

Field of study: **BIOLOGY**Type of study: **second level, full time**Specialization: **LABORATORY TECHNIQUES IN BIOLOGY**Education profile: **general academic**Total teaching effects: **37 (14 knowledge; 15 skills; 8 social competences)**

Symbol	<p style="text-align: center;">Field-related education effects on 2nd degree studies in the field of BIOLOGY, specialization: LABORATORY TECHNIQUES IN BIOLOGY</p> <p style="text-align: center;">After completion of the second degree studies in the field of biology, laboratory techniques in biology specialization, the graduate has the following knowledge, skills and social competences:</p>	References to education effects in the range of natural sciences
KNOWLEDGE		
KBT_W01	Has the knowledge allowing for interpretation of natural phenomena and processes in research work and practical activities. Knows research methodology mandatory in natural sciences. Formulates research hypothesis and solves scientific problems.	P2A_W01 P2A_W02 P2A_W07
KBT_W02	Has the knowledge in the range of statistics which enables an assessment of natural phenomena and processes course. Conducts an analysis of variance using statistical packages. Demonstrates an usefulness of parametric and non-parametric tests.	P2A_W01 P2A_W06
KBT_W03	Defines the relations and relationships occurring in the nature. Knows advanced methods of bioinformatic analysis. Describes natural processes using computer software for biological data manipulation.	P2A_W04 P2A_W06
KBT_W04	Knows the methods of chemical and instrumental analysis with special attention paid to physicochemical basis. Has the knowledge of research methods and techniques used in the laboratories. Knows the rules of biological material handling. Has the knowledge essential in laboratory equipment operation. Demonstrates the advantages and disadvantages of particular analytical techniques.	P2A_W03
KBT_W05	Characterizes microscopic examinations techniques and describes observations conducted using the microscopes.	P2A_W01 P2A_W03
KBT_W06	Selects techniques of biological particles labeling and plans biological experiments requiring particles labeling.	P2A_W01 P2A_W03
KBT_W07	Has theoretical knowledge of evolution processes in biology, rules of natural organisms classification, classical and evolutionary taxonomy, pheno- and phylogenetic analysis, phylogenetic trees, models and algorithms. Describes the methods of phylogenetics reconstruction.	P2A_W04 P2A_W05
KBT_W08	Characterizes techniques, methods and application of cell and tissue cultures of plant and animal organisms. Describes the rules of cytogenetic preparations making, their staining and proper analysis.	P2A_W01 P2A_W04
KBT_W09	Characterizes and differentiates biotic and abiotic elements of water environment. Demonstrates and characterizes methods of hydrobiological material analytical research conducting.	P2A_W04
KBT_W10	Characterizes the differences between nuclear and mitochondrial genomes of various animal and plant species. Is able to describe the functions of genes and non-coding DNA regions. Demonstrates the difference of the human genome compared to other primates genomes, has an ability of wide analysis of the consequences of primates genomes rearrangement.	P2A_W04 P2A_W05
	Explains the terms in the range of toxicology and defines intoxication term, its types, doses, ways of poisons absorption and excretion from an	P2A_W04

KBT_W11	organism. Knows the dangers resulting from an exposure on toxic substances for human and animals.	
KBT_W12	Knows the problems in the range of occupational safety and health in laboratories. Demonstrates the threats resulting from biological material handling.	P2A_W09
KBT_W13	Characterizes ethical basis of species, nature and environment protection. Knows ethical and legal standards concerning cells and tissues culturing <i>in vitro</i> , genetic engineering, <i>in vitro</i> fertilization.	P2A_W05
KBT_W14	Describes the methods of mammals, birds and fish reproduction steering. Has the knowledge in the range of embryo transfer, <i>in vitro</i> fertilization, reproduction cycles control and induction, oocytes obtaining, maturation and culturing, assisted reproduction. Knows the basis of embryo engineering.	P2A_W01 P2A_W04 P2A_W05
KBT_W15	Defines the purposefulness of an application of analytics of food and feed material of plant and animal origin taking into account human and animals nutritional needs. Characterizes the consequences resulting from nutrients deficiency or excess. selects the methods of an assessment of basic nutrients, mineral components and antinutritive substances.	P2A_W01 P2A_W04 P2A_W05
SKILLS		
KBT_U01	Makes use of the methods used in laboratory analytics: optical, spectroscopic, electroanalytical, distributive. Is able to evaluate the factors affecting the result of laboratory examinations, avoiding pre- and post-analytic errors. Interprets the results of laboratory analysis based on standards and reference values. Collects and interprets the data derived from analysis and formulates the conclusions based on them.	P2A_U01 P2A_U06
KBT_U01	Performs analysis using spectroscopic optical methods and atomic absorption spectroscopy (AAS). Is able to operate refractometers and polarimeters. Uses the electrochemical techniques: redox titration, potentiometry, electrogravimetry and coulometry, polarography, voltammetry.	P2A_U01
KBT_U02	Is able to collect and handle with material aimed for laboratory examinations. Performs analysis in the range of environment pollution, hydrobiological examinations, fodders and biological material analysis.	P2A_U01
KBT_U03	Demonstrates an ability of critical analysis and selection of the information, especially these from electronic sources. Creates and makes use of bioinformatics databases. Evaluates the relationships between the genes. Performs genome analysis (linkage analysis, association analysis). Uses the algorithms applied in bioinformatics.	P2A_U03
KBT_U04	Uses the knowledge in the range of toxicology, toxicokinetics and toxicodynamics in biological examinations. Calculates various substances toxic doses for plants and animals. Describes the symptoms of poisoning with drugs, metals and their compounds as well as pesticides. Explains and interprets an influence of industrial pollutions and toxins accumulation in food chain on animal health status. Is able to evaluate threats resulting from an existence of toxic alkaloids, mycotoxins, nitrogen compounds, trace elements. Performs basic toxicological analysis.	P2A_U01 P2A_U05
KBT_U05	Searches out for information of genomes. Is able to perform phylogenetic analysis based on the comparisons. Interprets human genome analysis. Is able to use comparative genomics in medicine.	P2A_U01 P2A_U02 P2A_U07
KBT_U06	Operates various types of microscopes. Is able to prepare the preparations for the study with an application of light and electron microscopy. Makes histological staining of the preparations. Is able to make use of SEM-EDS microscopy application in determination of elemental composition of the examined substance.	P2A_U01
	Performs <i>in vitro</i> and <i>in vivo</i> labeling of biological material. Is able to	

