – stanowi załącznik nr 1,
3. budownictwo, studia drugiego stopnia – stanowi załącznik nr 2,
4. inżynieria środowiska, studia pierwszego stopnia – stanowi załącznik nr 3,
5. inżynieria środowiska, studia drugiego stopnia – stanowi załącznik nr 4;
6. od roku akademickiego 2021/2022:
7. budownictwo, studia pierwszego stopnia – stanowi załącznik nr 5,
8. budownictwo, studia drugiego stopnia – stanowi załącznik nr 6,
9. inżynieria środowiska, studia pierwszego stopnia – stanowi załącznik nr 7,
10. inżynieria środowiska, studia drugiego stopnia – stanowi załącznik nr 8.

**§ 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 2a oraz załącznik nr 2a – Kierunki Wydziału Budownictwa i Inżynierii Środowiska.

**§ 4.**

Zarządzenie wchodzi w życie z dniem podpisania.

W zastępstwie Rektora

prof. dr hab. inż. Jacek Przepiórski

prorektor ds. nauki

Załącznik nr 1
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Budownictwo, studia pierwszego stopnia (na podstawie uchwały nr 88 Senatu ZUT z dnia 28 czerwca 2019 r.)

**Programme of studies:** *civil engineering*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** civil engineering and transport (100%)

**Name of qualification (Title conferred): inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| B\_1A\_W01 | Has knowledge from selected areas of mathematics, physics, chemistry and other areas appropriate for Civil Engineering, necessary to formulate and solve simple tasks within the scope of civil engineering; |
| B\_1A\_W02 | Knows the principles of descriptive geometry concerning the recording and reading of architectural and construction drawings, geodetic and geological maps with the use of CAD; |
| B\_1A\_W03 | Knows how to define a map projection and what are the basic geodetic works in civil engineering; |
| B\_1A\_W04 | Has knowledge of general mechanics and material strength; |
| B\_1A\_W05 | Has basic knowledge of fluid mechanics and hydrology; |
| B\_1A\_W06 | Knows the principles of structure mechanics and analysis of rod constructions within the scope of statistics; |
| B\_1A\_W07 | Knows the standards and technical requirements used in civil engineering; |
| B\_1A\_W08 | Knows the principles of constructing and dimensioning of building construction elements; |
| B\_1A\_W09 | Knows the principles of foundation laying of building structures; |
| B\_1A\_W10 | Knows the principles of analysis and construction of selected structures in general, industrial, transport civil engineering and hydro engineering; |
| B\_1A\_W11 | Has basic knowledge of designing road transport infrastructure objects; |
| B\_1A\_W12 | Has basic knowledge within the scope of building installations; |
| B\_1A\_W13 | Has knowledge related to basic issues within the scope of the programme of study; |
| B\_1A\_W14 | Knows selected analytical methods and computer programmes aiding construction design as well as organisation of construction works; |
| B\_1A\_W15 | Knows the most frequently used construction materials and products as well as the basics of their manufacturing technology; |
| B\_1A\_W16 | Knows the basics of construction physics; |
| B\_1A\_W17 | Knows typical engineering technologies used in civil engineering; |
| B\_1A\_W18 | Has knowledge on the subject of creating quality management procedures for construction works. Knows the standards and norms of work in civil engineering as well as the organisation and the principles of construction site management; |
| B\_1A\_W19 | Has basic knowledge on the subject of organisation and management of an investment process as well as conducting business activity in construction industry; |
| B\_1A\_W20 | Has knowledge on the subject of the influence of carrying out construction investment s on the environment; |
| B\_1A\_W21 | Has elementary knowledge within the scope of intellectual property and the sources of patent information; |
| B\_1A\_W22 | Has basic knowledge on the life cycle of devices, building structures as well as technical systems used in civil engineering; |
| B\_1A\_W23 | Has basic knowledge of developmental trends in civil engineering; |
| B\_1A\_W24 | Has basic knowledge on the subject of the necessity to include micro- and macroeconomic conditions in the decision process; |
| B\_1A\_W25 | Knows basic terms concerning ethics, philosophy, sociology, art, design and culture; |
| B\_1A\_W26 | Knows the system of education at a university, the principles of its functioning and the academic traditions; |
| **Skills** |
| B\_1A\_U01 | Is able to classify building structures; |
| B\_1A\_U02 | Is able to prepare a summary of loads acting on building structures; |
| B\_1A\_U03 | Is able to define properly the computer analysis calculation models of constructions; |
| B\_1A\_U04 | Is able to conduct a statistical analysis of statically determinate and indeterminate rod constructions, specify the stress and deformation states in construction elements as well as dimension them; |
| B\_1A\_U05 | Is able to select (analytic or numerical) tools for solving problems of analysis, design, execution of construction elements as well as building structures; |
| B\_1A\_U06 | Is able to use selected computer programmes aiding design decisions in civil engineering as well as critically evaluate the obtained results; |
| B\_1A\_U07 | Is able to design selected elements and simple engineering constructions as well as evaluate the existing solutions; |
| B\_1A\_U08 | Is able to solve basic engineering issues within the scope of the programme of study; |
| B\_1A\_U09 | Is able to design simple foundations for building structures; |
| B\_1A\_U10 | Is able to plan and conduct experiments, including computer measurements and simulations, interpret the obtained results and draw conclusions; |
| B\_1A\_U11 | Is able to read architectural and construction drawings as well as geodetic and geological maps. Is able to prepare graphic documentation in the environment of selected CAD programmes; |
| B\_1A\_U12 | Is able to prepare a simple cost estimation and schedule for construction works; |
| B\_1A\_U13 | Is able to assess risks while carrying out construction works and implement appropriate safety rules; |
| B\_1A\_U14 | Is able to use information technology, the Internet resources and other sources for finding general information, communicating and finding software aiding the work of a designer and construction works organiser; |
| B\_1A\_U15 | Has mastered the ability to communicate in a foreign language on B2 level including the knowledge of technical language elements within the scope of civil engineering; |
| B\_1A\_U16 | Is able to apply regulations of building law and water law; |
| B\_1A\_U17 | Is able to select building material and products; |
| B\_1A\_U18 | Is able to organise work on the construction site in accordance with the principles of construction technology and organisation; |
| B\_1A\_U19 | Is able to prepare documentation concerning the accomplishment of an engineering task; |
| B\_1A\_U20 | Is able to prepare documentation concerning preparation and accomplishment of a construction investment; |
| B\_1A\_U21 | Is able to prepare and deliver a presentation concerning the results of carrying out an engineering task; |
| B\_1A\_U22 | Has the ability to learn alone; |
| B\_1A\_U23 | Is able to use knowledge within the scope of economics to take rational decisions in business activity; |
| B\_1A\_U24 | Is able to differentiate non-material goods subject to protection, select the type of protection for an individual one as well as use patent literature and patent bases; |
| B\_1A\_U25 | Is able to interpret ethical and sociological programmes as well as analyse contemporary trends in culture, philosophy, art and design; |
| B\_1A\_U26 | Behaves, both during the studies and in her/his professional work, in accordance with the principles of ethics, occupational health and safety, fire protection, the applicable legal regulations and social norms, including the academic traditions; |
| B\_1A\_U27 | Has the awareness of the need of life-long learning; |
| **Social competences** |
| B\_1A\_K01 | Is able to inspire and organise the process of learning of other people; |
| B\_1A\_K02 | Understands non-technical aspects and consequences of engineering activity and its influence on environment; |
| B\_1A\_K03 | Is responsible for the safety of her/his own and the team; |
| B\_1A\_K04 | Is aware of the responsibility for her/his own work and the readiness to comply with the principles of teamwork and incur responsibility for joint accomplishment of a task; |
| B\_1A\_K05 | Is aware of the importance to behave in a professional manner and comply with the principles of professional ethics; |
| B\_1A\_K06 | Is able to think and act in an enterprising manner; |
| B\_1A\_K07 | Understands the need to communicate the knowledge of civil engineering to the society. Formulates conclusions and describes the results of her/his own work. Is communicative in media presentations; |
| B\_1A\_K08 | The student acquires the competences of identifying ethical and social dilemmas as well as issues related to culture, philosophy, art and design, which enables her/him to participate in social and cultural events in a responsible and conscious manner; |
| B\_1A\_K09 | Is prepared to work in a team, is aware of the responsibility for her/his own work and the tasks performed in a team as well as behaving in a professional manner and respecting the rules of professional ethics; |

Załącznik nr 2
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Budownictwo, studia drugiego stopnia (na podstawie uchwały nr 88 Senatu ZUT z dnia 28 czerwca 2019 r.)

