# Zarządzenie nr 124

## 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 Nauk o Żywności i Rybactwa

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 Nauk o Żywności i Rybactwa.
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:
   a) mikrobiologia, stosowana studia pierwszego stopnia – stanowi załącznik nr 1,
   b) mikrobiologia, stosowana studia drugiego stopnia – stanowi załącznik nr 2,
   c) rybactwo, studia pierwszego stopnia – stanowi załącznik nr 3,
   d) rybactwo, studia drugiego stopnia – stanowi załącznik nr 4,
   e) technologia żywności i żywienia człowieka, studia pierwszego stopnia – stanowi załącznik nr 5,
   f) technologia żywności i żywienia człowieka, studia drugiego stopnia – stanowi załącznik nr 6,
   g) zarządzanie bezpieczeństwem i jakością żywności, studia pierwszego stopnia – stanowi załącznik nr 7;
2) od roku akademickiego 2022/2023:
   a) mikrobiologia, stosowana studia pierwszego stopnia – stanowi załącznik nr 8,
   b) mikrobiologia, stosowana studia drugiego stopnia – stanowi załącznik nr 9,
   c) technologia żywności i żywienia człowieka, studia pierwszego stopnia – stanowi załącznik nr 10.

**§ 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 8 oraz załącznik nr 8 – Kierunki Wydziału Nauk o Żywności i Rybactwa.

**§ 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 124 Rektora ZUT z dnia 30 października 2023 r.

Mikrobiologia studia pierwszego stopnia (na podstawie uchwały nr 71 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *applied microbiology*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** nutrition and food technology (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| MS_1A_W01 | Has basic knowledge within the scope of chemistry, mathematics, statistics, physics and related sciences. |
| MS_1A_W02 | Has basic knowledge within the scope of economics, law, enterprise management as well as protection of intellectual property and patent law. |
| MS_1A_W03 | Has basic knowledge within the scope of ecology and environmental protection, the role and biological variety in biosphere and processes occurring in it. Knows the necessary tools, methods and techniques for environment shaping. |
| MS_1A_W04 | Has basic knowledge on the subject of nomenclature, basic definitions and structure of food components as well as mutual relations and transformations resulting from interactions between them. |
| MS_1A_W05 | Has knowledge concerning physical, chemical and biological factors (microorganisms, fungi, parasites and pests) occurring in food, modern methods of detecting them, their influence on the quality and health safety of food. |
| MS_1A_W06 | Has knowledge of a foreign language on B2 level. |
| MS_1A_W07 | Has basic knowledge on the subject of microorganisms and the processes occurring with their participation in various branches of industry and agriculture. |
| MS_1A_W08 | Has basic knowledge concerning plant, animal and human pathogens as well as methods of their identification. |
| MS_1A_W09 | Knows the directions and mechanisms of evolution as well as understands the processes conditioning them at the molecular level. Has knowledge on the subject of basic techniques of molecular biology and genetic engineering as well as possibilities of using modified organisms in agriculture and food industry. |
| MS_1A_W10 | Has basic knowledge concerning biotechnological equipment and techniques as well as their use in conducting bioprocesses. |
| MS_1A_W11 | Has the necessary knowledge within the scope of structure and functioning of cells and organs, the physiology of digestion and transformations of nutritional elements as well as their influence on consumer safety. |
| MS_1A_W12 | Has knowledge concerning organisation, equipment and methods of work and safety in research and diagnostic laboratories, in particular microbiological laboratories. |
| MS_1A_W13 | Has knowledge on the subject of analytic methods and their use in assessment of food and environment quality. |
| MS_1A_W14 | Has the necessary knowledge within the scope of fundamental technologies of products of plant and animal origin. |

| Code | Learning outcomes for programme of studies |
|---|---|
| **Skills** | |
| MS_A1_U01 | Has the ability to find, understand, analyse and develop as well as use the necessary information from various sources in Polish and a foreign language. Is able to interpret it as well as to draw conclusions, formulate and justify opinions. |
| MS_A1_U02 | Uses correct biological, chemical and physical terminology; is able to select the appropriate research procedures and methods. |
| MS_A1_U03 | Is able to recognise basic structures of living organisms, their location as well as understands the dependencies between their structure and activities, explains deviations from proper functioning of an organism. |
| MS_A1_U04 | Has basic ability of assessing the quality of raw materials, technical products and materials as well as selecting the appropriate equipment, biotechnical techniques and conducting bioprocesses. |
| MS_A1_U05 | Is able to differentiate organisms that are pathogenic and beneficial for production, food quality, human and animal health, the environment condition and the natural resources. |
| MS_A1_U06 | Uses basic research techniques and tools appropriate for Applied Microbiology and related fields and has the ability to conduct observations and evaluate process phenomena. |
| MS_A1_U07 | Has the ability to organise work in a laboratory as well as conduct analyses. Knows basic principles of research method validation. Is able to conduct statistical analyses of the obtained results. |
| MS_A1_U08 | Is able to select the methods and conduct analyses of environmental and biological samples. |
| MS_A1_U09 | Is able to evaluate the technological usefulness of plant and animal raw materials, propose the methods of processing them as well as select the analytic methods necessary for quality evaluation of manufactured products. |
| MS_A1_U10 | Has the ability to conduct the basic economic analysis of a technological process and introduce a suitable production safety management system. |
| **Social competences** | |
| MS_1A_K01 | Understands the need of life-long learning and the necessity to improve professional competences. Determines the directions of her/his own development and education. |
| MS_1A_K02 | Is aware of the importance to comply with the principles of professional ethics and respect for the diversity of sexes, beliefs and cultures. |
| MS_1A_K03 | Is aware of the responsibility for the safety of work of her/his own and others. Is able to behave in emergency. |
| MS_1A_K04 | Is able to think and act in an enterprising manner individually and in a team. |
| MS_1A_K05 | Is aware of the social role of a university graduate and, in particular, understands the need to popularise the knowledge gained. |

Załącznik nr 2

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Mikrobiologia studia drugiego stopnia (na podstawie uchwały nr 72 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *applied microbiology*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** nutrition and food technology (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| MS_2A_W01 | Has extended knowledge within the scope of statistical methods, information technology and bioinformatics used in agricultural and related sciences. |
| MS_2A_W02 | Has knowledge within the scope of dependencies between physiology of living organisms and genotype as well as the scope of immunology and immunoprophylaxis in animal breeding. |
| MS_2A_W03 | Has extended knowledge on the subject of microorganisms, their specificity, variety and role in agricultural and related sciences. |
| MS_2A_W04 | A student has extended knowledge concerning microbiological and biological phenomena occurring in pedosphere, hydrosphere and biosphere. |
| MS_2A_W05 | Has thorough knowledge concerning microorganisms (viruses, bacteria and fungi) and parasites as well as diagnostic methods used for detecting them. |
| MS_2A_W06 | Has knowledge of specialist vocabulary in a foreign language on B2+ level in a given field. |
| MS_2A_W07 | Has knowledge concerning biotechnology of antibiotics and drug resistance. |
| MS_2A_W08 | Has extended knowledge on the subject of influence of microorganisms on quality and health safety of food as well as biotechnology of food industry, including processing with participation of microorganisms. |
| MS_2A_W09 | Has knowledge within the scope of cell cultures and their use. |
| MS_2A_W10 | Has knowledge within the scope of obtaining and using the main types of biopolimers, mechanisms of biodegradation and biorefinery. |
| MS_2A_W11 | Has extended knowledge concerning the system of management and standardisation. Has extended knowledge within the scope of intellectual property protection and patent law. |
| MS_2A_W12 | Has in-depth knowledge of harmful compounds in the environment, contamination processes and methods of determining them. |
| MS_2A_W13 | Has extended knowledge of the processes occurring in the environment and the dependencies among the organisms functioning in it as well as the possibilities of using them. |

