ZARZĄDZENIE NR 87

Rektora Zachodniopomorskiego Uniwersytetu Technologicznego w Szczecinie z dnia 27 listopada 2017 r.

zmieniające zarządzenie nr 30 Rektora ZUT z dnia 25 września 2014 r.
w sprawie opisu efektów kształcenia w tłumaczeniu na język angielski

dla poszczególnych kierunków studiów prowadzonych w ZUT

Na podstawie art. 66 ust. 2 w związku art. 167 ust. 1 ustawy z dnia 27 lipca 2005 r. Prawo o szkolnictwie wyższym (tekst jedn. Dz. U. z 2016 r. poz. 1842, z późn. zm.) oraz § 11 ust. 2 rozporządzenia Ministra Nauki i Szkolnictwa Wyższego z dnia 16 września 2016 r. w sprawie dokumentacji przebiegu studiów (Dz. U. poz. 1554), w oparciu o uchwałę nr 42 Senatu ZUT z dnia 29 maja 2017 r. w sprawie określenia opisu efektów kształcenia dla kierunku studiów *budownictwo* pierwszego stopnia prowadzonego na Wydziale Budownictwa i Architektury ZUT, uchwałę nr 43 Senatu ZUT z dnia 29 maja 2017 r. w sprawie określenia opisu efektów kształcenia dla kierunku studiów *inżynieria środowiska* pierwszego i drugiego stopnia prowadzonego na Wydziale Budownictwa i Architektury ZUT oraz uchwałę nr 100 Senatu ZUT z dnia 25 września 2017 r. w sprawie określenia opisu efektów kształcenia dla kierunku studiów *odnawialne źródła energii* drugiego stopnia prowadzonego na Wydziale Kształtowania Środowiska i Rolnictwa ZUT, zarządza się, co następuje:

§ 1.

W zarządzeniu nr 30 Rektora ZUT z dnia 25 września 2014 r. w sprawie opisu efektów kształcenia w tłumaczeniu na język angielski dla kierunków studiów prowadzonych w ZUT, z późn. zm., wprowadza się zmiany:

1. w załączniku nr 2 – Wydział Budownictwa i Architektury dodaje się opisy efektów kształcenia w tłumaczeniu na język angielski dla kierunków studiów: budownictwo(civil engineering) pierwszego stopnia oraz inżynieria środowiska (environmental engineering) pierwszego i drugiego stopnia, których cykl kształcenia rozpoczyna się od roku akademickiego 2017/2018, stanowiące załącznik nr 1 do niniejszego zarządzenia;
	1. w załączniku nr 7 – Wydział Kształtowania Środowiska i Rolnictwa dodaje się opis efektów kształcenia w tłumaczeniu na język angielski dla kierunku studiów odnawialne źródła energii (renewable energy resources)*,* drugiego stopnia, stanowiący załącznik nr 2 do niniejszego zarządzenia.

§ 2.

Zarządzenie wchodzi w życie z dniem podpisania.

Rektor

dr hab. inż. Jacek Wróbel, prof. nadzw.

Załącznik nr 1 do zarządzenia nr 87 Rektora ZUT z dnia 27 listopada 2017 r.

Faculty of Civil Engineering and Architecture

1) Field of study: civil engineering [[1]](#footnote-1)