**Programme of studies:** *civil engineering*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** civil engineering and transport (100%)

**Name of qualification (Title conferred): magister inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| B\_2A\_W01 | Has advanced and in-depth knowledge within the scope of mathematics and other areas of science useful for formulating and solving complex tasks within the scope of civil engineering; |
| B\_2A\_W02 | Has detailed knowledge within the scope of the programmes of study related to civil engineering; |
| B\_2A\_W03 | Knows the basics of continuum mechanics. Knows the analysis principles of surface and solid construction statics issues; |
| B\_2A\_W04 | Has knowledge on the subject of construction modelling and theoretical foundations of the Finite Element Method; |
| B\_2A\_W05 | Has theory-based, detailed knowledge related to selected issues in civil engineering; |
| B\_2A\_W06 | Has advanced knowledge related to key issues within the scope of the selected specialisation; |
| B\_2A\_W07 | Has knowledge concerning management of construction undertakings within the technical and economic aspect; |
| B\_2A\_W08 | Knows the principles of constructing and dimensioning of the elements of complex constructions and building structures; |
| B\_2A\_W09 | Knows advanced methods and computer programmes used in solving complex tasks within the scope of civil engineering; |
| B\_2A\_W10 | Has knowledge concerning technical standards and norms within the scope of the specialisation studied; |
| B\_2A\_W11 | Knows the principles of industrial manufacturing of construction materials and products as well as preparation of construction elements and structures; |
| B\_2A\_W12 | Has basic knowledge within the scope of maintenance of structures and systems typical for the specialisation studied; |
| B\_2A\_W13 | Has knowledge of developmental trends and the most significant new achievements in civil engineering; |
| B\_2A\_W14 | Has knowledge necessary to understand social, economic, legal and other non-technical conditions of engineering activity, including the influence of carrying out construction investments on the environment; |
| B\_2A\_W15 | Knows and understands basic concepts and rules within the scope of industrial property protection and copyrights; |
| B\_2A\_W16 | Knows basic terms concerning ethics, philosophy, sociology, art, design and culture; |
| **Skills** |
| B\_2A\_U01 | Is able to obtain information from literature, data bases and other properly selected sources, also in a foreign language; is able to integrate the obtained information, interpret it and evaluate it critically as well as draw conclusions, formulate and sufficiently justify opinions; |
| B\_2A\_U02 | Is able to communicate with the use of various techniques with professionals and others, also in a foreign language; |
| B\_2A\_U03 | Is able to prepare a scientific study in Polish and a short scientific report in a foreign language presenting the results of her/his own scientific research; |
| B\_2A\_U04 | Is able to prepare and present, in Polish and a foreign language, an oral presentation concerning detailed issues within the scope specialisation studied; |
| B\_2A\_U05 | Is able to determine the directions of further learning and carry out the process of self-education; |
| B\_2A\_U06 | Has the ability to use a foreign language within the scope of fields of science and scientific disciplines appropriate for the programme of study, compliant with the requirements specified for B2+ level of the European Framework of Reference; |
| B\_2A\_U07 | Uses advanced specialist tools in order to find useful information, communicate and obtain software aiding the work of a designer and an organiser of construction processes; |
| B\_2A\_U08 | Is able to prepare technical documentation in the environment of selected CAD programmes; |
| B\_2A\_U09 | Is able to, depending on the research problem, formulate assumptions concerning the experiments, including measurements and numerical simulations, plan and conduct research, interpret the obtained results and draw conclusions; |
| B\_2A\_U10 | Is able to use analytic, simulation and experimental methods to formulate and solve engineering tasks as well as simple research problems; |
| B\_2A\_U11 | While formulating and solving engineering tasks, is able to integrate knowledge within the scope of fields of science and scientific disciplines related to civil engineering and use a systemic approach, also including non-technical aspects; |
| B\_2A\_U12 | Is able to formulate and test hypotheses connected with engineering problems and simple research problems; |
| B\_2A\_U13 | Is able to assess the usefulness and possibility of using new (technical and technological) achievements in civil engineering; |
| B\_2A\_U14 | Is able to classify simple and complex building structures; |
| B\_2A\_U15 | Is able to assess and prepare a summary of loads acting on building structures; |
| B\_2A\_U16 | Is able to identify and formulate a specification of complex engineering tasks characteristic for the specialisation studied, including atypical tasks, taking into consideration their non-technical aspects; |
| B\_2A\_U17 | Is able to perform a classic static analysis of surface constructions; |
| B\_2A\_U18 | Is able to assess the usefulness of methods and tools used for solving engineering tasks characteristic for the specialisation studied; |
| B\_2A\_U19 | Is able to select, for solving of an engineering task within the scope of environmental engineering, methods, techniques and tools (analytic or numerical ones), adjust the existing tools an develop new ones; |
| B\_2A\_U20 | Is able to design elements and complex constructions of building structures; |
| B\_2A\_U21 | Is able to dimension construction details in various building structures depending on the specialisation studied; |
| B\_2A\_U22 | Is able to design, in accordance with a predefined specification including also non-technical aspects, a complex structure or technological process appropriate for the specialisation studied and specify, at least in part, the manner of its accomplishment, using appropriate methods, techniques and tools; |
| B\_2A\_U23 | Is able to assess basic parameters: time, cost, quality while carrying out construction undertakings and implement appropriate corrective actions; |
| B\_2A\_U24 | Is able to prepare the effectiveness analysis of construction undertakings and assess risk in the context of enterprise economics as well as plan basic investment parameters; |
| B\_2A\_U25 | Is able to solve problems connected to the use and diagnostics of building structures Is able to propose improvements of the existing technical solutions; |
| B\_2A\_U26 | Is able to interpret ethical and sociological programmes as well as analyse contemporary trends in culture, philosophy, art and design; |
| B\_2A\_U27 | Has the awareness of the need of life-long learning; |
| **Social competences** |
| B\_2A\_K01 | Is able to professionally define, classify and apply the priorities used for accomplishment of an undertaken engineering task; |
| B\_2A\_K02 | Is responsible for reliability of the obtained results of her/his work and evaluation of the work of a team of subordinates; |
| B\_2A\_K03 | Is aware of their importance and understands non-technical aspects and consequences of engineering activity, including its influence on the environment and the related responsibility for the decisions taken; |
| B\_2A\_K04 | Is aware of the necessity of sustainable development in civil engineering; |
| B\_2A\_K05 | Is able to think and act in a creative and enterprising manner; |
| B\_2A\_K06 | Is aware of the need to raise professional and personal competences; extends and develops alone the knowledge within the scope of modern processes, technologies and management methods in civil engineering; |
| B\_2A\_K07 | Properly identifies and solves dilemmas related to job performance; is aware of acting in compliance with the rules of professional ethics; |
| B\_2A\_K08 | Understands the need to communicate to the society the knowledge on the subject of civil engineering, formulates and presents information and opinions in a generally understandable manner with justification of various points of view; |
| B\_2A\_K09 | The student acquires the competences of identifying ethical and social dilemmas as well as issues related to culture, philosophy, art and design, which enables her/him to participate in social and cultural events in a responsible and conscious manner; |

Załącznik nr 3
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Inżynieria środowiska, studia pierwszego stopnia (na podstawie uchwały nr 89 Senatu ZUT z dnia 28 czerwca 2019 r.)

