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

VALIDATE
Igor Sikorsky KPI Academic Council
(protocol №6 from 7.09.2020)
Chairman of Academic Council
_____ M. Ilchenko

«Біотехнології»
“Biotechnologies”
EDUCATIONAL AND SCIENTIFIC PROGRAM

The third (educational and scientific) level of higher education

by specialty: 162 Biotechnologies and Bioengineering fields of knowledge: 16 Chemical and bioengineering qualification: Doctor of Philosophy in Biotechnology and Bioengineering

Enacted by order of Igor Sikorsky KPI rector
from 17.09.2020 №1/282

Kyiv 2020

Preamble

DEVELOPED by the project team:

Project team leader:
Golub Nataliia Borysivna, *Doctor of Technical Sciences, Associate Professor, Professor of the Department of Environmentalbiotechnology and Bioenergy* _____

Work group members:
Dugan Oleksiy Martemyanovych*, Doctor of Biological Sciences, Professor, Dean of Biotechnology and Biotechnics faculty* _____
Todosiychuk Tetyana Serhiivna*, Doctor of Technical Sciences, Associate Professor, Head of Industrial Biotechnology Department* _____
Gorobets Svitlana Vasylivna, *Doctor of Technical Sciences, Professor, Head of Bioinformatics Department* _____
Kuzminsky Eugene Vasyliovich*, Doctor of Chemical Sciences, Professor, Head of Environmentalbiotechnology and Bioenergy Department* _____
Klechak Inna Rishardivna*, Ph.D of Technical Sciences, Associate Professor of Industrial Biotechnology Department* _____
Polishchuk Valentyna Yuriyivna*, Ph.D of Technical Sciences, Associate Professor of Industrial Biotechnology Department* _____

VALIDATED:
Scientific and methodical commission of NTUU Igor Sikorsky KPI on a specialty 162 Biotechnology and Bioengineering

Head of SMC _____ Nataliia Golub
(protocol № 4 from 27.08.2020)

Methodical commission of NTUU Igor Sikorsky KPI
Head of Methodical commission _____ Yurii Yakimenko
(protocol № 1 from 03.09.2020)

INCLUDED:

Bunchak Myronovych Alexander - Director tannery Ltd. "World of Leather" Ivano-Frankivsk region, Bolekhiv, PS candidate of agricultural sciences.

Snezhkin Yuriy Fedorovych - Institute of Technical Thermophysics National Academy of Sciences of Ukraine, Doctor of Technical Sciences, Prof., Academician of the National Academy of Sciences of Ukraine

Kozlovets Oleksandr Anatoliyovych - head of the design department of Unibud Energo LLC Service ", Ph.D.

Kravchenko Valeriy Oleksandrovych - acting Director of SE "Research and Design and Technology Institute of Municipal Economy "(SE" NDKTI MG "), Ph.D.

Lutsyk Viktor Borysovych - director of the project organization "OSTVA LLC" in Rivne.

Konovalov DV - Director of Experimental Agricultural Production IFRG NAS of Ukraine, Ph.D.

Voychuk Serhiy Ivanovych, Deputy Director for Research at the Institute of Microbiology and Virology. D.K. Zabolotny NAS of Ukraine, Ph.D.

Gorlov Yuriy Ivanovych, Deputy Chairman of the Management Board for Quality of PJSC Diaprof-Med Research and Production Company