Education level: first cycle degree

Education profile: general academic

Education areas: technological sciences

Professional title obtained by the graduate: inżynier

|  |  |
| --- | --- |
| Code  | Learning outcomes for programme of studies civil engineering |
| Knowledge |
| B\_1A\_W01 | Has knowledge in selected branches of mathematics, physics, chemistry and other areas characteristic for civil engineering, necessary to formulate and solve simple tasks within the scope of civil engineering. |
| B\_1A\_W02 | Is familiar with the rules of descriptive geometry and technical drawing regarding writing/reading architectonic/construction drawings, geodetic and geological maps using CAD |
| B\_1A\_W03 | Knows how to define cartographic mapping and what the basic geodetic works in construction are. |
| B\_1A\_W04 | Has knowledge of general mechanics and strength of materials |
| B\_1A\_W05 | Has basic knowledge in fluid mechanics and hydrology |
| B\_1A\_W06 | Is familiar with the rules of structural mechanics and analysis of rod constructions within the scope of statics |
| B\_1A\_W07 | Is familiar with technical standards and guidelines applied in civil engineering  |
| B\_1A\_W08 | Is familiar with the rules of constructing and dimensioning of construction elements |
| B\_1A\_W09 | Is familiar with the rules of laying building foundation |
| B\_1A\_W10 | Is familiar with the rules for analysis and construction of selected buildings in general, industrial, communications and water construction. |
| B\_1A\_W11 | Has basic knowledge in designing road transportation infrastructure facilities |
| B\_1A\_W12 | Has basic knowledge in construction installations |
| B\_1A\_W13 | Has knowledge related to basic problems within the scope of the course of study |
| B\_1A\_W14 | Is familiar with the selected analytical methods and computer programmes aiding construction design and organization of civil works. |
| B\_1A\_W15 | Is familiar with the most popular materials and construction products and the basic technology of its manufacture |
| B\_1A\_W16 | Is familiar with physics of the buildings |
| B\_1A\_W17 | Is familiar with typical engineering technologies used in civil engineering |
| B\_1A\_W18 | Has knowledge about creating procedures of civil works quality management. Is familiar with civil engineering norms and standards, as well as with the organisation and regulations of construction works. |
| B\_1A\_W19 | Has basic knowledge of the organisation and management of the investment process, as well as conducting business activity in civil engineering industry |
| B\_1A\_W20 | Has knowledge of the impact of civil engineering investments on the environment |
| B\_1A\_W21 | Has basic knowledge regarding intellectual property and sources of patent information |
| B\_1A\_W22 | Has basic knowledge of the life cycle of the construction equipment and facilities, as well as the technical systems used in civil engineering |
| B\_1A\_W23 | Has basic knowledge of development trends in civil engineering |
| B\_1A\_W24 | Has basic knowledge of the necessity to take the micro- and macroeconomic conditions into consideration in the decision-making process |
| Skills |
| B\_1A\_U01 | Can classify construction works |
| B\_1A\_U02 | Can compare the loads having impact on the construction works. |
| B\_1A\_U03 | Can define the calculation models of construction computer analysis correctly |
| B\_1A\_U04 | Can perform static analysis of statically determinant and indeterminate rod constructions, determine the stress and strain status in construction elements, as well as their dimensions. |
| B\_1A\_U05 | Can properly select the materials (analytical or numerical) to solve the analysis, design, execution of the elements of constructions and construction works |
| B\_1A\_U06 | Can use the selected computer programmes supporting the design decisions in civil engineering and critically evaluate the obtained results. |
| B\_1A\_U07 | Can design selected elements and simple engineering structures and evaluate the existing solutions. |
| B\_1A\_U08 | Can solve basic engineering problems within he scope of the field of study. |
| B\_1A\_U09 | Can design simple building foundations for construction works |
| B\_1A\_U10 | Can plan and conduct experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions. |
| B\_1A\_U11 | Can read architectonic/construction drawings, geodetic and geological maps. Can draw graphic documentation using the selected CAD programme. |
| B\_1A\_U12 | Can prepare a simple estimate and schedule of civil works. |
| B\_1A\_U13 | Can assess dangers in execution of civil works and implement proper safety measures |
| B\_1A\_U14 | Can use IT, on-line resources and other sources of information to find general information, communication and obtaining software supporting the work of a designer and civil works organizer. |
| B\_1A\_U15 | Has a command of a modern foreign language of at least B2 level, including technical vocabulary in the field of civil engineering. |
| B\_1A\_U16 | Can apply the provisions of construction and water law |
| B\_1A\_U17 | Can select construction materials and products |
| B\_1A\_U18 | Can organize works at the construction site in accordance with the civil engineering technology and organisation rules |
| B\_1A\_U19 | Can draw documentation regarding the realisation of engineering task |
| B\_1A\_U20 | Can draw documentation regarding preparation and execution of the construction investment |
| B\_1A\_U21 | Can prepare and present the results of the execution of the engineering task |
| B\_1A\_U22 | Has the ability to self-educate |
| B\_1A\_U23 | Can use the knowledge in economy to take rational decisions in business activity |
| B\_1A\_U24 | Can differentiate between intangible assets under protection and choose the type of protection suitable for a given asset, knows how to use patent literature and patent databases |
| Social competences  |
| B\_1A\_K01 | Understands the need for lifelong learning. Can inspire and organize the learning process for others. |
| B\_1A\_K02 | Understands the non-technical aspects and effects of engineering activity and its influence on the environment |
| B\_1A\_K03 | Is responsible for own safety and the safety of the team |
| B\_1A\_K04 | Is aware of responsibility for own work and willingness to comply with the rules of working in a team and bearing liability for jointly executed tasks |
| B\_1A\_K05 | Is aware of the importance of professional conduct and observing work ethics rules |
| B\_1A\_K06 | Is capable of thinking and acting in an entrepreneurial manner |
| B\_1A\_K07 | Understands the need to pass the knowledge on civil engineering to society. Formulates conclusions and describes the results of own works Is communicative in media presentations. |

