Ministry of Education and Science of Ukraine
National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

APPROVE
Scientific Council
Igor Sikorsky KPI
Protocol № 10
from 13/12/2021

“Applied biology”

EDUCATIONAL AND SCIENTIFIC PROGRAM

third (educational and scientific) level of higher education

specialty: **091 Biology**
areas of knowledge: **09 Biology**
qualification: **Doctor of Philosophy in Biology**

Effected by the Rector's Order
Igor Sikorsky KPI
from 15/02/2022
№ NON/75/2022

Kyiv
Igor Sikorsky Kyiv Polytechnic Institute
2022

Developed by the project team:

Project team leader:
Olexander GALKIN, Doctor of Biological Sciences, Professor, Head of the Department of Translational Medical Bioengineering Igor Sikorsky KPI

Project team members:
Oleksiy DUGAN, Doctor of Biological Sciences, Professor, Acting Head of the Department of Industrial Biotechnology and Biopharmacy, Igor Sikorsky KPI;
Tetiana TODOSIICHUK, Doctor of Eng. Sciences, Professor, Acting Dean of the Faculty of Biotechnology and Biotechnics of Igor Sikorsky KPI;
Eugene NASTENKO, Doctor of Biological Sciences, Professor, Head of the Department of Biomedical Cybernetics Igor Sikorsky KPI;
Olena BESPALOVA, Candidate of Biological Sciences, Senior Researcher, Associate Professor of the Department of Translational Medical Bioengineering, Igor Sikorsky KPI;
Valentina MOTRONENKO, Doctor of Philosophy, Associate Professor of the Department of Translational Medical Bioengineering, Igor Sikorsky KPI;
Daryna STAROSYLA, Candidate of Biological Sciences, Senior Researcher, Senior Researcher of the Laboratory of Experimental Chemotherapy of Viral Infections of the State Institution “Institute of Epidemiology and Infectious Diseases named after L.V. Gromashevsky National Academy of Medical Sciences of Ukraine";

Agreed:
Scientific and methodical commission of Igor Sikorsky KPI (NMC) in the specialty 091 Biology (Protocol № 1 of 01/12/2021)

Chairman of the NMC *Olexander GALKIN*

Methodical council of Igor Sikorsky KPI
(Protocol № 2 from 09/12/2021)

Vice Chairman of the Methodical Council *Anatoliy MELNICHENKO*

Professional examination was carried out by interested persons (stakeholders):

• *Natalia POEDYNOK,* Doctor of Biological Sciences, Senior Researcher, Head of the Grant Support Department of the National Research Fund of Ukraine*;*
• *Denis KOLIBO,* Doctor of Biological Sciences, Professor, Chief Researcher of the Institute of Biochemistry. O.B. Palladin of the National Academy of Sciences of Ukraine;
• *Valentina SOLOVYOVA,* Candidate of Biological Sciences, Senior Researcher, Acting Director of the State Research Center for Food Hygiene of the Ministry of Health of Ukraine;
• *Iryna KOSTENKO,* Candidate of Medical Sciences, Head of Marketing and Applications, Labvita LLC.

The educational program was discussed after receiving all comments and suggestions and approved at the meetings of the graduating departments:

Department of Translational Medical Bioengineering
(Protocol № 7 of 30 November 2021)

Head of the department *Olexander GALKIN*

Department of Industrial Biotechnology
(Protocol № 7 of 22 November 2021)

Acting Head of the department *Oleksiy DUGAN*

Department of Bioenergy, Bioinformatics and Ecobiotechnology
(Protocol № 6 of 22 November 2021)