**Programme of studies:** *environmental engineering*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** environmental engineering, mining and energy (73%),civil engineering and transport (27%)

**Name of qualification (Title conferred): inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| IS\_1A\_W01 | Has knowledge within the scope of mathematics, physics, chemistry, biology and other areas useful for formulating and solving simple tasks in environmental engineering; |
| IS\_1A\_W02 | Has basic knowledge within the scope of descriptive geometry and technical drawing concerning, in particular, the recording and reading of architectural and construction drawings, geodetic and geological maps with the use of CAD; |
| IS\_1A\_W03 | Has basic knowledge of technical mechanics and material strength useful for formulating and solving simple tasks in environmental engineering as well as designing devices for its needs; |
| IS\_1A\_W04 | Has basic knowledge within the scope of civil engineering, construction and structure of buildings as well as the manner of shaping construction components as regards heat, strength, humidity, air tightness and fire protection; |
| IS\_1A\_W05 | Has basic knowledge as regards soil mechanics, in particular within the scope connected with laying of heat ans sanitary networks in the ground as well as geotechnical tests used for selecting location of engineering structures, evaluation of their influence on neighbouring areas and the state of the environment as well as diagnostics of contaminated areas; |
| IS\_1A\_W06 | Knows the structure and properties of materials used in environmental engineering, with particular inclusion of installation materials, knows the methods of joining wires and networks into systems, has knowledge concerning the corrosion process and anti-corrosive protection; |
| IS\_1A\_W07 | Knows analytic calculation methods and computer programmes useful for design and calculation within the scope of environmental engineering; |
| IS\_1A\_W08 | Has knowledge within the scope of information technology, with particular inclusion of its applications in environmental engineering; |
| IS\_1A\_W09 | Has systematic, theory-based, general knowledge including key issues in environmental engineering concerning:•technical thermodynamics, • heat and mass exchange, • fluid mechanics, • biology and chemistry; |
| IS\_1A\_W10 | Has systematic, theory-based, general knowledge including processes and devices used in environmental engineering concerning, among other things: •fluid-flow and piston machines, •water and sewage management, •water and atmosphere protection, •melioration, •cooling technology, •ventilation and air-conditioning, •heating, •waste management; |
| IS\_1A\_W11 | Has systematic, theory-based, general knowledge including devices, fittings, securities, distribution systems, water, gas and energy supplies as well as adjustment of sanitary installations; |
| IS\_1A\_W12 | Has detailed knowledge connected with:•energy balancing, •heat conductivity, convection, radiation, heat penetration, •compressible and non-compressible fluid flow in installations, •compressible and non-compressible fluid flow in fluid-flow and piston machines used in environmental engineering, •thermodynamic transformations used in the main areas of environmental engineering, •fuel combustion, including low emission combustion; |
| IS\_1A\_W13 | Has detailed knowledge within the scope of natural sciences, including the influence of geological conditions on shaping of the natural environment, hydrological processes as well as the genesis and use of underground and surface waters; |
| IS\_1A\_W14 | Has detailed knowledge within the scope of protecting the environment from contaminations, noise and vibrations; |
| IS\_1A\_W15 | Has detailed knowledge within the scope of technological and design solutions in environmental engineering; |
| IS\_1A\_W16 | Has basic knowledge of developmental trends within the scope of environmental engineering, concerning, among other things:•systems of technical equipment in buildings, •heat and coolness sources, heat exchangers, • water and sewage networks, • technologies, systems and devices for water cleaning as well as sewage treatment plants, • air protection engineering, • hydrology, • waste management; |
| IS\_1A\_W17 | Has basic knowledge of the life cycle of technical devices, structures and systems in environmental engineering, including in particular:• systems of technical equipment in buildings, •energy supply systems, •heating, water supply and sewage networks, • water cleaning systems and sewage treatment plants, •air cleaning devices; |
| IS\_1A\_W18 | Knows basic methods, techniques, tools and materials used in solving simple engineering tasks within the scope of environmental engineering; |
| IS\_1A\_W19 | Has basic knowledge necessary to understand the conditions of engineering activity as well as the influence of various technical implementations on the environment, knows the standards and requirements used in environmental engineering; |
| IS\_1A\_W20 | Has basic knowledge concerning investment cost assessment, organisation and management of an investment process, quality management of installation works, conducting business activity and managing works in sanitary industry; |
| IS\_1A\_W21 | Knows the principles of measurements and organisation of work in laboratories; |
| IS\_1A\_W22 | Has knowledge related to basic issues within the scope of the programme of study; |
| IS\_1A\_W23 | Has elementary knowledge within the scope of intellectual property protection, knows the systems and sources of industrial property law and copyright law; has knowledge of he sources of patent information; |
| IS\_1A\_W24 | Has basic knowledge on the subject of the necessity to include micro- and macroeconomic conditions in the decision process and management of a construction enterprise; |
| IS\_1A\_W25 | Knows typical factors and types of dangers occurring in the industrial environment; knows the general principles of limiting hazard facors and risks in the working environment; |
| IS\_1A\_W26 | Knows basic terms concerning ethics, philosophy, sociology, art, design and culture; |
| IS\_1A\_W27 | Knows the system of education at a university, the principles of its functioning and the academic traditions; |
| **Skills** |
| IS\_1A\_U01 | Is able to classify devices and installations within the scope of environmental engineering; |
| IS\_1A\_U02 | Is able to select (analytic or numerical) tools for solving problems of analysis, design, execution of devices and installations within the scope of environmental engineering; |
| IS\_1A\_U03 | Is able to read architectural and construction drawings, geodetic and geological maps; is able to prepare graphic documentation in the environment of selected CAD programmes; |
| IS\_1A\_U04 | Is able to plan and conduct experiments, including computer measurements and simulations, interpret the obtained results and draw conclusions; |
| IS\_1A\_U05 | Is able to solve basic engineering issues within the scope of the programme of study; |
| IS\_1A\_U06 | Is able to prepare a simple cost estimation and schedule for sanitary works; |
| IS\_1A\_U07 | Has preparation required for working in an industrial environment and aaplies the OHS rules; |
| IS\_1A\_U08 | Is able to use Information Technologies, Internet resources and other sources for finding general information, for communication and for finding software aiding the work of a designer and organiser of works within the scope of environmental engineering; |
| IS\_1A\_U09 | Has mastered the ability to communicate in a foreign language on B2 level including the knowledge of technical language elements within the scope of environmental engineering; |
| IS\_1A\_U10 | Is able to apply regulations of building law and water law and environmental protection law; |
| IS\_1A\_U11 | Is able to select and use various materials and devices for constructing installations within the scope of environmental engineering; |
| IS\_1A\_U12 | Is able to organise work on the construction site and in another environment in accordance with the principles of technology and organisation of works; |
| IS\_1A\_U13 | Is able to prepare documentation concerning the accomplishment of an engineering task; |
| IS\_1A\_U14 | Is able to prepare and deliver a presentation concerning the results of carrying out an engineering task; |
| IS\_1A\_U15 | Has the ability to learn alone; |
| IS\_1A\_U16 | Is able to apply the knowledge within the scope of economics and management to make rational decisions in business activity; |
| IS\_1A\_U17 | Is able to differentiate non-material goods subject to protection, select the type of protection for an individual one as well as use patent literature and patent bases; |
| IS\_1A\_U18 | Is able to design and execute a simple device, structure, system or process typical for environmental engineering as well as evaluate the existing solutions; |
| IS\_1A\_U19 | Is able to select an appropriate technology for solving of a simple task within the scope of environmental engineering; |
| IS\_1A\_U20 | Is able to analyse and assess the influence of a device, process, technology or system on the environment; |
| IS\_1A\_U21 | Is able to analyse and assess the energy and economic efficiency of technical processes, in particular such used in environmental engineering; |
| IS\_1A\_U22 | Is able to interpret ethical and sociological programmes as well as analyse contemporary trends in culture, philosophy, art and design; |
| IS\_1A\_U23 | Behaves, both during the studies and in her/his professional work, in accordance with the principles of ethics, occupational health and safety, fire protection, the applicable legal regulations and social norms, including the academic traditions; |
| IS\_1A\_U24 | Has the awareness of the need of life-long learning; |
| **Social competences** |
| IS\_1A\_K01 | Is able to inspire and organise the process of learning of other people; |
| IS\_1A\_K02 | Understands non-technical aspects and consequences of engineering activity and its influence on environment; |
| IS\_1A\_K03 | Is responsible for the safety of her/his own and the team; |
| IS\_1A\_K04 | Is aware of the responsibility for her/his own work and the readiness to comply with the principles of teamwork and incur responsibility for joint accomplishment of a task; |
| IS\_1A\_K05 | Is aware of the importance to behave in a professional manner and comply with the principles of professional ethics; |
| IS\_1A\_K06 | Is able to think and act in an enterprising manner; |
| IS\_1A\_K07 | Understands the need to communicate the knowledge of civil engineering to the society. Formulates conclusions and describes the results of her/his own work. Is communicative in media presentations; |
| IS\_1A\_K08 | The student acquires the competences of identifying ethical and social dilemmas as well as issues related to culture, philosophy, art and design, which enables her/him to participate in social and cultural events in a responsible and conscious manner; |
| IS\_1A\_K09 | Is prepared to work in a team, is aware of the responsibility for her/his own work and the tasks performed in a team as well as behaving in a professional manner and respecting the rules of professional ethics; |

Załącznik nr 4
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Inżynieria środowiska studia drugiego stopnia (na podstawie uchwały nr 89 Senatu ZUT z dnia 28 czerwca 2019 r.)