1) Field of study: environmental engineering [[2]](#footnote-2)

Education level: first cycle degree

Education profile: general academic

Education areas: technological sciences

Professional title obtained by the graduate: inżynier

|  |  |
| --- | --- |
| Code | Learning outcomes for programme of studies environmental engineering |
| Knowledge |
| IS\_1A\_W01 | Has knowledge in mathematics, physics, chemistry, biology and other areas useful in formulating ad solving simple tasks in environmental engineering. |
| IS\_1A\_W02 | Is familiar with the rules of descriptive geometry and technical drawing regarding writing/reading architectonic/construction drawings, geodetic maps, geological using CAD. |
| IS\_1A\_W03 | Has basic knowledge in technical mechanics and strength of materials, useful in formulating and solving simple tasks in the scope of environmental engineering and designing devices for its needs. |
| IS\_1A\_W04 | Has basic knowledge in civil engineering, construction and structure of the buildings and the methods of shaping construction components in terms of heat, strength, humidity, air tightness. |
| IS\_1A\_W05 | Has basic knowledge regarding land mechanics, specifically with reference to laying heat and sanitary networks and geotechnical investigations for the location of engineering objects, their impact on adjacent areas, the state of the environment and the diagnostics of contaminated areas |
| IS\_1A\_W06 | Knows the construction and properties of materials used in environmental engineering with particular regard to installation materials, knows the methods of connecting wires and networks into systems, has knowledge regarding corrosion process and anti-corrosion protection. |
| IS\_1A\_W07 | Knows the selected analytical calculation methods and computer programs useful for design and calculations in the field of environmental engineering |
| IS\_1A\_W08 | Has knowledge of information technology, with particular emphasis on its applications in environmental engineering |
| IS\_1A\_W09 | Has organized, theoretically-grounded general knowledge covering key environmental engineering issues related to:• technical thermodynamics,• heat and mass exchange,• fluid mechanics,• biology and chemistry |
| IS\_1A\_W10 | Has organized, theoretically-grounded general knowledge covering processes and equipment used in environmental engineering, including:• flow and piston machines,• water and sewage management,• protection of waters and atmosphere,• drainage,• cooling technology,• ventilation and air conditioning,• heating industry,• waste management |
| IS\_1A\_W11 | Has organized, theoretically-grounded general knowledge covering equipment, fittings, security, distribution systems, water supply, gas and energy and regulation in the sanitary installation |
| IS\_1A\_W12 | Has detailed knowledge covering :•energy balancing,•heat conduction, convection, heat transfer, • flow of compressible and incompressible fluids in installations, •flow of compressible and incompressible fluids in flow and piston engines used in environmental engineering,•thermodynamic transformations used in major environmental engineering areas,• combustion of fuels including low-emission combustion |
| IS\_1A\_W13 | Has detailed knowledge of Earth sciences, including the impact of geological conditions on the natural environment, hydrological processes and the origin and use of groundwater and surface waters. |
| IS\_1A\_W14 | Has detailed knowledge of environmental protection against pollution, noise and vibration |
| IS\_1A\_W15 | Has detailed knowledge of technological and design solutions in environmental engineering |
| IS\_1A\_W16 | Has basic knowledge of development trends in the field of environmental engineering including:• building services engineering systems,• heat and cold sources, heat exchangers,• water supply and sewage networks,• technology, systems and equipment for water treatment and waste water treatment,• air protection engineering,• hydrology,• waste management |
| IS\_1A\_W17 | Has basic knowledge of the life cycle of equipment, objects and technical systems in environmental engineering, including in particular:• building services engineering systems,• energy supply systems,• heat, water and sewage networks,• water treatment and waste water treatment systems,• air protection devices |
| IS\_1A\_W18 | Knows the basic methods, techniques, tools and materials used to solve simple engineering tasks in the field of environmental engineering, |
| IS\_1A\_W19 | Has basic knowledge necessary to understand the legal conditions of engineering activities and the impact of different technical implementations on the environment, knows the standards and technical guidelines used in environmental engineering |