Head of the department *Natalia GOLUB*

CONTENT

1. PROFILE OF THE EDUCATIONAL PROGRAM

1 – Common information	
Full ZVO and institute / faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Faculty of Biotechnology and Biotechnics Faculty of Biomedical Engineering
Degree of higher education and title of qualification in the original language	Degree - Doctor of Philosophy Qualification - Doctor of Philosophy in Biology
Cycle / level of HE	NRC of Ukraine - level 8; QF-EHEA - the third cycle; EQF-LLL - level 8
The official name of the educational program	Applied Biology
Type of diploma and scope of educational program	Diploma of Doctor of Philosophy, single, educational component 40 credits, term of study 4 years. The scientific component involves conducting your own research and design of its results in the form of a dissertation.
Accreditation	The program is not accredited. It is planned to be accredited by the National Agency for Quality Assurance in Higher Education in 2022-2023.
Prerequisites	Presence of a master's degree
Languages of instruction	Ukrainian, English
Validity of the educational program	Validity of the educational program Until the next accreditation
Internet address of the permanent placement of the educational program	https://osvita.kpi.ua/091_ONPD_PB http://bi.fbmi.kpi.ua/uk/educational-program-ua/ http://prombiotech.kpi.ua/vstup/doktor-filosofiyi/ https://keb.kpi.ua/navchannya/navchalna-dokumentacziya/
2 – Мета освітньої програми	
Training a professional capable of solving complex problems in the field of applied biology, which involves a deep rethinking of existing and formulation of new competencies on the principles of modification of natural and artificial artificial systems, as well as regulatory mechanisms in biological systems and carry out research and innovation and research and teaching activities. The purpose of the educational program corresponds to the development strategy of Igor Sikorsky Kyiv Polytechnic Institute" for 2020-2025.	
3 – Characteristics of the educational program	
Subject area (field of knowledge, specialty)	Field of knowledge - 09 Biology, specialty - 091 Biology. *Object of study*: structure, functions and life processes of biological systems of different levels of organization, patterns of onto- and phylogeny and succession dynamics; biodiversity of living systems, their interaction with the environment, reactions under different living conditions; importance of living beings in the biosphere, national economy, health care. *Theoretical content* of the subject area: structure, functions and processes of life, systematics, methods of research of non-cellular life forms, prokaryotes and eukaryotes. Structural and functional characteristics of biological systems at different levels of the organization. Mechanisms of preservation, realization and transfer of genetic information in organisms. Forms of relationships between micro- and macro-organisms. Structure and functions of the immune system, mechanisms of immune reactions, their regulation and control. Concepts, concepts, principles, laws of

	modern biological science and their use to assess the state of biological systems of different levels of organization, presentation and use of biological research results. Scientific-innovative and scientific-pedagogical activity in the field of applied biology. *Methods, techniques and technologies*: methods of laboratory and field biological research, monitoring, bioinformatics, mathematical and statistical processing of experimental data and interpretation of biological research results, information and communication technologies, methods of empirical research and modeling of processes and phenomena of biological systems. Methods of teaching in high school. *Tools and equipment*: living objects, biological models, modern devices for laboratory and field biological research, databases, specialized software and computer tools.
Orientation of the educational program	Educational and scientific
The main focus of the educational program	Regulatory mechanisms in biological systems of different levels of organization as a basis for creating new (artificial) biological objects and managing the processes of life of natural organisms for their practical use. Key words: applied biology, biochemistry, molecular biology, cytology, genetics, microbiology, virology, immunology, biotechnology
Features of the program	The peculiarity of the program is, firstly, its applied nature (creating an innovative product, technology) and, secondly, its interdisciplinary nature (biological sciences, innovative technologies)
4 – Suitability of graduates for employment and further study	
Suitability for employment	Employment under DK 003: 2010: •2211.1 Researchers (biology, botany, zoology, etc.) • 2310 Teachers of universities and higher educational institutions. Types of economic activity according to KVED-2010: • 72.1 Research and experimental developments in the field of natural and technical sciences; • 85.4 Higher education; • 85.6 Auxiliary activities in the field of education.
Further training	Continuing education in doctoral studies and / or participation in postdoctoral programs
5 – Teaching and assessment	
Teaching and learning	Lectures, practical and seminar classes; blended learning technology; implementation of own scientific research with the possibility of using the material and technical base of partner organizations from among research and research and production institutions. Approbation of learning outcomes and scientific work is carried out at scientific departmental and faculty seminars, as well as by participating in specialized scientific conferences and more.
Evaluation	Rating system, assessment, oral and / or written exams, testing. Evaluation of the results of scientific work is carried out in the framework of periodic reports of applicants (at least 2 times a year).
6 – Program competencies	
Integral competence (IC)	Ability to solve complex problems and problems related to the regulatory mechanisms of biological systems, which involves a deep rethinking of existing and the creation of new holistic knowledge and / or professional practice