| Code | Learning outcomes for programme of studies |
|---|---|
| **Skills** | |
| MS_2A_U01 | Has the ability to use the necessary information from various sources in Polish and a foreign language. Is able to interpret it as well as to draw conclusions, formulate and justify opinions. |
| MS_2A_U02 | Is able to develop documentation concerning the accomplishment of an analytic task and to prepare a text containing the description of the results of such a task as well as to present them verbally (presentation) in Polish and a foreign language. |
| MS_2A_U03 | I able to select proper analytic procedures and methods. Is able to use in practice basic and specialist research techniques and tools appropriate for Applied Microbiology and related sciences. |
| MS_2A_U04 | Is able to differentiate organisms that are pathogenic and beneficial for a human being and animals as well as determine their role in the environment. |
| MS_2A_U05 | Has the ability to introduce systems of management and standardisation. Is able to use in practice the knowledge within the scope of law protecting intellectual property and labour law. Is able to conduct statistical analyses used in agricultural sciences. |
| MS_2A_U06 | Has the ability of working with genetic material and cell cultures as well as using imaging techniques. |
| MS_2A_U07 | Is able to use knowledge concerning the dependency of the immunological condition of animals and human beings in relation to their well-being. |
| **Social competences** | |
| MS_2A_K01 | Understands the need of life-long learning and the necessity to improve professional competences. Determines the directions of her/his own development and education (third cycle studies, post-graduate studies, courses). |
| MS_2A_K02 | Is aware of the importance to comply with the principles of professional ethics and respect for the diversity of sexes, beliefs and cultures. |
| MS_2A_K03 | Is aware of the responsibility for the safety of work of her/his own and others. Is able to behave in emergency. |
| MS_2A_K04 | Is able to think and act in an enterprising manner individually and in a team. |

Załącznik nr 3

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Rybactwo studia pierwszego stopnia (na podstawie uchwały nr 73 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *fishery*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** animal science and fisheries (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| RYB_A1_W01 | Has basic knowledge within the scope of chemistry, mathematics and physics. |
| RYB_A1_W02 | Knows elementary terminology within the scope of hydrochemistry and biochemistry. Has basic knowledge within the scope of processes occurring in ecosystems. Knows the analytic methods used within this scope. |
| RYB_A1_W03 | Knows the elementary terminology within the scope of toxicology of the aquatic environment, knows the basic concepts and mechanisms related to the flow of toxic substances in ecosystems. Knows the analytic methods used in toxicology. |
| RYB_A1_W04 | Has basic knowledge on the subject of microbes and their role in the aquatic environment. Knows the methods of detecting and determining them. |
| RYB_A1_W05 | Has systematic knowledge concerning biology and taxonomy of aquatic organisms, with particular inclusion of fish and invertebrates of economic significance in Fisheries. |
| RYB_A1_W06 | Has basic knowledge within the scope of parasites biology, with particular inclusion of the organisms of significance for the aquatic organisms used in economy. Knows the methods of detection, determination and fighting of parasite organisms. |
| RYB_A1_W07 | Has basic knowledge within the scope of IT techniques and knows the statistical tools used in engineering sciences. |
| RYB_A1_W08 | Has basic knowledge within the scope of techniques used in aquaculture, knows the biotechnique of breeding selected species of fish that are significant in aquaculture. |
| RYB_A1_W09 | Knows the foundations of ecology and aquatic environment protection as well as the results of anthropopression. Has knowledge of the processes occurring in the aquatic environment and knowledge on the subject of its monitoring. |
| RYB_A1_W10 | Knows the terminology used in genetics and the basic methods of applying the principles of genetic engineering in breeding of aquatic organisms. |
| RYB_A1_W11 | Has general knowledge on the subject of nutrients and knows the basic physiology of aquatic organisms' nutrition. |
| RYB_A1_W12 | Has knowledge on the subject of structure and functioning of hydrobionts, with particular inclusion of ichthyofauna. |
| RYB_A1_W13 | Has knowledge within the scope of reproduction biology and techniques of aquatic organisms. Has knowledge of the biotechnology of reproduction and rearing of juvenile stages of fish in natural and artificial conditions. |

| Code | Learning outcomes for programme of studies |
|---|---|
| RYB_A1_W14 | Has basic knowledge within the scope of fishing technologies used in marine and inland fishing as well as knows the principles of building and operating fishing vessels. |
| RYB_A1_W15 | Has basic knowledge on the subject of methods and manners of producing feeds for aquatic organisms. |
| RYB_A1_W16 | Knows the theoretical foundations of securing the raw materials of aquatic origin and the methods of their initial processing. |
| RYB_A1_W17 | Has basic knowledge of the non-technical conditions of engineering activity, knows the basic OHS principles in Fisheries. |
| RYB_A1_W18 | Has elementary knowledge within the scope of economics and enterprise management, environmental management as well as intellectual property protection and patent law. |
| RYB_A1_W19 | Has elementary knowledge of the distribution and size of biological water resources. Knows the methods of estimating and determining of their size. |
| RYB_A1_W20 | Knows the general principles of establishing and developing of individual entrepreneurship. Knows the applicable legal norms and is able to use them in practice. |
| **Skills** | |
| RYB_A1_U01 | Has the ability to find, understand, analyse and use the necessary information. Is able to analyse the obtained information, to interpret it as well as to draw conclusions, formulate and justify opinions. |
| RYB_A1_U02 | Is able to work in a team, to estimate the time necessary for accomplishment of an assigned task, to develop and implement a work schedule. Understands the need to learn. |
| RYB_A1_U03 | Is able to use properly the basic IT techniques necessary in his/her professional work. |
| RYB_A1_U04 | Is able to develop documentation concerning the accomplishment of an engineering task and to prepare a text containing the description of the results of such a task as well as to present them verbally (presentation) in Polish and in a foreign language. |
| RYB_A1_U05 | Uses a foreign language in an extent sufficient to communicate as well as to read scientific publications within the scope of aquatic environment, technological documentation and similar documents used in Fisheries with understanding. |
| RYB_A1_U06 | Is able to define and characterise the most important components of flora and fauna of aquatic environment and to determine their importance for fisheries. |
| RYB_A1_U07 | Is able to use the proper nomenclature, undertake the standard activities with the use of appropriate methods within the scope of hygiene, prophylaxis and toxicology in order to secure the health and proper welfare of aquatic animals. |
| RYB_A1_U08 | Is able to use proper nomenclature within the scope of microbiology. Is able to select the appropriate diagnostic techniques for targeted microbiological analysis. |
| RYB_A1_U09 | Has basic skills of solving engineering problems related to design and operation of various fishing tools. Is able to prepare simple fishing tools. |
| RYB_A1_U10 | Is able to recognise the raw material resources of aquatic origin and determine the manner of obtaining them. Is able to conduct the analysis of the factors influencing the effectiveness of their exploitation. |
| RYB_A1_U11 | Is able to interpret the results of genetic research and use them in breeding programmes and strategies of protecting resources and maintaining biodiversity. |