| IS\_1A\_W20 | Has basic knowledge of investment cost estimation, organization and management of investment process, quality management of installation works, conducting business activity and managing works in the sanitary sector. |
| IS\_1A\_W21 | He knows the rules of performing measurements and organizing work in laboratories |
| IS\_1A\_W22 | Has knowledge related to basic problems within the scope of the course of study |
| IS\_1A\_W23 | Has basic knowledge regarding intellectual property, knows the systems and sources of industrial property law and copyright law; has knowledge regarding the sources of patent information |
| IS\_1A\_W24 | Has basic knowledge of the necessity to take into consideration the micro- and macroeconomic conditions in the decision-making process |
| IS\_1A\_W25 | Knows typical factors and types of hazards in industrial environment; knows the general principles of reducing exposure and hazards in the work environment |
| Skills |
| IS\_1A\_U01 | Can classify equipment and installations in the field of environmental engineering |
| IS\_1A\_U02 | Can properly select the tools (analytical or numerical) for solving the problems of analysis, design and manufacture of the elements of devices and installations in the field of environmental engineering |
| IS\_1A\_U03 | Can read architectonic/construction drawings, geodetic and geological maps; can prepare graphic documentation using selected CAD programmes. |
| 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 he scope of the field of study. |
| IS\_1A\_U06 | Can prepare a simple estimate and schedule of sanitary works. |
| IS\_1A\_U07 | Has the necessary preparation for working in an industrial environment, applies the principles of occupational health and safety |
| IS\_1A\_U08 | Can use IT, on-line resources and other sources of information to find general information, communication and obtaining software supporting the work of a designer and environmental engineering works organizer. |
| IS\_1A\_U09 | Has a command of a modern foreign language of at least B2 level, including technical vocabulary in the field of environmental engineering. |
| IS\_1A\_U10 | Can apply the provisions of construction, water law and natural environment protection. |
| IS\_1A\_U11 | Can choose and use various materials and equipment in the construction of environmental engineering installations |
| IS\_1A\_U12 | Can organize works at the construction site and other work environment in accordance with engineering technology and organisational rules |
| IS\_1A\_U13 | Can draw documentation regarding the realisation of engineering task |
| IS\_1A\_U14 | Can prepare and present the results of the execution of the engineering task |
| IS\_1A\_U15 | Has the ability to self-educate |
| IS\_1A\_U16 | Can use the knowledge in economics and management to take rational decisions in business activity |
| IS\_1A\_U17 | Can differentiate between intangible assets under protection and choose the type of protection suitable for a given asset, knows how to use patent literature and patent databases |
| IS\_1A\_U18 | Can design and implement a simple device, system, or process typical of environmental engineering, and evaluate the existing solutions. |
| IS\_1A\_U19 | Can select the proper technology for the simple task of environmental engineering |
| IS\_1A\_U20 | Can analyse and evaluate the impact of the device, process, technology or system on the environment |
| IS\_1A\_U21 | Can analyse and evaluate energy efficiency as well as economic effectiveness of technical processes, especially those used in environmental engineering |
| Social competences  |
| IS\_1A\_K01 | Understands the need for lifelong learning. Can inspire and organize the learning process for others. |
| IS\_1A\_K02 | Understands the non-technical aspects and effects of engineering activity and its influence on the environment |
| IS\_1A\_K03 | Is responsible for own safety and the safety of the team |
| IS\_1A\_K04 | Is aware of responsibility for own work and is willing to comply with the rules of working in a team and bearing liability for jointly executed tasks |
| IS\_1A\_K05 | Is aware of the importance of professional conduct and observing work ethics rules |
| IS\_1A\_K06 | Is capable of thinking and acting in an entrepreneurial manner |
| IS\_1A\_K07 | Understands the need to pass the knowledge on civil engineering to the society  to society; formulates conclusions and describes the results of own works; is communicative in media presentations. |