KBT_U07	select the methods of biological experiments requiring particles labeling. Interprets and analyses the data obtained after biological particles labeling.	P2A_U01 P2A_U04
KBT_U08	Interprets the processes of plants and animals phylogenesis. Is able to prepare the data for phylogenetic analysis. Verifies and interprets the results of phylogenetic analysis. Uses molecular methods in phylogenetic examinations.	P2A_U01 P2A_U04
KBT_U09	Plans and performs the research tasks or experiments under a supervision of a scientific tutor. Is able to plan the research with animals participation and prepare the application for ethical committee.	P2A_U04
KBT_U010	Demonstrates an ability of scientific and creative solving of scientific problems, logical presentation of literature review and discussion leading using various communication means. Has an ability of oral presentations in Polish and foreign language in the range of natural sciences.	P2A_U02 P2A_U08 P2A_U10
KBT_U11	Demonstrates an ability of research work writing in Polish language, as well as short scientific communication in international conference language based on own scientific research.	P2A_U09
KBT_U12	Independently plans own professional or scientific career.	P2A_U11
KBT_U13	Evaluates the risk of laboratory work, with special attention paid to biological factors. Proceeds in a responsible manner in laboratory work, in accordance to the rules of occupational safety and health.	P2A_U06
KBT_U14	Is able to use specialist foreign language in the range of biology and related disciplines on the level higher than B2.	P2A_U012
KBT_U15	Evaluates reproduction abilities of the animals. Controls animals reproduction and makes use of reproduction biotechnology (cryopreservation, gender steering). Uses birds assisted reproduction techniques in creation of birds genetic reserves <i>ex situ in vitro</i> and in declining species protection. Performs semen collection, spermatozoa evaluation, and knows the methods of females insemination in various mammal species. Is able to make use of the methods of in vitro embryos obtaining. Knows the methods of females artificial insemination.	P2A_U04 P2A_U07
KBT_U15	Makes use of the knowledge of chemical analytics of food and fodder materials. Is able to determine basic nutrients, amino acids, macro- and microelements in food products and fodders. Knows mandatory analytical methods and techniques compliant with the Official Methods of Analysis of Analytical Chemists (AOAC 2005). Performs an evaluation of the research results based on reference values and nutritional standards of human and animals.	P2A_U04 P2A_U07
COMPETENCES		
KBT_K01	Demonstrates an awareness of updating the knowledge in the range of analytical techniques used in biological research. Is open to new technical achievements. Actively improves qualifications using scientific and popular publications.	P2A_K01 P2A_K05
KBT_K02	Demonstrates creativity and is able to determine the priorities in task realization taking into account the team work.	P2A_K02 P2A_K03
KBT_K03	Is aware of the rules of creation and development of the forms of individual activity and entrepreneurship. Properly adjudicates current biology dilemmas in ethical, legal and economic aspect.	P2A_K04
KBT_K04	Proceeds according to the rules of occupational safety and health during the work in analytical laboratories demonstrating responsibility for an assessment of threats resulting from research techniques applied. Demonstrates the care of safe work circumstances creation.	P2A_K06
KBT_K05	Demonstrates creativity in problems solving acting in systematic and enterprising manner.	P2A_K08
KBT_K06	Is determined in actions aimed at animals protection. Demonstrates ethical attitudes in scientific research.	P2A_K04

KBT_K07	Is open on research problems solving using the most up-to-date technologies. Demonstrates an activity and determination in funds acquisition on new technologies creation and research projects realization.	P2A_K01 P2A_K03
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