**Programme of studies:** *environmental engineering*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** environmental engineering, mining and energy (66%),civil engineering and transport (34%)

**Name of qualification (Title conferred): magister inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| IS\_2A\_W01 | Knows basic terms concerning ethics, philosophy, sociology, art, design and culture; |
| IS\_2A\_W02 | Has advanced and in-depth knowledge within the scope of mathematics (including mainly mathematical statistics and probability calculus) as well as environmental chemistry useful for formulating and solving complex tasks in environmental engineering; |
| IS\_2A\_W03 | Has detailed knowledge within the scope of other programmes of study related to environmental engineering, including within the scope of electrical engineering, mechanical engineering, environmental protection, spatial planning, security engineering, in particular security of installations and other technical systems; |
| IS\_2A\_W04 | Knows the available environmental protection technologies, knows the principles of analysis of technical solutions in environmental engineering, civil engineering and industry as regards determining their influence on the environment; |
| IS\_2A\_W05 | Has knowledge on the subject of modelling processes, configuration of systems and devices on environmental engineering; |
| IS\_2A\_W06 | Has theory-based, detailed knowledge related to selected issues in automatic control, control and operation of technical devices as well as within the scope of dynamic properties of structures and systems in environmental engineering; |
| IS\_2A\_W07 | Has advanced knowledge connected with key issues within the scope of environmental engineering; |
| IS\_2A\_W08 | Has knowledge concerning management of undertakings within the scope of environmental engineering and civil engineering in the technical and economic aspect as well as organisation of an investment and cost assessment process; |
| IS\_2A\_W09 | Knows the principles of system, process and device analysis in environmental engineering within widely understood area of behaviours and influences; |
| IS\_2A\_W10 | Knows advanced methods and computer programmes used in solving complex tasks within the scope of environmental engineering; |
| IS\_2A\_W11 | Has knowledge concerning technical standards and norms within the scope of environmental engineering; |
| IS\_2A\_W12 | Knows the possibilities of using alternative sources of energy in civil engineering and industry; |
| IS\_2A\_W13 | Has basic knowledge within the scope of maintenance of structures and systems typical for environmental engineering; |
| IS\_2A\_W14 | Has knowledge of developmental trends and the most significant achievements in environmental engineering; |
| IS\_2A\_W15 | Has knowledge necessary to understand social, economic, legal and other non-technical conditions of engineering activity, including the influence of carrying out technical investments on the environment; has systematic knowledge within the scope of identifying dangers, knows the safety and protection measures as well as the criteria of their selection; |
| IS\_2A\_W16 | Knows and understands basic concepts and rules within the scope of industrial property protection and copyrights; |
| **Skills** |
| IS\_2A\_U01 | Is able to interpret ethical and sociological programmes as well as analyse contemporary trends in culture, philosophy, art and design; |
| IS\_2A\_U02 | Is able to obtain information from literature, data bases and other properly selected sources, also in a foreign language; is able to integrate the obtained information, interpret it and evaluate it critically as well as draw conclusions, formulate and sufficiently justify opinions; |
| IS\_2A\_U03 | Is able to communicate with the use of various techniques with professionals and others, also in a foreign language; |
| IS\_2A\_U04 | Is able to prepare a scientific study in Polish and a short scientific report in a foreign language presenting the results of his/her own scientific research; |
| IS\_2A\_U05 | Is able to prepare and present, in Polish and a foreign language, an oral presentation concerning detailed issues within the scope of environmental engineering; |
| IS\_2A\_U06 | Is able to determine the directions of further learning and carry out the process of self-education; |
| IS\_2A\_U07 | Has the ability to use a foreign language within the scope of fields of science and scientific disciplines appropriate for the programme of study, compliant with the requirements specified for B2+ level of the European Framework of Reference; |
| IS\_2A\_U08 | Uses advanced specialist tools in order to find useful information, communicate and obtain software aiding the work of a designer and an organiser of technical processes in environmental engineering; |
| IS\_2A\_U09 | Is able to prepare technical documentation in the environment of selected CAD programmes; |
| IS\_2A\_U10 | Is able to, depending on the research problem, formulate assumptions concerning the experiments, including measurements and numerical simulations, plan and conduct research, interpret the obtained results and draw conclusions; |
| IS\_2A\_U11 | Is able to use analytic, simulation and experimental methods to formulate and solve engineering tasks as well as simple research problems within the scope of environmental engineering; |
| IS\_2A\_U12 | While formulating and solving engineering tasks, is able to integrate knowledge within the scope of fields of science and scientific disciplines related to environmental engineering such as: civil engineering, power engineering, electrical engineering, security engineering, spatial planning, economic sciences and environmental protection as well as use a systemic approach, also including non-technical aspects; |
| IS\_2A\_U13 | Is able to formulate and test hypotheses connected with engineering problems and simple research problems; |
| IS\_2A\_U14 | Is able to assess the usefulness and possibility of using new (technical and technological) achievements in environmental engineering; |
| IS\_2A\_U15 | Is able to classify simple and complex structures within the scope of environmental engineering; |
| IS\_2A\_U16 | Is able to identify and formulate a specification of complex engineering tasks characteristic for environmental engineering, including atypical tasks, taking into consideration their non-technical aspects, including in particular the influence on the natural environment; |
| IS\_2A\_U17 | Is able to conduct measurements and tests of systems, processes and devices in environmental engineering within the scope of analysis of their proper operation, environmental impact and identification; |
| IS\_2A\_U18 | Is able to assess the usefulness of methods and tools used for solving engineering tasks characteristic for environmental engineering; |
| IS\_2A\_U19 | Is able to select, for solving of an engineering task within the scope of environmental engineering, methods, techniques and tools (analytic or numerical ones), adjust the existing tools an develop new ones; |
| IS\_2A\_U20 | Is able to design elements, installations, systems and device included within the scope of environmental engineering; |
| IS\_2A\_U21 | Is able to find solutions alternative to the existing ones within the scope of systems, processes and devices in environmental engineering; |
| IS\_2A\_U22 | Is able to design, in accordance with a predefined specification including also non-technical aspects, a complex structure or technological process appropriate for the specialisation studied and specify, at least in part, the manner of its accomplishment, using appropriate methods, techniques and tools; |
| IS\_2A\_U23 | Is able to assess the basic parameters: time, cost, quality during execution of undertakings within the scope of environmental engineering and implement correcting actions; is able to prepare the effectiveness analysis of undertakings within the scope of environmental engineering and perform risk analysis in the context of entrepreneurship economics, plan basic investment parameters; |
| IS\_2A\_U24 | Is able to assess risks while carrying out construction works and implement appropriate safety rules; |
| IS\_2A\_U25 | Is able to solve problems connected with operation of environmental engineering structures Is able to propose improvements of the existing technical solutions; |
| IS\_2A\_U26 | Has the awareness of the need of life-long learning; |
| **Social competences** |
| IS\_2A\_K01 | The student acquires the competences of identifying ethical and social dilemmas as well as issues related to culture, philosophy, art and design, which enables her/him to participate in social and cultural events in a responsible and conscious manner; |
| IS\_2A\_K02 | Is able to professionally define, classify and apply the priorities used for accomplishment of an undertaken engineering task; |
| IS\_2A\_K03 | Is responsible for reliability of the obtained results of her/his work and evaluation of the work of a team of subordinates; |
| IS\_2A\_K04 | Is aware of their importance and understands non-technical aspects and consequences of engineering activity, including its influence on the environment and the related responsibility for the decisions taken; |
| IS\_2A\_K05 | Is aware of the necessity of sustainable development in environmental engineering; |
| IS\_2A\_K06 | Is able to think and act in a creative and enterprising manner; |
| IS\_2A\_K07 | Is aware of the need to raise professional and personal competences; extends and develops alone the knowledge within the scope of modern processes, technologies and management methods in environmental engineering; |
| IS\_2A\_K08 | Properly identifies and solves dilemmas related to job performance; is aware of acting in compliance with the rules of professional ethics; |
| IS\_2A\_K09 | Understands the need to communicate to the society the knowledge on the subject of environmental engineering, formulates and presents information and opinions in a generally understandable manner with justification of various points of view; |

Załącznik nr 5
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Budownictwo studia pierwszego stopnia (na podstawie uchwały nr 109 Senatu ZUT z dnia 31 maja 2021 r.)