1) Field of study: environmental engineering 2

Education level: second cycle degree

Education profile: general academic

Education areas: technological sciences

Professional title obtained by the graduate: magister inżynier

|  |  |
| --- | --- |
| Code | Learning outcomes for programme of studies environmental |
| Knowledge |
| IS\_2A\_W01 | Has extensive and enhanced knowledge of mathematics (including mainly mathematical statistics and probability calculations) and environmental chemistry, useful for formulating and solving complex environmental engineering tasks. |
| IS\_2A\_W02 | Has detailed knowledge in the fields of studies related to environmental engineering including electrical engineering, mechanical engineering, environmental protection, spatial planning, security engineering, especially installation safety and other technical systems. |
| IS\_2A\_W03 | Knows the available environmental protection technologies, knows the principles of analysis of technical solutions in environmental engineering, construction and industry with a view to determining their environmental impact. |
| IS\_2A\_W04 | Has knowledge of process modelling, systems configuration and environmental engineering |
| IS\_2A\_W05 | Has theoretically-grounded, detailed knowledge related to selected issues of automation, control and operation of technical equipment and dynamic properties of objects and systems of environmental engineering. |
| IS\_2A\_W06 | Has extensive knowledge related to key issues of environmental engineering |
| IS\_2A\_W07 | Has knowledgeable about the management of environmental and construction engineering projects in the technical and economic aspect and the organization of the investment process and cost estimation. |
| IS\_2A\_W08 | Knows the principles of analysing systems, processes and devices in environmental engineering in a wide range of behavioural and affective domains |
| IS\_2A\_W09 | Knows advanced methods, computer programs used in solving complex tasks in the field of environmental engineering |
| IS\_2A\_W10 | Has knowledge of norms and technical standards in environmental engineering |
| IS\_2A\_W11 | Knows the opportunities for the use of alternative energy sources in construction and industry |

1) opis efektów kształcenia dla kierunku studiów inżynieria środowiska (environmental engineering) drugiego stopnia w tłumaczeniu na język angielski obowiązujący dla cyklu kształcenia rozpoczynającego się od roku akademickiego 2017/2018