1. PROFILE OF THE EDUCATIONAL PROGRAM
by specialty 162 Biotechnology and Bioengineering

1 – General information	
Complete IHE and institute / faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" Faculty of Biotechnology and Biotechnics
Higher education degree and title of qualification in the original language	Degree - Doctor of Philosophy Qualification - Doctor of Philosophy in Biotechnology and Bioengineering
The official name of the educational program	Biotechnology
Type of diploma and scope of educational program	Doctor of Philosophy diploma, single, educational component 40 credits, term of study 4 years. The scientific component involves conducting own research and design of its results in the form of a dissertation.
Availability of accreditation	Accredited for the first time, National Agency for Higher Education Quality Assurance, 2021
Cycle/HE level	NQL Ukraine – level 8 QF-EHEA – third cycle EQF-LLL – level 8
Prerequisites	Master's degree
Language (s) of teaching	Ukrainian, English (Russian for foreigners)
Term of the educational program	Until the next accreditation
Internet address of the permanent placement of the educational program	https://osvita.kpi.ua/ "educational programs" tab http://biotech.kpi.ua/index.php/uk/osvitni-prohramy
2 – Goal of educational program	
Training of a professional capable of solving complex problems in the biotechnology and bioengineering field, which involves a deep reimagining of existing and formulation of new competencies on the principles of creation and modification of new and old biotechnologies in various fields and capabilities for research and innovation activities. The purpose of the educational program corresponds to the development strategy of Igor Sikorsky KPI. for 2020-2025.	
3 – Characteristics of the educational program	
Subject area	*Object:* biotechnological processes of obtaining biologically active substances and products by biosynthesis and / or biotransformation *Aims of learning*: training of specialists in biotechnology and bioengineering, able to solve complex problems in the field of professional and / or research and innovation activities in biotechnology and bioengineering, which involves a deep reimagining of existing and creation of new holistic knowledge and or professional practice. *Theoretical content of the subject area*. Fundamental and applied scientific bases of industrial use of biosynthetic and / or biotransformation potential of living objects for obtaining practically valuable products. Analysis, design, innovative approaches to solving complex problems in the field of biotechnology; research of 5 processes of obtaining target products and waste utilization using living organisms and their components and

	methods to increase productivity. *Methods, techniques and technologies*. Chemical, physicochemical, biochemical, microbiological, molecular biological, genetic research methods, technologies of biotechnological productions, information and computer technologies. *Tools and equipment*: for the biological agents analysis and products of their vital activity, equipment for cultivation of biological agents, isolation and purification of target products, specialized software
Orientation of the educational program	Educational and scientific
The main focus of the educational program	The program is based on standard scientific provisions with inclusion of the current state of biotechnology development for the metabolic processes management in organisms to create targeted products or technologies using living structures to preserve the environment and focuses on current specializations in which further professional and scientific careers are possible. Keywords: industrial biotechnology, bioinformatics, bioengineering, bioenergy, environmentalbiotechnology
Features of the program	Program main feature is a combination of methods from different areas of biotechnology and bioengineering to create an innovative product and / or biotechnology. The implementation of the program includes the involvement of practical professionals in the classroom.
4 – Suitability of graduates for employment and further study	
Suitability for employment	Employment under DK 003: 2010: 2211.2 Biotechnologist 2359.1 Other researchers in the field of education 2310 Teachers of universities and higher educational institutions
Further training	Continuation of education and obtaining the degree of Doctor of Sciences
5 – Teaching and assessment	
Teaching and learning	Lectures, practical and seminar classes; blended learning technology; graduate students conducting laboratory and practical classes with biotechnology students; Ph.D dissertation preparation, designing of research installations if necessary, approbation of scientific work results at seminars, conferences
Evaluation	Rating system, assessment, verbal and written exams, testing
6 – Program competencies	
Integral competence	Ability to solve complex problems and problems problems in the field of professional and / or research and innovation activities in biotechnology and bioengineering, which involves a deep reimagining of existing and creation of new holistic knowledge and or professional practice.

General Competences (GC)	
GC 1	Ability to search, process and analyze information from various sources
GC 2	Ability to abstractly think, analyze and synthesize.
GC 3	Ability to work in an international scientific context.
GC 4	Ability to communicate in a foreign language (English or another according to the specifics of the specialty) to the extent sufficient to present and discuss the results of their scientific work verbally and in writing, as well as for a full understanding of foreign scientific texts in the specialty.
GC 5	Ability to generate new ideas (creativity), to conduct research at the appropriate level.
GC 6	Ability to form a systematic scientific worldview.