General competencies (GC)	
GC 1	Ability to manage research projects and / or make proposals for research funding, registration of intellectual property rights and manage the process of commercialization of research and development.
GC 2	Ability to form a systematic scientific worldview, professional ethics and general cultural outlook.
GC 3	Acquisition of universal skills of a researcher, in particular oral and written presentation of the results of own research in Ukrainian.
GC 4	Ability to communicate in a foreign language (English or another according to the specifics of the specialty) to a sufficient extent to present and discuss the results of their scientific work orally and in writing, as well as for full understanding of foreign scientific texts in the specialty.
GC 5	Ability to use modern information technologies in scientific activities, search and critical analysis of information.
GC 6	Ability to abstract thinking, analysis and synthesis.
GC 7	The ability to generate new ideas (creativity), to conduct research at the appropriate level.
GC 8	Ability to work in an international scientific context.
Professional competencies of the specialty (PC)	
PC 1	Ability to revise existing concepts of modern biology by critically understanding and adapting newly created methods and technologies, by generating original hypotheses.
PC 2	Ability to develop new models and conduct experiments aimed at solving problems related to applied problems in biology, according to the specific needs of scientific research.
PC 3	Ability to critically evaluate the results obtained, make decisions and recommend alternative strategies for solving problems related to the creation and regulation of biological objects, research methods and technologies with their participation.
PC 4	Ability to assess the risks of the introduction of modern technologies (including biotechnology) for the natural environment, human health, its compliance with national and international standards and practices.
PC 5	Ability to create tools and methodologies of scientific activity, evaluation and implementation of the results of modern developments, solutions and achievements of natural sciences in biology.
PC 6	Ability to organize research and educational process in higher education institutions, as well as to use modern educational technologies.
PC 7	Ability to independently formulate a scientific problem in the field of creation of artificial biological systems and their practical use and / or regulatory mechanisms of biological systems, as well as to determine ways to solve it.
7 – Program learning outcomes	
KNOWLEDGE	
PLO 1	Knowledge of general scientific philosophical concepts, understanding of the role of science in the development of society.
PLO 2	Knowledge of modern methods of conducting research, organization and planning of the experiment, practices of publishing scientific results.
PLO 3	Knowledge and understanding of problematic issues of modern biochemistry, molecular biology and cytology in the context of creating new (artificial) and managing the life processes of natural organisms (for their practical use).

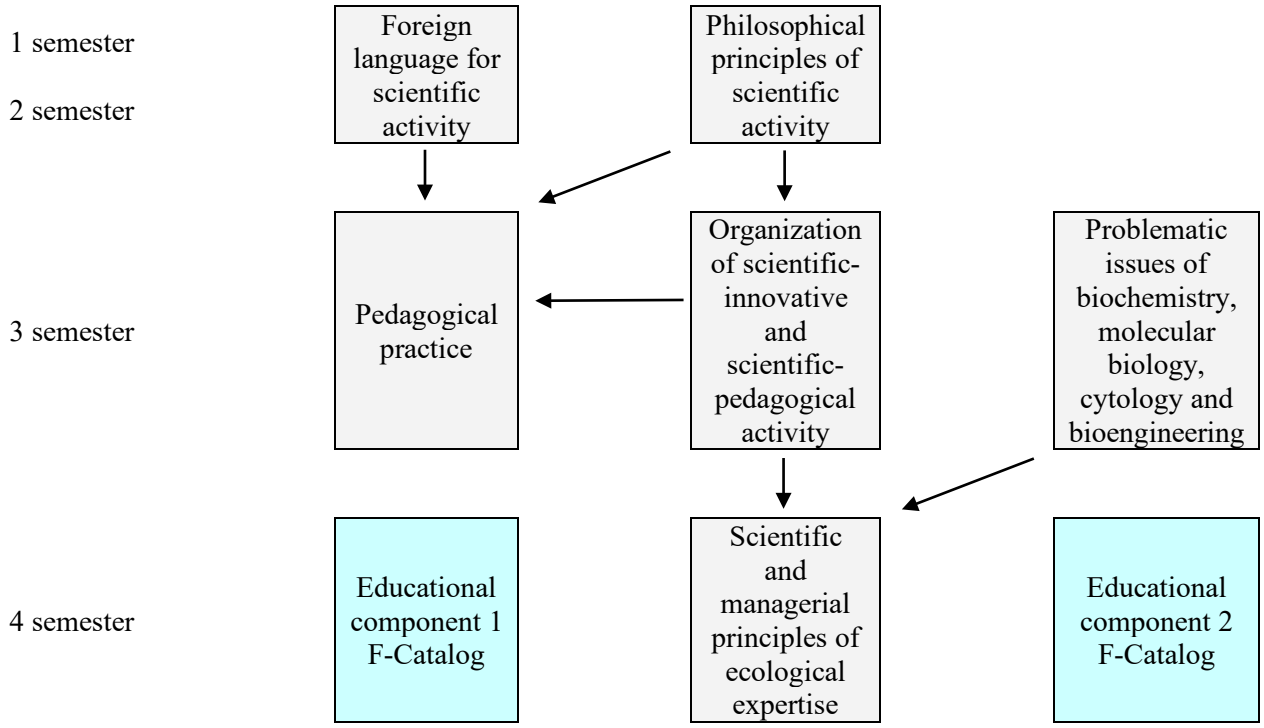
PLO 4	Knowledge of the basic principles of environmental assessment in the context of scientific and scientific-technical activities.
SKILLS	
PLO 5	Solve complex systemic and specialized problems in the field of applied biology and biotechnology
PLO 6	Rethink existing theoretical knowledge and professional practices in the field of life sciences.
PLO 7	Use advanced methods (including information technology) and professional skills to solve biological problems in research and innovation.
PLO 8	Presentation, discussion of the results of scientific work in Ukrainian
PLO 9	Solve complex problems related to the implementation of biological developments.
PLO 10	Use specialized fundamental knowledge to solve problems in various fields of biology.
PLO 11	Develop content, structure educational material and conduct classes of various kinds.
PLO 12	To organize and manage the cognitive activity of students, to form in students critical thinking and the ability to carry out activities in all its components.
PLO 13	Presentation, discussion of the results of scientific work in English in oral and written form, as well as full understanding and analysis of foreign scientific texts in the specialty
8 – Resource support for program implementation	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE (Licensing conditions for educational activities, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187, as amended)
Logistics	In accordance with the technological requirements for material and technical support of educational activities of the appropriate level of HE (Licensing conditions for educational activities, approved by the Resolution of the Cabinet of Ministers of Ukraine of 30.12.2015 № 1187, as amended)
Information and educational and methodical support	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the appropriate level of HE (Licensing conditions for educational activities, approved by the Resolution of the Cabinet of Ministers of Ukraine from 30.12.2015 № 1187, as amended)
9 – Academic mobility	
National credit mobility	Possibility of concluding agreements on academic mobility and double diplomacy
International credit mobility	Possibility of concluding agreements on international academic mobility (Erasmus + K1), on double graduation, on long-term international projects, which provide for the included training of students
Training of foreign applicants for higher education	Teaching can be in English