|  |  |
| --- | --- |
| IS\_2A\_W12 | Has basic knowledge of maintenance of facilities and systems typical for environmental engineering |
| IS\_2A\_W13 | Has knowledge of development trends and most significant new achievements in environmental engineering |
| IS\_2A\_W14 | Has knowledge necessary to understand the social, economic, legal and other non-technical determinants of the engineering activity, including the impact of technical investment on the environment; has an organized knowledge of hazard identification, knows security and protection measures and criteria for their selection |
| IS\_2A\_W15 | Knows and understands basic concepts and principles in the field of industrial property protection and copyright law |
| Skills |
| IS\_2A\_U01 | Can obtain information from literature, databases and other carefully selected sources, including in a foreign language; can integrate the information obtained, interpret and evaluate it, as well as draw conclusions and formulate and comprehensively justify the opinions. |
| IS\_2A\_U02 | Can communicate using various techniques in a professional environment and in other environments, including in a foreign language |
| IS\_2A\_U03 | Can prepare a scientific study in Polish and brief scientific report in a foreign language, presenting the results of their own scientific research. |
| IS\_2A\_U04 | Can prepare and give oral presentations on specific issues in the field of environmental engineering both in Polish and in a foreign language. |
| IS\_2A\_U05 | Can define the directions of further learning process and implement the process of self-education |
| IS\_2A\_U06 | Has language skills in the fields of science and disciplines relevant to the field of study, in accordance with the requirements set for level B2 + of the Common European Framework of Reference for Languages |
| IS\_2A\_U07 | Uses advanced specialist tools to search for useful information, communication, and acquisition of software assisting work of a designer and organizer of technical processes in environmental engineering. |
| IS\_2A\_U08 | Can draw graphic documentation using the selected CAD programme. |
| IS\_2A\_U09 | Can, in a manner suitable for the research problem, formulate assumptions about experiments, including measurements and numerical simulations, plan and conduct research, interpret the results and draw conclusions. |
| IS\_2A\_U10 | Has ability to use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems in the field of environmental engineering. |
| IS\_2A\_U11 | When formulating and solving engineering tasks, can integrate knowledge in the field of science and disciplines related to environmental engineering such as: construction, power engineering, electrical engineering, security engineering, spatial planning, economics and environmental protection as well as apply systematic approach, including non-technical aspects |
| IS\_2A\_U12 | Can formulate and test hypotheses related to engineering problems and simple research problems |
| IS\_2A\_U13 | Can evaluate the suitability of new achievements and their being fit-for-use (techniques and technologies) in environmental engineering |
| IS\_2A\_U14 | Can classify simple and complex objects in the field of environmental engineering |
| IS\_2A\_U15 | Can identify and formulate specifications for complex engineering tasks specific to environmental engineering, including non-typical tasks, taking into account their non-technical aspects, particularly environmental impact |
| IS\_2A\_U16 | Can perform measurements and tests of environmental engineering systems, processes and devices within the scope of analysis of correctness of operation, environmental impact and identification |
| IS\_2A\_U17 | Can assess the suitability of methods and tools for solving engineering tasks characteristic for environmental engineering |
| IS\_2A\_U18 | Can select the methods, techniques and tools (analytical or numerical) to solve engineering task, adapt existing tools and develop new ones. |
| IS\_2A\_U19 | Can design elements, installations, systems and equipment that fall within the scope of environmental engineering |
| IS\_2A\_U20 | Can find alternatives to existing systems, processes and devices in environmental engineering |
| IS\_2A\_U21 | In accordance wit the specification, can also take into account non-technical aspects, design a complex object or technological process appropriate to the specialization studied and determine, at least partially, the manner of its implementation using appropriate methods, techniques and tools. |
| IS\_2A\_U22 | Can assess basic parameters: time, cost, quality in the implementation of environmental engineering projects and implement appropriate corrective actions; can draw up an analysis of the effectiveness of environmental engineering projects and prepare risk assessment in the context of the company's economics, plan the basic parameters of the investment |
| IS\_2A\_U23 | Can assess threats related to execution of construction and installation works and implement proper safety measures |
| IS\_2A\_U24 | Can solve problems related to the operation of environmental engineering works. Can propose improvements to existing technical solutions |
| Social competences  |
| IS\_2A\_K01 | Can define, classify, and apply priorities to accomplish an engineering task in a professional manner |
| IS\_2A\_K02 |  Is responsible for the reliability of his work and for the work of the team he or she supervises |
| IS\_2A\_K03 | Is aware of the importance and understands the non-technical aspects and effects of the engineering activities, including its impact on the environment and the resulting responsibility for the decisions made |
| IS\_2A\_K04 | Is aware of the need for sustainable development in environmental engineering |
| IS\_2A\_K05 | Is capable of thinking and acting in a creative and entrepreneurial manner |
| IS\_2A\_K06 | Is aware of the need to improve professional and personal competences, complements and broadens the knowledge of modern processes, technologies and management methods in environmental engineering. |
| IS\_2A\_K07 | Identifies and resolves dilemmas related to the profession correctly, is aware of ethical conduct |
| IS\_2A\_K08 | Understands the need to educate the public about environmental engineering, formulates and presents information and opinions in a universally understandable manner, justifying various points of view. |