| Code | Learning outcomes for programme of studies |
|---|---|
| RYB_A1_U12 | Is able to compose the ingredients of a feed based on the collected data concerning the chemical composition of components and the nutritional requirements of an aquatic organism. Is able to use the basic feed analyses and assess the effectiveness of nutrition based on breeding results. |
| RYB_A1_U13 | Is able to perform basic engineering calculations connected with designing of a closed cycle, a pond and a cage culture. |
| RYB_A1_U14 | Is able to carry out the reproduction and incubation of roe of selected fish species in artificial conditions. Is able to rear fish in a practical manner. |
| RYB_A1_U15 | Is able to assess the resources of a reservoir based on the collected data. Is able to develop a surface water management plan and prepare the appropriate documentation of a fishing region. |
| RYB_A1_U16 | Is able to conduct a complete analysis of physical, chemical and biological factors of waters, determine the condition of surface waters and indicate the directions of the activities aiming at improvement of their condition. Knows the provisions of law regulating the functioning of fisheries and environmental protection and is able to use them in her/his professional work. |
| RYB_A1_U17 | While formulating and solving technological problems, is able to perceive their non-technical aspects, including the environmental, economic and legal ones. Applies the occupational health and safety rules. |
| RYB_A1_U18 | Is able to select machines and tools necessary for proper functioning of an aquaculture facility or a fishing enterprise. |
| **Social competences** | |
| RYB_A1_K01 | Is aware of her/his knowledge and skills.Understands the need of learning and knows the possibilities of life-long learning and development. Determines the directions of her/his own development and education (studies of the second and third cycle, post-diploma studies, courses). |
| RYB_A1_K02 | Has the awareness of the importance of behaving in a professional manner, complying with the principles of professional ethics and respecting the variety of believes and cultures. |
| RYB_A1_K03 | 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. |
| RYB_A1_K04 | Is aware of the risk and is able to evaluate the effects of the activity performed within the scope of broadly understood fisheries and water management. |
| RYB_A1_K05 | Is able to think and act in a creative and enterprising manner. |
| RYB_A1_K06 | Is aware of the social role of a university graduate and, in particular, understands the need to popularise the knowledge gained. Is able to accept the function of a leader. |

Załącznik nr 4

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Rybactwo studia drugiego stopnia (na podstawie uchwały nr 73 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *fishery*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** animal science and fisheries (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| RYB_A2_W01 | Has advanced knowledge within the scope of selected areas of biology, chemistry, biotechnology and toxicology that enables proper planning of water protection with the use of suitable techniques. |
| RYB_A2_W02 | Has in-depth knowledge within the scope of using IT and statistical techniques in fisheries and hydrobiological research. |
| RYB_A2_W03 | Has in-depth knowledge within the scope of legal and technological requirements for fish enterprises (ports, vessels, fishing enterprises, aquaculture facilities). |
| RYB_A2_W04 | Has advances knowledge on health hazards occurring in the environment as well as in intensive breeding conditions, knows modern diagnostic methods. |
| RYB_A2_W05 | Has in-depth knowledge on biotechnological processes leading to obtaining of a specific product from biological aquatic resources as well as knows the methods of processing such products. |
| RYB_A2_W06 | Has in-depth knowledge as regards biology and taxonomy of aquatic organisms, including in particular fish of economic importance. Has advanced knowledge within the scope of biodiversity in the aquatic environment used in fisheries management and aquaculture. |
| RYB_A2_W07 | Has advanced knowledge on nutritional needs of aquatic animals, the role of food elements as well as the principles of rational nutrition. |
| RYB_A2_W08 | Has in-depth knowledge concerning the management of off-shore areas and areas dependent on fisheries as well as areas of special natural protection. |
| RYB_A2_W09 | Has in-depth knowledge within the scope of using techniques in aquaculture, knows the biotechnique of breeding selected species of hydrobionts. |
| RYB_A2_W10 | Has advanced knowledge on the use of aquatic living resources (lrecreational use of basins) in a manner other than in fisheries. |
| RYB_A2_W11 | Has advanced knowledge within the scope of using the principles of genetic engineering in breeding aquatic organisms as well as analytic methods used in genetic, biotechnological and other research. |
| RYB_A2_W12 | Has in-depth knowledge within the scope of the methods for estimating and evaluating the size of biological aquatic resources as well as mechanisms shaping the size of fish production of various types of basins. |
| RYB_A2_W13 | Has in-depth knowledge on fishing techniques. |
| RYB_A2_W14 | Has knowledge necessary to understand the non-technical conditions of engineering activity, knows the OHS principles in fisheries. |

| Code | Learning outcomes for programme of studies |
|---|---|
| RYB_A2_W15 | Has knowledge within the scope of intellectual property protection and patent law. |
| RYB_A2_W16 | Knows the principles of developing individual entrepreneurship and the basics of accounting. |
| **Skills** | |
| RYB_A2_U01 | Has the ability to find, understand, analyse and use the necessary information from various sources. Is able to integrate the obtained information, to interpret it as well as to draw conclusions, formulate and justify opinions. |
| RYB_A2_U02 | Is able to work individually and in a team, to estimate the time necessary for accomplishment of an assigned task, to develop and implement a work schedule that guarantees meeting deadlines. |
| RYB_A2_U03 | Is able to develop documentation concerning the accomplishment of an engineering task and to prepare a text containing the description of the results of such a task as well as to present them verbally (presentation) in Polish and in a foreign language. |
| RYB_A2_U04 | Uses a foreign language in an extent sufficient to communicate as well as to read scientific publications, technical, technological and similar documentation with understanding. |
| RYB_A2_U05 | Has the ability to learn, for example to raise professional competences. |
| RYB_A2_U06 | Is able to define and characterise the components of flora and fauna of aquatic environment and to indicate their importance for fisheries. |
| RYB_A2_U07 | Is able to prepare complex breeding programmes, strategies of protecting waters and their resources as well as preserving biodiversity in aquatic environment including the evaluation of usefulness of various types of waters for conducting sustainable management of fisheries. |
| RYB_A2_U08 | Is able to organise and conduct, alone or in a team, advanced research within the scope of health hazards of hydrobionts. Is able to determine the nutritional value of hydrobionts. |
| RYB_A2_U09 | Is able to develop and conduct alone a complex of research connected with the evaluation of usefulness of particular types of feeds in feeding selected species of aquatic animals. |
| RYB_A2_U10 | Is able to perform the function of a lake ichthyologist, a manager of an aquaculture facility and a manager of a fishing enterprise. |
| RYB_A2_U11 | Is able to observe, understand and predict the influence of various factors on the dependencies between functioning of the aquatic environment, the size of resources and the fishing effectiveness of various basins. |
| RYB_A2_U12 | Is able to develop a plan of protection and exploitation of resources based on the theory of sustainable fisheries. |
| RYB_A2_U13 | Is able to plan and conduct a technological process of breeding aquatic animals in a full cycle. |
| RYB_A2_U14 | Is able to use fishing techniques. |
| RYB_A2_U15 | Is able to combine logically the dependencies between biological factors, exploitation, production in fisheries and quality of aquatic environment, taking into consideration the systemic and non-technical aspects. |

| Code | Learning outcomes for programme of studies |
|---|---|
| **Social competences** | |
| RYB_A2_K01 | Is able to think and act in an enterprising and creative manner. |
| RYB_A2_K02 | Understands the need to formulate and transfer to the society - e.g. through mass media - information and opinions concerning the issues in fisheries and the links of fisheries with other types of human activity, including in particular the protection of aquatic environment. |
| RYB_A2_K03 | 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 able to perform the function of a leader. |
| RYB_A2_K04 | Is aware of the need of life-long learning, extending and updating of his/her knowledge. |