**Programme of studies:** C*ivil Engineering*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** civil engineering and transport (100%)

**Name of qualification (Title conferred): inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| B\_1A\_W01 | Knows and understands basic knowledge of selected areas of mathematics, physics, chemistry and other areas relevant to civil engineering, necessary to formulate and solve simple problems concerning civil engineering |
| B\_1A\_W02 | Knows the rules of descriptive geometry and technical drawing concerning saving and reading architectural and construction drawings, geodetic and geological maps using CAD |
| B\_1A\_W03 | Knows the rules and properly defines cartographic projectionsKnows the basic geodetic works in civil engineering |
| B\_1A\_W04 | Knows and understands basic knowledge of general mechanics and strength of materials |
| B\_1A\_W05 | Knows and understands basic general knowledge of fluid mechanics and hydrology |
| B\_1A\_W06 | Knows and understands the principles of structural mechanics and the analysis of bar structures in the field of statics |
| B\_1A\_W07 | Knows the standards and technical guidelines used in civil engineering |
| B\_1A\_W08 | Knows and understands the principles of construction and dimensioning of building structure elements |
| B\_1A\_W09 | Knows and understands the basic principles of foundation work |
| B\_1A\_W10 | Knows and understands the principles of analysis and construction of selected general and industrial construction facilities, transport infrastructure and water engineering facilities |
| B\_1A\_W11 | Knows and understands the basic knowledge of designing the land transport infrastructure facilities |
| B\_1A\_W12 | Knows and understands basic general knowledge in the field of building systems |
| B\_1A\_W13 | Knows and understands basic general knowledge in the field of civil engineering and knows its basic terminology in foreign language |
| B\_1A\_W14 | Knows and understands selected analytical methods and computer programs supporting structural design and construction management plans |
| B\_1A\_W15 | Knows the most commonly used construction materials and products, as well as the basics of their production technology  |
| B\_1A\_W16 | Knows and understands the basics of construction physics |
| B\_1A\_W17 | Knows and understands typical engineering technologies used in construction |
| B\_1A\_W18 | Knows and understands basic general knowledge in the field of building quality management and its procedures, knows the work standards and guidelines in civil engineering and the organizations and principles of construction management |
| B\_1A\_W19 | Knows and understands basic general knowledge in the field of organization and investment management and conducting business activities in civil engineering |
| B\_1A\_W20 | Knows and understands the construction investments’ impact on the environment |
| B\_1A\_W21 | Knows and understands basic terminology and principles of intellectual property protection, including patents and copyright |
| B\_1A\_W22 | Knows and understands basic knowledge on product life-cycle, building facilities and technical systems in civil engineering |
| B\_1A\_W23 | Knows and understands basic general knowledge on development trends in civil engineering |
| B\_1A\_W24 | Knows and understands basic general knowledge on the necessity of taking into account micro- and macro-economic conditions in decision-making process |
| B\_1A\_W25 | Knows basic terminology in law, economics, ethics, philosophy, sociology, arts, design and culture |
| B\_1A\_W26 | Knows the tertiary education system, understands its principles and academic habits  |
| **Skills** |
| B\_1A\_U01 | Can classify building objects |
| B\_1A\_U02 | Can prepare the list of loads operating on construction objects |
| B\_1A\_U03 | Can correctly define computational models of computer structure analysis |
| B\_1A\_U04 | Can perform a static analysis of statically determinate and indeterminate rod structures, define the stresses and strains in structural elements and set their dimensions |
| B\_1A\_U05 | Can correctly select tools (analytical or numerical) to solve the problems of analysis, design, execution of structural elements and building objects |
| B\_1A\_U06 | Can use selected computer programs supporting design decisions in construction industry and critically evaluate the obtained results |
| B\_1A\_U07 | Can design selected elements and simple engineering structures as well as evaluate existing solutions |
| B\_1A\_U08 | Can solve basic engineering issues in civil engineering |
| B\_1A\_U09 | Can design simple buildings’ foundations  |
| B\_1A\_U10 | Can plan, carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions |
| B\_1A\_U11 | Can read architectural and construction drawings, geodetic and geological maps. Can prepare graphic documentation in CAD programs |
| B\_1A\_U12 | Can prepare simple cost estimate and construction works’ schedule |
| B\_1A\_U13 | Can assess the risks accompanying the implementation of construction works and implement appropriate safety measures  |
| B\_1A\_U14 | Can use information technology, internet resources and other sources to search for general information, communication and software supporting designer’s work and the construction works’ organizer |
| B\_1A\_U15 | Can communicate in foreign modern language at B2 level, including technical vocabulary on civil engineering |
| B\_1A\_U16 | Can apply the provisions of construction and water law |
| B\_1A\_U17 | Can select materials and construction products |
| B\_1A\_U18 | Can organize work on the construction site in accordance with the principles of construction technology and its organization |
| B\_1A\_U19 | Can prepare the documentation regarding the completion of engineering work |
| B\_1A\_U20 | Can prepare the documentation regarding the preparation and execution of building investment |
| B\_1A\_U21 | Can prepare and deliver a presentation about the outcome of engineering work and can discuss its results |
| B\_1A\_U22 | Can independently plan and carry out the process of self-learning  |
| B\_1A\_U23 | Can use knowledge on Economics in order to take reasonable decisions in business activities |
| B\_1A\_U24 | Can distinguish the goods subject to protection, can choose the relevant kind of protection for certain good, can make use of patent literature and patent databases |
| B\_1A\_U25 | Can interpret ethical and sociological programs, on law and economics, as well as analyze contemporary trends in culture, philosophy, arts and design |
| B\_1A\_U26 | Can act, during studies and professional work, in accordance with the ethical principles, safety and fire protection regulations, law and social standards, including academic customs |
| B\_1A\_U27 | Can work individually and collaborate in a team |
| **Social competences** |
| B\_1A\_K01 | Is ready to independently undertake different tasks, demonstrating proper work organization |
| B\_1A\_K02 | Is ready to reflect on non-technical aspects and effects of engineering activities and their impact on environment |
| B\_1A\_K03 | Is ready to follow and disseminate models of proper conduct in the work environment and beyond |
| B\_1A\_K04 | Is ready to think creatively while solving engineering problems; effectively uses the ability to think creatively and can act in an entrepreneurial way  |
| B\_1A\_K05 | Is ready to act professionally and take into account ethical aspects related to professional work and its ethic |
| B\_1A\_K06 | Is ready to provide the society with knowledge on construction.Can draw conclusions and the results of own work in an accessible way. Is communicative in presentations |
| B\_1A\_K07 | Is ready to communicate effectively and initiate social activities that would allow to responsibly and consciously participate in social and cultural events |

Załącznik nr 6
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Budownictwo studia drugiego stopnia (na podstawie uchwały nr 109 Senatu ZUT z dnia 31 maja 2021 r**.)**

**Programme of studies:** C*ivil Engineering*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** civil engineering and transport (100%)