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code e/d	Components of the educational program (academic disciplines, practices, qualification work)	Number of credits	Form of final control
I. REGULATORY COMPONENTS			
RC 01	Philosophical principles of scientific activity	6	*Exam, test*
RC 01.1	*Philosophical principles of scientific activity. Part 1. Scientific outlook and ethical culture of a scientist*	*2*	*Test*
RC 01.2	*Philosophical principles of scientific activity. Part 2. Philosophical epistemology and epistemology*	*4*	*Exam*
RC 02	Scientific and managerial principles of ecological expertise	4	*Test*
RC 03	Problematic issues of biochemistry, molecular biology, cytology and bioengineering	8	*Exam*
RC 04	Foreign language for scientific activity	6	*Exam, test*
RC 04.1	*Foreign language for scientific activity. Part 1. Scientific research*	*3*	*Test*
RC 04.2	*Foreign language for scientific activity. Part 2. Scientific communication*	*3*	*Exam*
RC 05	Organization of scientific-innovative and scientific-pedagogical activity	4	*Test*
RC 06	Pedagogical practice	2	*Test*
II. SELECTIVE COMPONENTS			
SC 01	Educational component 1 F-Catalog	5	*Exam*
SC 02	Educational component 2 F-Catalog	5	*Exam*
The total amount of regulatory components:		**30**	
Total volume of selective components:		**10**	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		**40**	

∗For graduate students studying in a foreign language - Ukrainian or the language of instruction (at the choice of the applicant)

3. STRUCTURAL AND LOGICAL SCHEME



4. SCIENTIFIC COMPOSITION

Year of study	The content of the graduate student's scientific work	Form of control
1 year	Selection and justification of the topic of one's own scientific research, determination of the content, deadlines and scope of scientific works; selection and justification of the methodology of conducting one's own scientific research, carrying out a review and analysis of existing views and approaches developed in modern science in the chosen direction. Preparation and publication of at least 1 article (usually a review) in specialized scientific publications (domestic or foreign) on the topic of research; participation in scientific and practical conferences (seminars) with the publication of abstracts of reports.	Approval of the individual plan of the graduate student's work at the academic council of the institute / faculty, reporting on the progress of the individual graduate student's plan twice a year
2 year	Under the guidance of a scientific supervisor, conducting one's own scientific research, which involves solving research tasks by applying a complex of theoretical and empirical methods. Preparation and publication of at least 1 article in specialized scientific publications (domestic or foreign) on the topic of research; participation in scientific and practical conferences (seminars) with the publication of abstracts of reports.	Reporting on the progress of the individual graduate student's plan twice a year
3 year	Analysis and generalization of the obtained results of own scientific research; substantiation of the	Reporting on the progress of the individual graduate