Załącznik nr 5

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Technologia żywności i żywienia człowieka studia pierwszego stopnia (na podstawie uchwały nr 74 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *food technology and human nutrition*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** nutrition and food technology (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| TZZ_A1_W01 | Has basic knowledge within the scope of inorganic and organic chemistry including the knowledge of applied terminology, chemical terms and laws, knows the properties of chemical elements, selected organic and inorganic compounds as well as mechanisms of chemical reactions. |
| TZZ_A1_W02 | Has basic knowledge within the scope of mathematics including matrices, derivatives, mathematical analysis and calculus. |
| TZZ_A1_W03 | Has basic knowledge within the scope of physics including mechanics, thermodynamics, optics, electricity and magnetism, elements of nuclear physics and foundations of spectroscopy. |
| TZZ_A1_W04 | Has basic knowledge within the scope of nomenclature, basic definitions and structure of the main food elements as well as mutual relations, transformations and interactions between them. Has knowledge within the scope of biochemical transformations in organisms. |
| TZZ_A1_W05 | Knows elementary terminology within the scope of food hygiene and toxicology; has knowledge of dangerous organisms and substances present in raw materials and food products as well as biological and chemical factors responsible for their presence; knows the principles of procedure necessary to prevent food health risks. |
| TZZ_A1_W06 | Has basic knowledge on the subject of microbes, their role and influence on food health quality as well as their participation in technological processes. Knows the relations between the initial microbiological quality of raw materials, the parameters of technological processes as well as hygiene and microbiological quality of a product. Has basic knowledge on the subject of pathogens in food. |
| TZZ_A1_W07 | Has systematic knowledge concerning examination of raw materials and food products, including in particular the methods of analysis and evaluation of food quality. Has knowledge on the subject of new techniques of instrumental analysis. Has knowledge on the subject of commodity science characteristics of raw materials and food products. Knows the most important systems of food quality and safety management. |
| TZZ_A1_W08 | Knows the principles and laws underlying process engineering. Has knowledge of basic concepts and terminology necessary in food industry engineering and machine science. Has basic knowledge connected with materials, construction solutions of machines and devices in food industry, designing, operation of process lines and processes in food industry. |
| TZZ_A1_W09 | Has basic knowledge within the scope of IT techniques and knows the statistical tools used in engineering sciences. |

| Code | Learning outcomes for programme of studies |
|---|---|
| TZZ_A1_W10 | Has basic knowledge within the scope of functioning of aquatic organisms obtained for processing, knows the principles and basic methods of obtaining aquatic organisms that are caught or bred. |
| TZZ_A1_W11 | Knows the foundations of ecology and environmental protection as well as the results of anthropopression. Has knowledge of the processes occurring in the environment depending on its nature and knowledge on the subject of its monitoring. |
| TZZ_A1_W12 | Knows the terminology used in nutrigenomics and the dependencies between human diet and genetic conditioning. |
| TZZ_A1_W13 | Has general knowledge on the subject of product components and their suitability for nutrition, planning of rational nutrition of a healthy and ill human being as well as assessment of the nutritional status. Has basic knowledge on the subject of dangers resulting from nutritional mistakes; knows the principles of creating prophylactic programmes. |
| TZZ_A1_W14 | Has knowledge on the subject of structure and functioning of the human body, changes caused by environmental aggression factors and their prophylaxis; knows the role and metabolism of nutrients taken as well as determinants of nutritional behaviour and mechanisms of creating nutritional behaviours. Has knowledge on the subject of basic diet supplements and dietetic preparations. |
| TZZ_A1_W15 | Has knowledge within the scope of terminology, characteristics of the methods of obtaining and classification of raw materials of plant and animal origin as well as byproducts and changes occurring during preservation, storage and processing. |
| TZZ_A1_W16 | Has basic knowledge within the scope of engineering technologies, especially technology of products of plant and animal origin, food and beverage technology, biotechnology, technology of processing byproducts and food industry waste. Knows basic methods, techniques, tools and materials used for solving engineering tasks. |
| TZZ_A1_W17 | Has basic knowledge on the subject of the influence of individual operations and technological processes on the quality of ready products. Knows the principles of selecting raw materials and production methods, shaping the functional and nutritional properties as well as the principles of designing food products. Has knowledge of product cost calculation methods and knows the general principles of establishing and conducting various forms of individual entrepreneurship. |
| TZZ_A1_W18 | Has systematic knowledge on the subject of methods of securing raw materials and food products during transport, storage and distribution.<br>Has knowledge within the scope of materials for producing packaging, their division, assessment, certification, marking and selection. Knows basic systems of food packaging. |
| TZZ_A1_W19 | Has basic knowledge of the non-technical conditions of engineering activity, knows the basic OHS principles in food industry. |
| TZZ_A1_W20 | Has elementary knowledge within the scope of economics and enterprise management, intellectual property protection and patent law. |
| TZZ_A1_W21 | Knows the general principles of developing individual entrepreneurship and the basics of accounting. |
| TZZ_A1_W22 | Knows and understands the principles of interaction between the environment and food elements as well as food and the human being. |

| Code | Learning outcomes for programme of studies |
|---|---|
| **Skills** | |
| TZZ_A1_U01 | Has the ability to find, understand, analyse and use the necessary information from literature, data bases and other sources. Is able to integrate the obtained information, to interpret it as well as to draw conclusions, formulate and justify opinions. |
| TZZ_A1_U02 | Is able to work individually and in a team, to estimate the time necessary for accomplishment of an assigned task, to develop and implement a work schedule that guarantees meeting deadlines. |
| TZZ_A1_U03 | Is able to develop documentation concerning the accomplishment of an engineering task and to prepare a text containing the description of the results of such a task as well as to present them verbally (presentation) in Polish and in a foreign language. |
| TZZ_A1_U04 | Uses a foreign language in an extent sufficient to communicate as well as to read scientific publications, technological documentation, instruction manuals of devices (machines) and similar documents with understanding. |
| TZZ_A1_U05 | Has the ability to learn, for example to raise professional competences. |
| TZZ_A1_U06 | Uses proper chemical nomenclature and terminology; is able to select appropriate procedures and analytic methods; is able to determine the credibility of analyses. 1,2,8. |
| TZZ_A1_U07 | Is able to identify and characterise the main food elements, their transformations in an organism and in food products and their physicochemical properties as well as examine and determine the dependencies between these elements. |
| TZZ_A1_U08 | Is able to use the proper nomenclature, undertake the standard activities with the use of appropriate methods within the scope of food hygiene and toxicology in order to guarantee its pro-health quality. |
| TZZ_A1_U09 | Is able to use microbiological terminology, select appropriate diagnostic techniques for targeted microbiological analysis of food, is able to recognise parasitic organisms. |
| TZZ_A1_U10 | Is able to combine various methods of food analysis and assessment, control the changes occurring during its storage, evaluate the quality of raw materials and food products. Is able to define and detect food adulteration. |
| TZZ_A1_U11 | Has basis skills of solving engineering problems connected with designing, equipping and operation of food industry process lines, is able to use the learned methods of computer analysis and assessment of technological problems. |
| TZZ_A1_U12 | Is able to recognise raw materials of aquatic origin, determine the adequate manner of obtaining individual organisms, identify and analyse the factors influencing the exploitation effectiveness of aquatic organisms used in food processing. |
| TZZ_A1_U13 | Is able to monitor the environment and act in a manner adequate for the level of risk. |
| TZZ_A1_U14 | Is able to examine and indicate the dependencies between human diet and genetic conditioning. |
| TZZ_A1_U15 | Is able to increase the pro-health effects of diet influence on human body through appropriate selection of diet components. |
| TZZ_A1_U16 | Is able to design and evaluate menus for various population groups.<br>Has the ability to identify and correct mistakes in nutrition and lifestyle of various population groups. |