**Name of qualification (Title conferred): magister inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| B\_2A\_W01 | Knows and understands in an in-depth manner knowledge of maths and other areas of science, useful for formulating and solving complex tasks in the field of civil construction |
| B\_2A\_W02 | Knows and understands advanced general knowledge in the field of civil engineering. Knows specialized terminology in a foreign language consistent with the field of studies |
| B\_2A\_W03 | Knows and understands the basics of continuum mechanics. Knows the principles of the analysis of statics of surface and solid structures |
| B\_2A\_W04 | Knows and understands advanced genera knowledge on the issues of modeling structures and theoretical foundations of the finite element method |
| B\_2A\_W05 | Knows and understands detailed general knowledge in the field of selected issues related to civil engineering |
| B\_2A\_W06 | Knows and understands detailed general knowledge including key issues on civil engineering |
| B\_2A\_W07 | Knows and understands the principles of managing construction projects in the technical and economic aspect |
| B\_2A\_W08 | Knows and understands the principles of analysis, construction and dimensioning of complex structures and building objects |
| B\_2A\_W09 | Knows and understands the advanced methods and computer programs used in solving complex issues in the field of civil engineering |
| B\_2A\_W10 | Knows and understands advanced general knowledge on standards and technical standards relevant to the studied discipline |
| B\_2A\_W11 | Knows and understands the principles of industrial production of building materials. Knows and understands the principles of production technology and the execution of building elements and structures |
| B\_2A\_W12 | Knows and understands advanced general knowledge on maintenance of civil engineering typical facilities and systems |
| B\_2A\_W13 | Knows and understands advanced general knowledge about development trends and the most important latest developments in civil engineering. Knows and understands basics principles on developing individual entrepreneurship in civil engineering |
| B\_2A\_W14 | Knows and understands advanced general knowledge necessary to understand social, economic, legal and other non-technical conditions of engineering activities, including the impact of construction investment on environment  |
| B\_2A\_W15 | Knows and understands the principles of intellectual property protection and copyright |
| B\_2A\_W16 | Knows and understands the advanced terminology of ethics, economics, law, philosophy, sociology, art, design and culture  |
| **Skills** |
| B\_2A\_U01 | Can obtain information from literature, database and other properly selected sources, including those in foreign language;Can analyze and interpret the obtained information as well as critically assess, draw conclusions, formulate and comprehensively justify the opinions |
| B\_2A\_U02 | Can communicate using various techniques in a professional environment as well as in other settings, including in a foreign language |
| B\_2A\_U03 | Can prepare scientific study in Polish and a short scientific report in foreign language, presenting the result of their own research |
| B\_2A\_U04 | Can prepare and deliver an oral presentation on specific civil engineering issues; can make contact with the listeners |
| B\_2A\_U05 | Can determine the directions of further learning and implement the process of self-learning |
| B\_2A\_U06 | Can speak a foreign language including specialist vocabulary according two the requirements of level B2 plus of the Common European Framework for Languages |
| B\_2A\_U07 | Can use the advanced specialist tools to search for useful information and communication, and to obtain software supporting the designer and organizer of construction processes |
| B\_2A\_U08 | Can prepare technical documentation in the environment of selected CAD programs |
| B\_2A\_U09 | Can, in accordance with the reaserch problem, formulate the assumptions regarding the experiments, incl. numerical measurements and simulation; can plan and conduct research, interpret its outcome, assess critically and draw conclusions |
| B\_2A\_U10 | Can use analytical, simulation and experimental methods to formulate and solve engineering issues |
| B\_2A\_U11 | While formulating and solving engineering problems the student can integrate knowledge in the field of science and scientific disciplines, related to civil engineering , and can apply a systemic approach, taking into account non-technical aspects |
| B\_2A\_U12 | Can formulate and test hypotheses concerning engineering issues and simple reaserch problems |
| B\_2A\_U13 | Can assess the usefulness of latest achievements in civil engineering |
| B\_2A\_U14 | Can clarify simple and complex building objects |
| B\_2A\_U15 | Can assess and comply the loads acting on building objects |
| B\_2A\_U16 | Can identify and formulate a specification of complex engineering tasks, characteristic of the studied specialty, including non-standard tasks, taking into account their non-technical aspects |
| B\_2A\_U17 | Can prepare static analysis of surface structures |
| B\_2A\_U18 | Can evaluate the usefulness of methods and tools for solving engineering issues  |
| B\_2A\_U19 | Can correctly choose methods, techniques and tools (analytical or numerical) to solve engineering tasks, adopting current tools and developing new ones |
| B\_2A\_U20 | Can design the elements and complex constructions, and building objects |
| B\_2A\_U21 | Is able to dimension construction details in various objects typical for civil engineering |
| B\_2A\_U22 | In compliance with given specification and taking into account non-technical aspects, the student can design complex construction object or technological process and specify at least partially, the method of their implementation, using appropriate methods, techniques and tools used in civil engineering |
| B\_2A\_U23 | Can assess te basic parameters:time, costs, quality while implementing the construction projects and implement proper corrective actions |
| B\_2A\_U24 | Can prepare the effectiveness analysis of construction projects and assess the financial risk, as well as plan the main investment parameters |
| B\_2A\_U25 | Can solve problems related to the exploitation and diagnosis of construction objectsCan suggest the improvements to existing technical solutions |
| B\_2A\_U26 | Can interpret the ethical and sociological programs in the field of law and economics, can analyze contemporary trends in culture, philosophy, art and design |
| B\_2A\_U27 | Can independently plan and implement life-long self education, and guide others in this regard |
| **Social competences** |
| B\_2A\_K01 | Is ready to independently integrate the acquired knowledge and undertake new and comprehensive activities in an organized manner in order to carry out the engineering task, also in conditions of limited access to the necessary information |
| B\_2A\_K02 | Is ready to inspire others and organize the process of self-improvement in professional area |
| B\_2A\_K03 | Is ready to reflect on non-technical aspects and the effects of engineering activities, including its impact on environment in connection with the responsibilities for undertaken decisions |
| B\_2A\_K04 | Is ready to initiate activities in the field of sustainable development in civil engineering |
| B\_2A\_K05 | Is ready to take decisions in creative and entrepreneurial way  |
| B\_2A\_K06 | Is ready to improve professional and personal competence, independently expands knowledge in the field of modern processes, technologies and management methods in civil engineering |
| B\_2A\_K07 | Is ready to identify and resolve dilemmas related to the profession, is aware how to act ethically |
| B\_2A\_K08 | Is ready to transfer professional knowledge; can formulate and deliver information and opinions in a comprehensible manner explaining various standpoints |
| B\_2A\_K09 | Is ready to identify ethical and sociological dilemmas as well as issues related to culture, philosophy and art, which allow to responsibly and consciously participate in social and cultural events |

Załącznik nr 7
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Inżynieria środowiska studia pierwszego stopnia (na podstawie uchwały nr 109 Senatu ZUT z dnia 31 maja 2021 r.)

**Programme of studies:** *Environmental Engineering*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** environmental engineering, mining and energy (73%),civil engineering and transport (27%)