Załącznik nr 2 do zarządzenia nr 87 Rektora ZUT z dnia 27 listopada 2017 r.

Faculty of Environmental Management and Agriculture

Field of study: renewable energy resources [[3]](#footnote-3)

Education level: second cycle degree

Education profile: general academic

Education areas: agricultural, forestry and veterinary sciences

Professional title obtained by the graduate: magister inżynier

|  |  |
| --- | --- |
| Code | Learning outcomes for programme of studies renewable energy resources |
| Knowledge |
| OZE\_2A\_W01 | The graduate has knowledge regarding the legal grounds, management and financing various forms of business activity in the field of renewable energy sources, as well as the knowledge in the field of patent law, intellectual property protection, ergonomics and occupational health and safety; |
| OZE\_2A\_W02 | Has extensive knowledge in the field of social sciences, economics and law, indispensable in understanding the problems of managing the resources of natural energy sources |
| OZE\_2A\_W03 | Has extensive knowledge in the selected branches of mathematics, physics, chemistry and biology, indispensable in describing the processes and formulating and solving the tasks regarding generating, processing and using energy from renewable sources; |
| OZE\_2A\_W04 | Has structured knowledge in the scope of systems, technologies, techniques, devices and installations used in energy production from biomass, rules and methods of integrating conventional energy sources with technologies using renewable energy sources with technologies using renewable energy sources, as well as extensive knowledge regarding development of the energy sector in the aspect of limiting greenhouse gas emissions; |
| OZE\_2A\_W05 | Has structured and extensive knowledge regarding localization requirements and technological solutions, construction, operating procedures and exploitation of renewable energy sources installations. |
| OZE\_2A\_W06 | Has extensive knowledge regarding the cultivation of energy crops; |
| OZE\_2A\_W07 | Has extensive knowledge regarding technical processes and the structure, operating principles and exploitation of the machines for harvesting, processing and management of biomass, as well as knowledge in the field of supply logistics and storage of biotic energy carriers; |
| OZE\_2A\_W08 | Has extensive knowledge regarding technical processes and structure, operating principles and exploitation of the industrial and experimental installations for manufacturing liquid and gaseous biofuels; |
| OZE\_2A\_W09 | Has extensive knowledge in handling, automatics and methods and procedures of taking measurements for productions, processing and use of renewable energy; |
| OZE\_2A\_W10 | Has extensive knowledge in the field of energy industry, regarding forecasting the demand for energy carriers and renewable energy sources technologies used in low energy housing. |
| OZE\_2A\_W11 | Understands the concept of sustainable development, has knowledge of the methods of environment protection; |
| OZE\_2A\_W12 | Has extensive knowledge in designing devices used for generating, processing and use of renewable energy sources and the knowledge regarding costing and selecting construction materials and consumables for energy devices and installations; |
| OZE\_2A\_W13 | Has detailed knowledge in methodology of scientific work, preparation of publications and presentation of the results of the research works, knows specialist foreign vocabulary regarding renewable energy sources. |
| Skills |
| OZE\_2A\_U01 | The graduate can assess the economic effectiveness of the investment in the field of renewable energy sources, conduct risk analysis, initiate and conduct business activity and apply for public funds assistance, can use intellectual property resources and patent information and knows how to apply the principles of occupational health and safety; |
| OZE\_2A\_U02 | Analyses the interactions in natural environment, can apply current research methods practically, is able to solve the problems of renewable energy sources management resulting from different social and economic needs and expectations in the local natural environment; |
| OZE\_2A\_U03 | Can apply the knowledge in mathematics, physics, chemistry and biology to describe processes as well as to formulate and solve engineering and research tasks regarding generating, processing and use of renewable energy sources in the energy sector. |
| OZE\_2A\_U04 | Can assess whether the systems, technologies, devices and installations used in producing energy from biomass are used correctly as well as evaluate their integration with conventional energy utilities, is also able to draw a detailed balance of greenhouse gas (GHG) emissions; |
| OZE\_2A\_U05 | Can assess the abiotic renewable energy sources as well as the form and scope of their use, understands the rules for creating, operation and execution on technical systems using abiotic renewable energy resources; |
| OZE\_2A\_U06 | Can plan cultivation of the energy crops; |
| OZE\_2A\_U07 | Can assess technological process of harvesting biomass, select appliances for processing and management of manufacturing and waste biomass, store the biotic energy carriers and plan further deliveries of biomass. |
| OZE\_2A\_U08 | Can carry out and evaluate the selected technological project carried out in installations used for manufacturing biofuels; |
| OZE\_2A\_U09 | Can perform computer simulation of regulation, carry out operational measurements and regulate the operating systems and automatics of devices and installation within the scope of renewable energy sources. |
| OZE\_2A\_U10 | Can establish the demand for energy carriers for investment areas and construction objects, taking into consideration the spatial planning of the area. |
| OZE\_2A\_U11 | Recognises the risks and is able to select methods limiting the negative impact of natural energy sources on the environment. |
| OZE\_2A\_U12 | Can design a selected renewable energy sources technology, installation or device using computer aid tools for engineering works using CAD programmes, as well as carry out investment cost estimation. |
| OZE\_2A\_U13 | Can use the knowledge in the field of methodology of scientific research in order to conduct, document and present engineering and research works, as well as obtain information from literature, databases and other sources, integrate and interpret the obtained information; has a command of a foreign language, can prepare a well-documented problem analysis or oral presentation related to renewable energy sources management. |
| Social competences  |
| OZE\_2A\_K01 | The graduate critically evaluates the results of activity within the scope of renewable energy resources; |
| OZE\_2A\_K02 | Is aware of the significance of the knowledge in solving practical and cognitive problems. |
| OZE\_2A\_K03 | Is aware of the necessity to participate in the social activities for the benefit of the natural environment; |
| OZE\_2A\_K04 | Is capable of thinking and acting in an entrepreneurial manner |
| OZE\_2A\_K05 | Takes responsibility for own actions, observes the standards of work ethics. |