| Code | Learning outcomes for programme of studies |
|---|---|
| TZZ_A1_U17 | Is able to characterise, evaluate and classify raw materials of plant and animal origin as well as byproducts, determine the transformations occurring in them and assess their technological usefulness. |
| TZZ_A1_U18 | Is able to plan the production process of preserved food and calculate the costs of its manufacturing. |
| TZZ_A1_U19 | Is able to design a food product of desired characteristics, taking into consideration the economic account. |
| TZZ_A1_U20 | Is able to take actions aiming at solving technical and technological problems in processing of food raw materials of plant and animal origin. Knows the advantages and disadvantages of undertaken actions. |
| TZZ_A1_U21 | Is able to characterise food industry byproducts and waste as well as plan the methods and manners of managing them. |
| TZZ_A1_U22 | Is able to select an appropriate type of packaging as well as choose the best method of securing raw materials and food products for specific conditions. |
| TZZ_A1_U23 | Is able to estimate the influence of technological processes on quality and efficiency of dishes. |
| TZZ_A1_U24 | Applies the occupational health and safety rules. |
| TZZ_A1_U25 | While formulating and solving technological problems, is able to perceive their non-technical aspects, including the environmental, economic and legal ones. |
| TZZ_A1_U26 | Is able to use the analytic methods learned for evaluation and analysis of the appropriateness of conducted technological processes. |
| TZZ_A1_U27 | Is able to select machines and devices necessary for proper conducting of a technological process connected with food processing. |
| TZZ_A1_U28 | Is able to design process lines selecting adequate machines and devices for a specific process. |
| TZZ_A1_U29 | Knows the advantages and disadvantages of undertaking the activities aiming at solution of professional problems. |
| TZZ_A1_U30 | Uses basic Information Technologies for obtaining and processing of information within the scope of food processing. |
| **Social competences** | |
| TZZ_A1_K01 | Is aware of her/his knowledge and skills. Understands the need of learning and knows the possibilities of life-long learning and development. Determines the directions of her/his own development and education (studies of the second and third cycle, post-diploma studies, courses). |
| TZZ_A1_K02 | Has the awareness of the importance of behaving in a professional manner, complying with the principles of professional ethics and respecting the variety of believes and cultures. |
| TZZ_A1_K03 | 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 able to cooperate and work in a group as well as to specify the priorities used for accomplishment of specified tasks. |
| TZZ_A1_K04 | Is aware of the risk and is able to evaluate the effects of the activity performed within the scope of broadly understood food processing and human nutrition. |
| TZZ_A1_K05 | Is able to think and act in a creative and enterprising manner. |
| TZZ_A1_K06 | Is aware of the social role of a university graduate and, in particular, understands the need to popularise the knowledge gained. Is able to accept the function of a leader. |

Załącznik nr 6

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Technologia żywności i żywienia człowieka studia drugiego stopnia (na podstawie uchwały nr 74 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *food technology and human nutrition*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** nutrition and food technology (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| TZZ_A2_W01 | Has advanced and in-depth knowledge within the scope of selected areas of mathematics, consumer and customs law. |
| TZZ_A2_W02 | Has advanced and in-depth knowledge within the scope of using IT techniques in food industry. |
| TZZ_A2_W03 | Has in-depth knowledge within the scope of hygienic and technological requirements for food processing facilities. |
| TZZ_A2_W04 | Has in-depth knowledge on plant and animal toxins, addictive substances and pests. |
| TZZ_A2_W05 | Has advanced knowledge on microbiological processes leading to obtaining of a specific food product as well as knows the research methods used to monitor such processes. |
| TZZ_A2_W06 | Has in-depth knowledge within the scope of food commodity science, the system of commodity classification, quality management, standards and standardisation. Knows new or alternative solutions to analytic problems. Has in-depth knowledge within the scope of quality management systems. |
| TZZ_A2_W07 | Has advanced knowledge on human nutritional needs, the role of diet components, the composition of products as well as the rules of rational nutrition of healthy and ill people. |
| TZZ_A2_W08 | Has in-depth knowledge concerning modern trends in dietetics in the context of pathophysiological processes. |
| TZZ_A2_W09 | Has advanced knowledge on dependencies in functioning of individual human body systems as well as the influence of life style and nutritional style on health condition. Knows the physiological changes occurring in the body in a particular period of life, the nutritional recommendations adjusted to such changes. |
| TZZ_A2_W10 | Knows the nutritional systems and fashions as well as their consequences. |
| TZZ_A2_W11 | Has advanced knowledge on technology of food of plant and animal origin, including in particular new processing methods. |
| TZZ_A2_W12 | Has in-depth knowledge within the scope of raw materials of plant and animal origin, their physiochemical properties and nutritional value. |
| TZZ_A2_W13 | Has well-grounded knowledge within the scope of designing food products and technological lines, including packaging systems. |
| TZZ_A2_W14 | Has in-depth knowledge on technological effects of using starter cultures in food processing industry. |

| Code | Learning outcomes for programme of studies |
|---|---|
| TZZ_A2_W15 | Has the knowledge necessary to understand non-technical conditions of engineering activity as well as the influence of food industry on functioning and development of rural areas. Knows the OHS rules applicable in food industry. |
| TZZ_A2_W16 | Has advanced economic, legal and social knowledge connected with food industry. Has elementary knowledge within the scope of intellectual property protection and patent law. |
| TZZ_A2_W17 | Knows the principles of developing individual entrepreneurship and the basics of accounting. |
| **Skills** | |
| TZZ_A2_U01 | Has the ability to find, understand, analyse and use the necessary information from literature, data bases and other sources. Is able to integrate the obtained information, to interpret it as well as to draw conclusions, formulate and justify opinions. |
| TZZ_A2_U02 | Is able to work individually and in a team, to estimate the time necessary for accomplishment of an assigned task, to develop and implement a work schedule that guarantees meeting deadlines. |
| TZZ_A2_U03 | Is able to develop documentation concerning the accomplishment of an engineering task and to prepare a text containing the description of the results of such a task as well as to present them verbally (presentation) in Polish and English. |
| TZZ_A2_U04 | Uses English in an extent sufficient to communicate as well as to read scientific publications, technological documentation, instruction manuals of devices (machines) and similar documents with understanding. |
| TZZ_A2_U05 | Has the ability to learn, for example to raise professional competences. |
| TZZ_A2_U06 | Is able to determine the influence of microbiological processes on correct processing of a raw material, is able to examine the relationship between production conditions and microbiological dangers. |
| TZZ_A2_U07 | Has in-depth skills that enable independent analysis and quality assessment of food products. Is able to develop and implement independently GMP, GHP and HACCP systems. |
| TZZ_A2_U08 | Is able to organise and conduct, alone or in a team, advanced research within the scope of the hazards of food quality and safety. |
| TZZ_A2_U09 | Is able to develop independently a complex of research connected with evaluation of specific qualitative features of a particular food commodity. |
| TZZ_A2_U10 | Is able to evaluate the nutritional style and condition of healthy and ill people. Is able to plan independently weekly menus and diets for various groups of people in systems of individual and group nutrition. |
| TZZ_A2_U11 | Is able to plan, evaluate and introduce corrections in nutritional values of daily food rations for people in various physiological states. |
| TZZ_A2_U12 | Is able to observe, understand and predict the influence of various factors on the dependencies between functioning of basic systems of the body. Is able to assess the relevancy of nutritional systems and fashions in the context of the body's needs. |
| TZZ_A2_U13 | Is able to develop production procedures and technological documentation of plant and animal products. |
| TZZ_A2_U14 | Is able to plan a production process, to manage it and to estimate its costs. |
| TZZ_A2_U15 | Is able to use in practice new methods of food product processing. |
| TZZ_A2_U16 | Is able to combine logically the dependencies between biological factors, processing and quality of the obtained food products, taking into consideration the systemic and non-technical aspects. |