**Name of qualification (Title conferred): inżynier**

**Description of the planned educational effects**

|  |  |
| --- | --- |
| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| IS\_1A\_W01 | Knows and understands the basic knowledge in the field of mathematics, physics, chemistry, biology, and other areas that are useful for formulating and solving simple tasks in the field of environmental engineering |
| IS\_1A\_W02 | Knows the principles of descriptive geometry and technical drawing, particularly regarding the notation and interpretation of architectural drawings, construction drawings, geodetic maps, and geological maps using CAD |
| IS\_1A\_W03 | Knows and understands the basic knowledge of technical mechanics and strength of materials that is useful for formulating and solving simple tasks in the field of environmental engineering and designing devices for its needs |
| IS\_1A\_W04 | Knows and understands the basic knowledge in the field of construction, building structures, and the way components are shaped in terms of thermal, structural, moisture-related, and air tightness aspects |
| IS\_1A\_W05 | Knows and understands the basic knowledge related to soil mechanics, particularly in the context of installing heat and sanitary networks in the ground, as well as geotechnical investigations used for selecting the location of engineering structures, assessing their impact on adjacent areas and the environment, and diagnosing contaminated areas |
| IS\_1A\_W06 | Knows and understands the structure and properties of materials used in environmental engineering, with particular emphasis on installation materials; is familiar with methods of connecting pipes and networks into systems and has knowledge about the corrosion process and anti-corrosion protection measures |
| IS\_1A\_W07 | Knows and understands selected analytical computational methods and computer programs that are useful for designing and making calculations in the field of environmental engineering |
| IS\_1A\_W08 | Knows and understands the basics of information technology, with particular emphasis on its applications in environmental engineering |
| IS\_1A\_W09 | Knows and understands basic general knowledge covering key topics in environmental engineering, including:• technical thermodynamics,• heat and mass transfer,• fluid mechanics,• biology and chemistry |
| IS\_1A\_W10 | Knows and understands the basic knowledge covering the processes and devices used in environmental engineering, including:• fluid and reciprocating machinery,• water and wastewater management,• water and air pollution control,• land reclamation,• refrigeration technology,• ventilation and air conditioning,• heating systems,• waste management,• renewable energy sources.Knows the basic terminology in a modern foreign language |
| IS\_1A\_W11 | Knows and understands the basic general knowledge covering devices, fittings, safeguards, distribution systems, water supply, gas supply, energy supply, and regulation in sanitary installations |
| IS\_1A\_W12 | Knows and understands basic knowledge related to:• energy balancing,• heat conduction, convection, radiation, heat transfer,• flow of compressible and incompressible fluids in installations,• flow of compressible and incompressible fluids in flow and reciprocating machines used in environmental engineering,• thermodynamic transformations used in major areas of environmental engineering,• fuel combustion, including low-emission combustion |
| IS\_1A\_W13 | Knows and understands basic knowledge in the field of Earth science, including the impact of geological conditions on shaping the natural environment, hydrological processes, and the origin and utilization of groundwater and surface water |
| IS\_1A\_W14 | Knows and understands basic knowledge in the field of environmental protection against pollution, noise, and vibrations |
| IS\_1A\_W15 | Knows and understands basic knowledge in the field of technological and design solutions in environmental engineering |
| IS\_1A\_W16 | Knows and understands basic knowledge about development trends in environment engineering, including:* technical equipment systems for buildings,
* heat and cooling sources, heat exchangers,
* water supply sewage networks,
* water treatment technologies, wastewater treatment,
* air pollution control engineering
* geotechnics,
* hydrology

waste management |
| IS\_1A\_W17 | Knows and understands the basic knowledge about the life cycle of devices, objects, and technical systems in environmental engineering, including in particular:• technical equipment systems of buildings,• energy supply systems,• heating, water supply, and sewage networks,• water treatment and wastewater treatment systems,• air protection devices |
| IS\_1A\_W18 | Knows and understands the basic methods, techniques, tools, and materials used in solving simple engineering tasks in the field of environmental engineering |
| IS\_1A\_W19 | Knows and understands the basic knowledge necessary to understand the legal aspects of engineering activities and the impact of various technical implementations on the environment;is familiar with standards and technical guidelines used in environmental engineering |
| IS\_1A\_W20 | Knows and understands the basic knowledge regarding the valuation of investment costs, organization and management of the investment process, quality management of installation works, conducting business activities, and managing construction projects in the sanitation industry |
| IS\_1A\_W21 | Knows the principles of conducting measurements and organizing work in laboratories |
| IS\_1A\_W22 | Knows and understands the knowledge associated with the basic concepts within the scope of the studied field |
| IS\_1A\_W23 | Knows and understands the basic concepts and principles related to intellectual property, systems and sources of industrial property rights, copyright law, and sources of patent information |
| IS\_1A\_W24 | Knows and understands the basic knowledge regarding the need to consider micro- and macroeconomic conditions in the decision-making process and the management of a construction company |
| IS\_1A\_W25 | Knows and understands typical types of hazards occurring in industrial environment; is familiar with general principles for limiting exposure factors and hazards in the workplace environment |
| IS\_1A\_W26 | Knows the basic terminology related to law, economics, ethics, philosophy, sociology, art, design, and culture |
| IS\_1A\_W27 | Knows the higher education system, understands the principles of its functioning, and is familiar with academic customs and practices |
| **Skills** |
| IS\_1A\_U01 | Can classify devices and installations in the field of environmental engineering |
| IS\_1A\_U02 | Can correctly select analytical or numerical tools for solving problems related to analysis, design, and implementation of devices and installations in the field of environmental engineering |
| IS\_1A\_U03 | Can read architectural, construction drawings, as well as geodetic and geological maps; can also prepare graphical documentation in the environment of selected CAD software programs |
| IS\_1A\_U04 | Can plan and conduct experiments, including measurements and computer simulations, interpret the obtained results, and draw conclusions |
| IS\_1A\_U05 | Can solve basic engineering problems within the scope of the studied field |
| IS\_1A\_U06 | Can prepare a basic cost estimate and schedule for sanitary works |
| IS\_1A\_U07 | Can work in an industrial environment and apply occupational health and safety principles |
| IS\_1A\_U08 | Can use information technology, Internet resources, and other sources to search for general information, communicate, and search for software tools to assist in the work of a designer and organizer of environmental engineering projects |
| IS\_1A\_U09 | Can communicate in a modern language at a B2 level, including knowledge of technical language elements related to environmental engineering |
| IS\_1A\_U10 | Can apply the regulations of building law, water law, geological law, and environmental protection in practice |
| IS\_1A\_U11 | Can select and utilize various materials and equipment in the construction of installations in the field of environmental engineering |
| IS\_1A\_U12 | Can organize work on construction sites and in other work environments according to the principles of technology and work organization |
| IS\_1A\_U13 | Can prepare documentation regarding the implementation of an engineering task and conduct its analysis |
| IS\_1A\_U14 | Can prepare and deliver a presentation regarding the results of the implementation of an engineering task and engage in discussions about them |
| IS\_1A\_U15 | Is capable of self-learning |
| IS\_1A\_U16 | Can use knowledge in the field of economics and management to make rational decisions in business activities |
| IS\_1A\_U17 | Is capable of distinguishing intangible goods subject to protection, selecting the type of protection for a given good, and being able to use patent literature and patent databases |
| IS\_1A\_U18 | Can design and implement simple devices, objects, systems, or processes typical for environmental engineering, as well as evaluate existing solutions |
| IS\_1A\_U19 | Can select the appropriate technology for solving a simple task in the field of environmental engineering |
| IS\_1A\_U20 | Can analyze and assess the impact of a device, process, technology, or system on the environment |
| IS\_1A\_U21 | Can perform an analysis and evaluation of the energy efficiency, economic viability, and environmental impact of technical processes, particularly those used in environmental engineering |
| IS\_1A\_U22 | Can interpret ethical and sociological programs, as well as analyze contemporary trends in culture, philosophy, art, and design |
| IS\_1A\_U23 | Can adhere to the principles of ethics, occupational health and safety, fire protection, applicable laws, and social norms, including academic customs, during both academic studies and professional work |
| IS\_1A\_U24 | Can independently plan and pursue lifelong learning throughout life |
| **Social competences** |
| IS\_1A\_K01 | Is ready to independently undertake independent work, demonstrating proper work organization, including working effectively as part of a team |
| IS\_1A\_K02 | Is ready to engage in reflection on the non-technical aspects and consequences of engineering activities, as well as their impact on the environment |
| IS\_1A\_K03 | Is ready to adhere to and promote the principles of proper conduct in the workplace and beyond |
| IS\_1A\_K04 | Is ready to critically assess the knowledge, the information I receive, and the outcomes of work |
| IS\_1A\_K05 | Is ready to act in a professional manner and consider the ethical aspects associated with work and professional ethos |
| IS\_1A\_K06 | Is ready to engage in creative thinking while solving engineering problems. Can effectively use creative thinking skills and engage in entrepreneurial approaches to work |
| IS\_1A\_K07 | Is ready to disseminate knowledge to society regarding environmental engineering issues |
| IS\_1A\_K08 | Is ready to effectively communicate and initiate actions within society, as well as actively participate in social and cultural events with awareness |
| IS\_1A\_K09 | Is ready to work as part of a team and take responsibility for their own work and the tasks assigned within the team; can conduct in a professional manner and adhere to professional ethics principles |

Załącznik nr 8
do zarządzenia nr 121 Rektora ZUT z dnia 30 października 2023 r.

Inżynieria środowiska studia drugiego stopnia (na podstawie uchwały nr 109 Senatu ZUT z dnia 31 maja 2021 r.)