Year of study	The content of the graduate student's scientific work	Form of control
	scientific novelty of the obtained results, their theoretical and/or practical significance. Preparation and publication of at least 1 article in specialized scientific publications on the topic of research; participation in scientific and practical conferences (seminars) with the publication of abstracts of reports.	student's plan twice a year
4 year	Designing the scientific achievements of the graduate student in the form of a dissertation, summarizing the completeness of the coverage of the results of the dissertation in scientific articles in accordance with current requirements. Implementation of the obtained results and receipt of supporting documents. Submission of documents for the preliminary examination of the dissertation. Preparation of a scientific report for graduation certification (dissertation defense).	Reporting on the progress of the individual graduate student's plan twice a year. Providing a conclusion on the scientific novelty, theoretical and practical significance of the results of the dissertation.

5. FORM OF GRADUATE CERTIFICATION OF HIGHER EDUCATION APPLICANTS

The graduation certification of the holders of the degree of "Doctor of Philosophy" in the educational and scientific program "Applied Biology" is carried out in the form of an open defense of the dissertation in accordance with the law and ends with the issuance of a document of the established model on the award of the degree of Doctor of Philosophy with the assignment of the qualification "Doctor of Philosophy in Biology" in the specialty 091 Biology.

The dissertation is subject to mandatory plagiarism testing and must be published on the official website of the higher education institution or its department.

The dissertation is defended openly and publicly.

6. MATRIX OF CONFORMITY OF SOFTWARE COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	RC 01	RC 02	RC 03	RC 04	RC 05	RC 06	Scientific component
GC1	+	+			+		+
GC2	+						+
GC3	+	+	+		+		+
GC4		+	+	+			+
GC5		+	+		+		+
GC6	+	+	+		+		+
GC7	+	+	+		+		+
GC8	+	+			+		+
PC1		+	+				+
PC2		+	+				+
PC3		+	+				+
PC4		+	+				+
PC5		+	+				+
PC6	+				+	+	+
PC7			+		+		+
IC	+	+	+	+	+	+	+

7. MATRIX OF PROVIDING SOFTWARE LEARNING RESULTS BY RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

	RC 01	RC 02	RC 03	RC 04	RC 05	RC 06	Scientific component
PLO 1	+						+
PLO 2	+		+		+		+
PLO 3		+	+				+
PLO 4		+					+
PLO 5		+	+		+		+
PLO 6	+	+	+		+		+
PLO 7		+	+		+		+
PLO 8	+	+	+		+		+
PLO 9		+	+		+		+
PLO 10		+	+				+
PLO 11					+	+	+
PLO 12					+	+	+
PLO 13		+	+	+			+

8. MATRIX OF COMPLIANCE OF THE COMPONENTS OF THE PROGRAM WITH COMPONENTS PROVIDING ACQUISITION OF COMPETENCIES BY THE POSTGRADUATE STUDY ACCORDING TO THE NATIONAL FRAMEWORK FRAMEWORK

Competences in accordance with the National Qualifications Framework	Program components
In-depth knowledge of the specialty, including mastering the basic concepts, understanding of theoretical and practical problems, history of development and current state of scientific knowledge in the chosen specialty, mastering the terminology of the research area	**RC 2, RC 3**
General scientific (philosophical) competencies aimed at forming a systematic scientific worldview, professional ethics and general cultural outlook	**RC 1**
Universal skills of the researcher, in particular oral and written presentation of results of own scientific research in Ukrainian, application of modern information technologies in scientific activity, organization and carrying out of educational employment, management of scientific projects and / or drawing up of offers concerning financing of scientific researches, registration of intellectual property rights	**RC 1, RC 2, RC 3, RC 5, RC 6**
Language competencies sufficient to present and discuss the results of their research in English orally and in writing, as well as for a full understanding of foreign language scientific texts in the specialty	**RC 2, RC 3, RC 4**