| Code | Learning outcomes for programme of studies |
|---|---|
| **Social competences** | |
| TZZ_A2_K01 | Is able to think and act in a creative and enterprising manner. |
| TZZ_A2_K02 | Understands the need to formulate and transfer to the society - e.g. through mass media - information and opinions concerning broadly understood nutritional issues and other aspects of food science engineer's activity. |
| TZZ_A2_K03 | 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 able to accept the function of a leader. |
| TZZ_A2_K04 | Is aware of the need of life-long learning, extending and updating of her/his knowledge. |

Załącznik nr 7

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Zarządzanie bezpieczeństwem i jakością żywności studia pierwszego stopnia (na podstawie uchwały nr 75 Senatu ZUT z dnia 26 czerwca 2017 r.)

**Programme of studies:** *food safety and quality management*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** nutrition and food technology (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| ZBJŻ1A_W01 | Has basic knowledge within the scope of chemistry, mathematics, statistics, physics and related sciences. |
| ZBJŻ1A_W02 | Has basic knowledge within the scope of economics, law and social issues concerning Food Safety and Management. |
| ZBJŻ1A_W03 | Has basic knowledge within the scope of biodiversity in the environment, including characteristics of the raw materials processed for food purposes as well as mutual relations between food processing and the natural environment. |
| ZBJŻ1A_W04 | Has knowledge of the determinants between the quality and composition of food and the functioning of the human body. |
| ZBJŻ1A_W05 | Has knowledge concerning physical, chemical and biological factors (microorganisms, parasites and pests) occurring in food, modern methods of detecting them, their influence on the quality and health safety of food. |
| ZBJŻ1A_W06 | Has knowledge of a foreign language on B2 level. |
| ZBJŻ1A_W07 | Has basic knowledge on the subject the processes occurring with participation of microorganisms in various branches of industry. |
| ZBJŻ1A_W08 | Has knowledge of how to obtain and use packaging materials and their impact on food quality and safety. |
| ZBJŻ1A_W09 | Has knowledge of the physiology of digestion and transformations of nutrients as well as their influence on consumer health safety. |
| ZBJŻ1A_W10 | Has knowledge of chemical compounds, including toxic ones, present in the environment and food as well as their transformations, contamination processes and methods of their determination. |
| ZBJŻ1A_W11 | He knows the control organizations and food quality assurance systems, the principles of their implementation and documentation in Poland and the EU within the scope related to the studied field of study. |
| ZBJŻ1A_W12 | He knows the methods of securing and assessing the quality of raw materials and food. |
| ZBJŻ1A_W13 | Has knowledge within the scope of intellectual property protection and labour law. |
| ZBJŻ1A_W14 | Has knowledge on the subject of basic techniques of molecular biology and genetic engineering as well as possibilities of using modified organisms in food processing. |
| ZBJŻ1A_W15 | Has knowledge of the principles of creating and organizing transport and distribution of food. |

| Code | Learning outcomes for programme of studies |
|---|---|
| **Skills** | |
| ZBJŻ1A_U01 | Is able to identify chemical, physical and biological factors, including microbiological ones, occurring in the natural environment and during production, storage and transport of food, affecting its safety and quality. |
| ZBJŻ1A_U02 | Is able to choose methods of assessing the quality and safety of raw materials and food products. |
| ZBJŻ1A_U03 | Is able to select a type of packaging as well as choose the best method of securing raw materials and food products for specific conditions. |
| ZBJŻ1A_U04 | Is able to prepare documentation necessary for the implementation and certification of quality systems in food processing plants |
| ZBJŻ1A_U05 | Has the ability to learn alone, e.g. in order to improve her/his professional competences and has the ability to plan her/his own career independently. |
| ZBJŻ1A_U06 | Is able to identify and characterise the main food elements, their transformations in in food products and the organism as well as examine and determine the dependencies between these elements. |
| ZBJŻ1A_U07 | Is able to indicate the influence of food quality on the safety and protection of public health. |
| ZBJŻ1A_U08 | Is able to characterize environmental hazards arising from food production and to plan waste management methods and manners. |
| ZBJŻ1A_U09 | Has the ability to use the necessary information from various sources in Polish and in foreign languages. Is able to interpret it as well as to draw conclusions, formulate and justify opinions. |
| ZBJŻ1A_U10 | Is able to develop documentation concerning the accomplishment of an engineering task and to prepare a text containing the description of the results of such a task as well as to present them verbally (presentation) in Polish and in a foreign language. |
| ZBJŻ1A_U11 | Uses basic Information Technologies for obtaining and processing of information within the scope of Food Safety and Quality Management. Is able to conduct statistical analyses of experiment results. |
| ZBJŻ1A_U12 | Applies the occupational health and safety rules. |
| ZBJŻ1A_U13 | Is able to assess the positive and negative effects of genetic modifications. |
| **Social competences** | |
| ZBJŻ1A_K01 | Understands the need of life-long learning and the necessity to improve professional competences. Determines the directions of her/his own development and education (post-graduate studies, courses). |
| ZBJŻ1A_K02 | Is aware of the importance to comply with the principles of professional ethics and respect for the diversity of sexes, beliefs and cultures. |
| ZBJŻ1A_K03 | Is aware of the responsibility for the safety of work of her/his own and others.<br>Is able to behave in emergency. |
| ZBJŻ1A_K04 | Is able to think and act in an enterprising manner individually and in a team. |
| ZBJŻ1A_K05 | Is aware of the social role of a university graduate and, in particular, understands the need to popularise the knowledge gained. |

Załącznik nr 8

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Mikrobiologia studia pierwszego stopnia (na podstawie uchwały nr 209 Senatu ZUT z dnia 27 czerwca 2022 r.)