**Programme of studies:** *Environmental Engineering*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Engineering and technology

**Discipline of science:** environmental engineering, mining and energy (66%),civil engineering and transport (34%)

**Name of qualification (Title conferred): magister inżynier**

**Description of the planned educational effects**

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| **Code** | **Learning outcomes for programme of studies** |
| **Knowledge** |
| IS\_2A\_W01 | Knows and understands advanced terminology related to ethics, law, economics, philosophy, sociology, art, design, and culture |
| IS\_2A\_W02 | Knows and understands advanced and in-depth theoretical knowledge in mathematics, including mathematical statistics and probability theory, as well as environmental chemistry, which is useful for formulating and solving complex tasks in the field of environmental engineering |
| IS\_2A\_W03 | Knows and understands advanced knowledge and understanding of the general areas of study related to environmental engineering, including electrical engineering, mechanical engineering, environmental protection, spatial planning, and safety engineering, particularly safety of installations and other technical systems |
| IS\_2A\_W04 | Knows and understands advanced technologies for environmental protection, principles of analyzing technical solutions in environmental engineering, construction, and industry to assess their impact on the environment |
| IS\_2A\_W05 | Knows and has comprehensive understanding of advanced general knowledge related to process modeling, system configuration, and devices in environmental engineering |
| IS\_2A\_W06 | Has advanced general knowledge related to selected topics in automation, control, and operation of technical devices, as well as the dynamic properties of objects and systems in environmental engineering |
| IS\_2A\_W07 | Has advanced general knowledge in key areas assigned to the field of environmental engineering. Is also familiar with specialized terminology in foreign languages related to the studied field |
| IS\_2A\_W08 | Is familiar with and understands advanced general knowledge related to project management in the field of environmental and civil engineering, including technical-economic aspects, as well as the organization of the investment process and cost estimation. |
| IS\_2A\_W09 | Is familiar with and understands the principles of analyzing systems, processes, and devices in environmental engineering within the broad scope of behaviors and interactions. |
| IS\_2A\_W10 | Is familiar with and understands advanced methods and computer programs used in solving complex tasks in the field of environmental engineering. |
| IS\_2A\_W11 | Is familiar with and understands general knowledge regarding standards and technical norms in the field of environmental engineering |
| IS\_2A\_W12 | Knows and understands advanced general knowledge about the possibilities of utilizing alternative energy sources in the construction and industrial sectors |
| IS\_2A\_W13 | Knows and understands general knowledge regarding the maintenance of facilities and systems typical for environmental engineering |
| IS\_2A\_W14 | Knows and understands general knowledge about developmental trends and significant new advancements in environmental engineering |
| IS\_2A\_W15 | Knows and understands advanced general knowledge necessary for understanding the social, economic, legal, and other non-technical aspects of engineering activities, including the impact of technical investments on the environment. They have organized knowledge in identifying hazards, understanding safety and protection measures, and criteria for their selection |
| IS\_2A\_W16 | Knows and understands the basic concepts and principles of industrial property protection and copyright law |

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| **Skills** |
| IS\_2A\_U01 | Is capable of interpreting ethical and sociological programs, as well as programs related to law, economics, and analyzing contemporary trends in culture, philosophy, art, and design |
| IS\_2A\_U02 | Is able to gather information from literature, databases, and other properly selected sources, including foreign language sources. They can integrate the acquired information, interpret and critically evaluate it, draw conclusions, and formulate and thoroughly justify opinions |
| IS\_2A\_U03 | Is capable of effectively communicating using various techniques in a professional environment and in other settings, including foreign languages |
| IS\_2A\_U04 | Is able to prepare a scientific paper in Polish and a brief scientific report in a foreign language, presenting the results of their own scientific research |
| IS\_2A\_U05 | Is capable of preparing and delivering an oral presentation in both Polish and a foreign language, focusing on detailed topics within the field of environmental engineering |
| IS\_2A\_U06 | Is capable of identifying directions for further learning and undertaking the process of self-education |
| IS\_2A\_U07 | Can speak a foreign language, including specialized terminology in the fields of science and academic disciplines relevant to chosen field of study, in accordance with the requirements specified for the B2+ level of the Common European Framework of Reference for Languages |
| IS\_2A\_U08 | Is capable of using advanced specialized tools for searching useful information, communication, and acquiring software to assist in the work of a designer and organizer of technical processes in environmental engineerinig |
| IS\_2A\_U09 | Can create technical documentation in the environment of selected CAD software programs |
| IS\_2A\_U10 | Is capable of formulating assumptions regarding experiments, including measurements and numerical simulations, in accordance with the research problem; can plan and conduct research, interpret the obtained results, and draw conclusions |
| IS\_2A\_U11 | Can use analytical, simulation, and experimental methods to formulate and solve engineering tasks and simple research problems in the field of environmental engineering |
| IS\_2A\_U12 | Is capable of integrating knowledge from various scientific disciplines related to environmental engineering, such as construction, energy, electrical engineering, safety engineering, spatial planning, economics, and environmental protection, in formulating and solving engineering tasks. Can also apply a systems approach that considers both technical and non-technical aspects |
| IS\_2A\_U13 | Can formulate and test hypotheses related to engineering problems and simple research problems |
| IS\_2A\_U14 | Is able to assess the usefulness and potential of new advancements (techniques and technologies) in environmental engineering. |
| IS\_2A\_U15 | Is able to classify complex objects in the field of environmental engineering |
| IS\_2A\_U16 | Is able to identify and formulate specifications for complex engineering tasks specific to environmental engineering, including non-typical tasks, taking into account their non-technical aspects, particularly their impact on the natural environment |
| IS\_2A\_U17 | Is able to perform measurements and studies of systems, processes, and devices in environmental engineering, focusing on analyzing their proper functioning, environmental impact, and identification of key parameters |
| IS\_2A\_U18 | Is able to assess the suitability of methods and tools used to solve engineering tasks specific to environmental engineering |
| IS\_2A\_U19 | Is able to select appropriate methods, techniques, and tools (analytical or numerical) to solve engineering tasks in the field of environmental engineering; can adapt existing tools to suit the requirements of the specific engineering problem and develop new tools if necessary |
| IS\_2A\_U20 | Is capable of designing elements, installations, systems, and devices within the field of environmental engineering |
| IS\_2A\_U21 | Is capable of finding alternative solutions in relation to existing systems, processes, and devices in environmental engineering |
| IS\_2A\_U22 | Is able to design a complex object or technological process in accordance with the given specification, taking into account non-technical aspects. Additionally, can determine, at least partially, the method of its implementation using appropriate methods, techniques, and tools, relevant to the studied specialization |
| IS\_2A\_U23 | Is capable of assessing the fundamental parameters such as time, cost, and quality in the implementation of environmental engineering projects and implementing appropriate corrective actions; can prepare an analysis of the effectiveness of environmental engineering projects and evaluate risk in the context of the company's economics;additionally, can plan the basic parameters of investments |
| IS\_2A\_U24 | Can assess the hazards involved in construction and installation works and implement appropriate safety measures |
| IS\_2A\_U25 | Can solve problems related to the operation of environmental engineering facilities. He can propose improvements to existing technical solutions |
| IS\_2A\_U26 | Can independently plan and implement own lifelong learning and guide others in this regard |
| **Social competences** |
| IS\_2A\_K01 | Is ready to identify ethical and sociological dilemmas and address issues related to culture, philosophy, and art; which enables to responsibly and consciously participate in social and cultural events |
| IS\_2A\_K02 | Is ready to independently integrate acquired knowledge and undertake new and comprehensive actions in an organized manner to accomplish the engineering task at hand, even in conditions of limited access to necessary information |
| IS\_2A\_K03 | Is ready to enhance professional and personal competencies and independently supplement and expand the knowledge in the field of modern processes, technologies, and management methods in environmental engineering |
| IS\_2A\_K04 | Is ready to reflect on the non-technical aspects and consequences of engineering activities, including their impact on the environment, while being mindful of the responsibility associated with decision-making |
| IS\_2A\_K05 | Is ready to initiate actions related to sustainable development in environmental engineering |
| IS\_2A\_K06 | Is ready to make decisions in a creative and entrepreneurial manner |
| IS\_2A\_K07 | Is ready to inspire and organize the process of improving his own professional skills and also those of others |
| IS\_2A\_K08 | Is ready to identify and resolve dilemmas related to the practice of his profession. He is aware of the importance of conducting himself in accordance with ethical principles |
| IS\_2A\_K09 | Is ready to disseminate knowledge about environmental engineering to society. He formulates and presents information and opinions in a universally understandable manner, providing justification for different perspectives |