1. 1) opis efektów kształcenia dla kierunku studiów budownictwo(civil engineering) pierwszego stopnia w tłumaczeniu na język angielski obowiązujący dla cyklu kształcenia rozpoczynającego się od roku akademickiego 2017/2018

 uchwała nr 42 Senatu ZUT z dnia 29.05.2017 r. w sprawie określenia opisu efektów kształcenia dla kierunku studiów *budownictwo* pierwszego stopnia prowadzonego na Wydziale Budownictwa i Architektury ZUT [↑](#footnote-ref-1)
2. 1) opis efektów kształcenia dla kierunku studiów inżynieria środowiska (environmental engineering) pierwszego stopnia w tłumaczeniu na język angielski obowiązujący dla cyklu kształcenia rozpoczynającego się od roku akademickiego 2017/2018

 uchwała nr 43 Senatu ZUT z dnia 29.05.2017 r. w sprawie określenia opisu efektów kształcenia dla kierunku studiów *inżynieria środowiska* pierwszego i drugiego stopnia prowadzonego na Wydziale Budownictwa i Architektury ZUT [↑](#footnote-ref-2)
3. uchwała nr 100 Senatu ZUT z dnia 25.09.2017 r. w sprawie określenia opisu efektów kształcenia dla kierunku studiów *odnawialne źródła energii* drugiego stopnia prowadzonego na Wydziale Kształtowania Środowiska i Rolnictwa ZUT [↑](#footnote-ref-3)