**Programme of studies:** *applied microbiology*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** animal science and fisheries (9%), health sciences (9%), biological sciences (11%), nutrition and food technology (71%)

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| MS_1A_W01 | knows and understands, to an advanced degree, chemistry, mathematics, statistics, physics and related sciences. |
| MS_1A_W02 | knows and understands, to an advanced degree, depending on the subjects studied, issues in the fields of humanistic, social and legal knowledge, enabling an understanding of social phenomena and processes and issues in the fields of economics and business management as well as the protection of intellectual property and patent law. |
| MS_1A_W03 | knows and understands, to an advanced degree, issues in ecology, monitoring and protection of the aquatic environment, the role and biodiversity and processes occurring in the biosphere; knows the necessary tools, methods and techniques to shape the environment. |
| MS_1A_W04 | knows and understands, to an advanced degree, the structure and functioning of the human body, the role and metabolism of nutrient intake and the main biochemical transformations; knows and understands, to an advanced degree, the activity of pathogenic agents and understands the principles of immune regulation and the principles of immunological diagnosis. |
| MS_1A_W05 | knows and understands, to an advanced degree, the issues of physical, chemical and biological factors (microorganisms, fungi, parasites and pests) present in food, modern methods of their detection, the impact of these factors on the quality and health safety of food. |
| MS_1A_W06 | knows and understands, to an advanced degree, foreign language issues at level B2. |
| MS_1A_W07 | knows and understands, to an advanced degree, issues in the field of microbial processes and their use in various branches of industry and agriculture. |
| MS_1A_W08 | knows and understands, to an advanced degree, the issues of plant, animal and human pathogens and methods of their identification. |
| MS_1A_W09 | knows and understands, to an advanced degree, issues related to the directions and mechanisms of evolution, the processes determining them at the molecular level; knows and understands, to an advanced degree, issues related to basic techniques of molecular biology and genetic engineering and the possibilities of using modified organisms in agriculture and food industry. |
| MS_1A_W10 | knows and understands, to an advanced degree, issues related to biotechnological instrumentation and techniques and their use in carrying out bioprocesses. |

| Code | Learning outcomes for programme of studies |
|---|---|
| MS_1A_W11 | knows and understands, to an advanced degree, issues in the biology of prokaryotic and eukaryotic organisms. |
| MS_1A_W12 | knows and understands, to an advanced degree, issues in the organisation, equipment and working methods and safety of research and diagnostic laboratories in particular microbiological laboratories. |
| MS_1A_W13 | knows and understands, to an advanced degree, issues in analytical methods and their use in food and environmental quality assessment. |
| MS_1A_W14 | knows and understands, to an advanced degree, issues in the basics of plant and animal product technology. |
| **Skills** | |
| MS_1A_U01 | can find and use information from a variety of sources in Polish and in a foreign language; can interpret and draw conclusions and formulate and justify opinions. |
| MS_1A_U02 | can use correct biological, chemical and physical terminology and can select appropriate procedures and research methods. |
| MS_1A_U03 | can recognise the basic structures of living organisms, their location and understands the relationship between structure and actions and explains deviations from normal organismal functioning. |
| MS_1A_U04 | can assess the quality of raw materials, products and technical materials and select appropriate instrumentation, biotechnological techniques and carry out a bioprocess. |
| MS_1A_U05 | can differentiate between pathogenic and beneficial organisms affecting production, food quality, animal and human health, the environment and natural resources. |
| MS_1A_U06 | can apply basic research techniques and tools specific to applied microbiology and related fields and can carry out observation and evaluation of process phenomena. |
| MS_1A_U07 | can organise laboratory work and carry out analyses; can validate a research method; can carry out statistical analyses of the results obtained. |
| MS_1A_U08 | can select methods and perform analyses of environmental and biological samples. |
| MS_1A_U09 | can assess the technological suitability of plant and animal raw materials, propose methods for their processing, and select analytical methods necessary for assessing the quality of manufactured products. |
| MS_1A_U10 | can carry out basic economic analyses of the technological process and introduce appropriate production safety management systems. |
| **Social competences** | |
| MS_1A_K01 | is ready for further training and the need to improve professional competence; is ready to set directions for his/her own development and education. |
| MS_1A_K02 | is ready to comply with professional ethics and respect diversity of gender, views and cultures. |
| MS_1A_K03 | is ready to take responsibility for the safety of his/her own work and that of others. |
| MS_1A_K04 | is ready to think and act in an entrepreneurial way individually and as part of a team. |
| MS_1A_K05 | is ready to popularise the knowledge acquired. |

Załącznik nr 9

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Mikrobiologia studia drugiego stopnia (na podstawie uchwały nr 209 Senatu ZUT z dnia 27 czerwca 2022 r.)

**Programme of studies:** *applied microbiology*

**Level of qualification:** second cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** animal science and fisheries (12%), nutrition and food technology (88%)

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| MS_2A_W01 | knows and understands, to an in-depth degree, the statistical methods, information technology and bioinformatics used in agricultural and related sciences. |
| MS_2A_W02 | knows and understands, to an in-depth degree, issues in the genomics and proteomics of organisms, their physiology and in the field of immunology and immunoprophylaxis in animal husbandry. |
| MS_2A_W03 | knows and understands, to an in-depth degree, issues concerning micro-organisms, their specificity, diversity and role in agricultural and related sciences. |
| MS_2A_W04 | knows and understands, to an in-depth degree, the microbiological and biological phenomena occurring in the pedosphere, hydrosphere and biosphere. |
| MS_2A_W05 | knows and understands, to an in-depth degree, issues concerning microorganisms (viruses, bacteria, fungi) and parasites and diagnostic methods for their detection. |
| MS_2A_W06 | knows and understands, to an in-depth degree, professional vocabulary in a foreign language at level B2+ in the relevant field. |
| MS_2A_W07 | knows and understands, to an in-depth degree, issues concerning antibiotic biotechnology and drug resistance. |
| MS_2A_W08 | has an in-depth knowledge of the impact of microorganisms on the quality and health safety of food and of the biotechnology of the food industry, including processing with microorganisms. |
| MS_2A_W09 | has an in-depth knowledge of cell culture and its application. |
| MS_2A_W10 | has an in-depth knowledge of the methods of obtaining and using the main types of biopolymers, mechanisms of biodegradation and biorefining. |
| MS_2A_W11 | has an extended knowledge of the management system and standardisation; has as an extended knowledge of the law protecting intellectual property and labour law. |
| MS_2A_W12 | has an in-depth knowledge of harmful compounds in the environment, contamination processes and methods for their determination. |

| Code | Learning outcomes for programme of studies |
|---|---|
| MS_2A_W13 | knows and understands, to an in-depth degree, the processes of the environment and the interrelationships between organisms in it and the possibilities of their use. |
| **Skills** | |
| MS_2A_U01 | can use information from various sources in Polish and in a foreign language; can interpret and draw conclusions and formulate and justify opinions. |
| MS_2A_U02 | can prepare documentation for an analytical task and prepare a text containing a discussion of the results of the task and present it in verbal (presentation) and descriptive form in Polish and in a foreign language. |
| MS_2A_U03 | can select appropriate analytical procedures and methods; can apply in practice basic and specialised techniques and research tools specific to applied microbiology and related sciences. |
| MS_2A_U04 | can differentiate between pathogenic and beneficial organisms for humans and animals and identify their role in the environment. |
| MS_2A_U05 | can introduce management and standardisation systems; can make practical use of knowledge of the law protecting intellectual property and labour law; can carry out statistical analyses used in agricultural sciences. |
| MS_2A_U06 | can work with genetic material, cell cultures and can use imaging techniques. |
| MS_2A_U07 | can apply knowledge of the relationship between the immunological status of animals and humans in relation to their welfare. |
| **Social competences** | |
| MS_2A_K01 | is ready for continuous training and the need to improve professional competences; determines the directions of his/her own development and education (PhD studies, postgraduate studies and courses). |
| MS_2A_K02 | is ready to observe professional ethics and respect diversity of gender, views and cultures. |
| MS_2A_K03 | is ready to take responsibility for the safety of his/her own work and that of others; is ready to deal with emergencies. |
| MS_2A_K04 | is ready to think and act in an entrepreneurial way individually and as part of a team. |

Załącznik nr 10

do zarządzenia nr 124 Rektora ZUT z dnia 30 października 2023 r.

Technologia żywności i żywienia człowieka studia pierwszego stopnia (na podstawie uchwały nr 14 Senatu ZUT z dnia 31 stycznia 2022 r.)

**Programme of studies:** *Food Technology and Human Nutrition*

**Level of qualification:** first cycle studies

**Educational profile:** general academic

**Fields of science:** Agricultural sciences

**Discipline of science:** nutrition and food technology (100%),

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

## Description of the planned educational effects

| Code | Learning outcomes for programme of studies |
|---|---|
| **Knowledge** | |
| TZZ_A1_W01 | has an advanced knowledge and understanding of general and inorganic chemistry and organic chemistry necessary for the field of study. |
| TZZ_A1_W02 | has an advanced knowledge and understanding of mathematics and physics. |
| TZZ_A1_W03 | has an advanced knowledge and understanding of food components, transformations and interactions between them; knows and understands the main biochemical transformations. |
| TZZ_A1_W04 | knows and understands, to an advanced degree, information technology and statistical tools used in engineering sciences. |
| TZZ_A1_W05 | knows and understands, to an advanced degree, the issues of ecology and environmental protection, and the effects of anthropopression; knows and understands environmental processes, understands the need for environmental monitoring. |
| TZZ_A1_W06 | knows and understands, to an advanced degree, the principles of interaction between the environment and food components and food and humans. |
| TZZ_A1_W07 | knows and understands food hygiene and toxicology, to an advanced degree, has advanced knowledge of hazardous agents present in raw materials and food products, knows and understands the principles of prevention of food health hazards. |
| TZZ_A1_W08 | has an advanced knowledge and understanding of microorganisms and their impact on technological processes and food quality; knows the pathogens present in food. |
| TZZ_A1_W09 | knows and understands, to an advanced degree, the functioning of the main quality and food safety management systems. |
| TZZ_A1_W10 | knows and understands, to an advanced degree, the methods and systems for protecting raw materials and food products during transport, storage and distribution; knows packaging materials, principles of certification and labelling. |
| TZZ_A1_W11 | is familiar with new techniques of instrumental analysis; knows and understands, to an advanced degree, methods of testing raw materials and food products. |
| TZZ_A1_W12 | has an advanced knowledge of the commodity characteristics of raw materials and food products |

| Code | Learning outcomes for programme of studies |
|---|---|
| TZZ_A1_W13 | knows and understands, to an advanced degree, the methods of extraction, classification of raw materials of plant origin, animal origin and by-products and the changes in them during preservation, storage and processing. |
| TZZ_A1_W14 | knows aquatic organisms harvested for processing, knows and understands methods of harvesting fished and farmed aquatic organisms to a degree appropriate to the speciality. |
| TZZ_A1_W15 | knows and understands the principles and laws of process engineering, has an advanced knowledge of food engineering and machine engineering terminology relating to materials, structural solutions for food industry machinery and equipment, design, operation of process lines. |
| TZZ_A1_W16 | knows and understands, to an advanced degree, the methods, techniques, tools and materials used in solving engineering tasks in food technology and biotechnology. |
| TZZ_A1_W17 | knows and understands, to an advanced degree, the impact of unit operations and processes on the quality of finished products; knows and understands the principles of food product design. |
| TZZ_A1_W18 | knows and understands, to an advanced degree, the non-technical considerations of engineering activities, knows the principles of health and safety in the food industry. |
| TZZ_A1_W19 | knows and understands, to an advanced degree, issues in economics and accounting, principles of creation and development of forms of individual entrepreneurship, business management, protection of intellectual property and patent law. |
| TZZ_A1_W20 | knows and understands the structure and functioning of the human body to a degree appropriate to the speciality. To an advanced level, he/she knows and understands the role and metabolism of nutrient intake and the determinants of nutritional behaviour; knows and understands the terminology used in nutrigenomics and the relationship between human nutrition and genetic determinants to a degree adapted to the specialisation. |
| TZZ_A1_W21 | knows and understands, to an advanced degree, issues concerning rational nutrition of healthy and sick people and assessment of nutritional status; knows and understands the risks of nutritional errors and the principles of developing preventive programmes. |
| **Skills** | |
| TZZ_A1_U01 | can search, analyse, interpret and use information from a variety of literature sources; can prepare documentation concerning the realization of an engineering task and present the results in written and oral form in Polish and in a foreign language; can use a foreign language at level B2. |
| TZZ_A1_U02 | can independently plan and implement own lifelong learning; can plan and organise individual and team work. |
| TZZ_A1_U03 | can carry out a laboratory experiment, select appropriate analytical procedures and methods to identify chemical compounds and assess the quality and safety of food and process flows, can determine the reliability of analyses. |
| TZZ_A1_U04 | can identify the main food components, their transformations in food products and critically evaluate the relationships observed. |
| TZZ_A1_U05 | can apply knowledge of food hygiene and toxicology to ensure food safety. |
| TZZ_A1_U06 | can control changes occurring during food storage; can detect food adulteration and the presence of parasitic organisms in food. |
| TZZ_A1_U07 | can solve engineering problems related to the design, equipment and operation of food processing lines. For this purpose he/she can use the learned computer methods. |

| Code | Learning outcomes for programme of studies |
|---|---|
| TZZ_A1_U08 | can identify aquatic raw materials and critically evaluate factors affecting the efficiency of exploitation and rearing of aquatic organisms used in food processing. |
| TZZ_A1_U09 | can monitor the environment and act in a manner appropriate to the degree of risk. |
| TZZ_A1_U10 | can select, investigate and demonstrate the relationship between human nutrition and genetic determinants. |
| TZZ_A1_U11 | can formulate and verify hypotheses on nutrient metabolism in the human body. |
| TZZ_A1_U12 | can design, evaluate and revise menus for different population groups; can critically evaluate the selection of dietary components to enhance health-promoting effects. |
| TZZ_A1_U13 | can evaluate and classify raw materials of plant origin, animal origin and by-products, identify the transformations taking place in them and assess their technological suitability. |
| TZZ_A1_U14 | can design a food product and plan its production process taking into account the economic calculation. |
| TZZ_A1_U15 | can take action to solve technical and technological problems in the processing of food raw materials of plant and animal origin; can identify advantages and disadvantages of actions taken. |
| TZZ_A1_U16 | can plan methods and ways to manage by-products and waste from the food industry. |
| TZZ_A1_U17 | can appropriately select tools to evaluate packaging and packaging systems for raw materials and food products. |
| TZZ_A1_U18 | can critically evaluate and compare the impact of different technological processes on the quality and performance of dishes. |
| TZZ_A1_U19 | can plan and organise work in accordance with health and safety principles. |
| TZZ_A1_U20 | can recognise non-technical aspects in solving technological problems. |
| TZZ_A1_U21 | can critically evaluate actions to solve professional problems. |
| TZZ_A1_U22 | can use information technology in acquiring and processing information in food processing. |
| **Social competences** | |
| TZZ_A1_K01 | is ready to apply acquired knowledge in solving cognitive and practical problems. |
| TZZ_A1_K02 | is ready to comply with the principles of professional ethics. |
| TZZ_A1_K03 | is ready to interact and work in a group. |
| TZZ_A1_K04 | is ready to act in an entrepreneurial manner. |
| TZZ_A1_K05 | is ready to act to promote knowledge. |