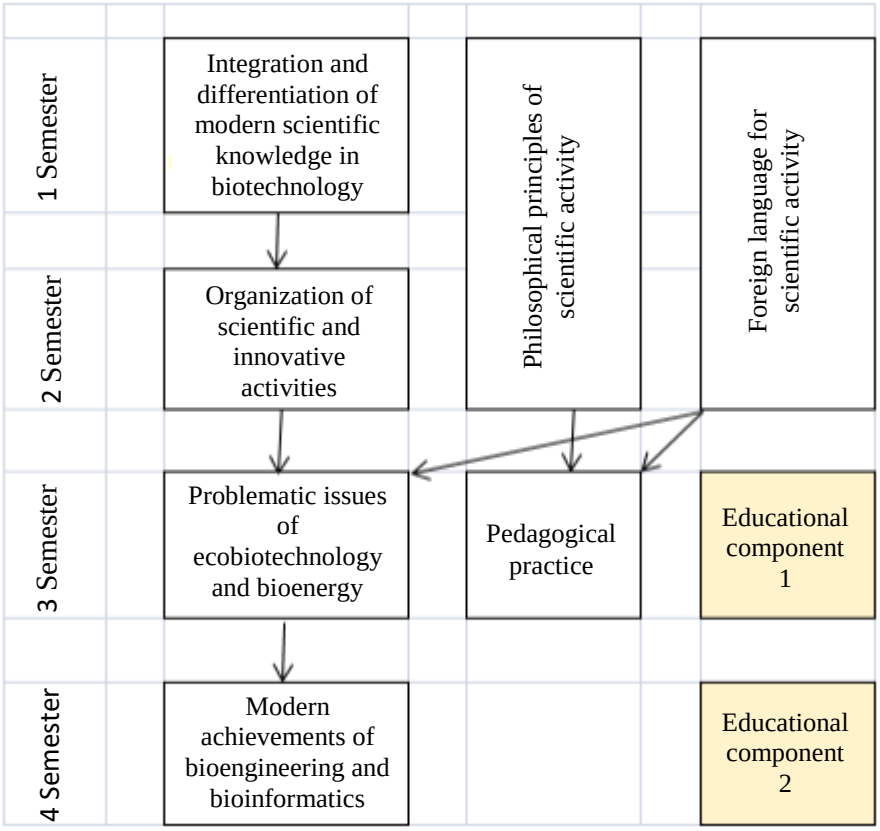
Professional competencies of the specialty (PC)	
PC 1	Ability to revise existing concepts of modern biotechnology and bioengineering by critically understanding and adapting newly created methods and technologies, by generating original hypotheses.
PC 2	Ability to perform original research, achieve scientific results that create new knowledge in the field of biotechnology and bioengineering and related interdisciplinary areas that can be published in leading scientific journals in biotechnology and related fields.
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 biotechnology for the environment, human health, its compliance with national and international standards and practices.
PC 5	Ability to develop new and improve existing biotechnology based on an understanding of modern scientific facts, concepts, theories, principles and methods of bioengineering and biotechnology.
PC 6	Ability to use modern information technologies, databases and other electronic resources, specialized software in scientific and educational activities.
PC 7	Ability to carry out scientific and pedagogical activities in higher education, use modern educational technologies and organize research of students.
PC 8	Ability to verbally and in writing present and discuss the results of research and / or innovative developments in Ukrainian and English, a deep understanding of English scientific texts in the field of research.
7 – Program learning outcomes	
KNOWLAGE	
PLO 1	Knowledge of general scientific philosophical concepts, understanding of science role in the development of society
PLO 2	Knowledge of modern research methods, organization and planning of the experiment, practices of publishing scientific results
PLO 3	Knowledge and understanding of problematic issues of modern biotechnology (including at the border of subject areas) and bioengineering to create modern biotechnology.
PLO 4	Knowledge and usage of modern physiological, biochemical and genetic approaches for biological agents implementation and regulation of biotechnological processes.
SKILLS	
PLO 5	Have advanced conceptual and methodological knowledge in biotechnology and cross-cutting areas, as well as research skills sufficient to conduct scientific and applied research at the level of the latest world achievements in the field, gain new knowledge and / or innovate.
PLO 6	Develop and implement scientific and / or innovative engineering projects that provide an opportunity to rethink existing and create new holistic knowledge and / or professional practice and solve significant scientific and technological problems of biotechnology in compliance with academic ethics and social, economic, environmental and legal aspects .
PLO 7	Apply modern tools and technologies for searching, processing and analyzing information, in particular, statistical methods of data analysis of large volumes and / or complex structures, specialized databases and information systems.
PLO 8	Freely present and discuss with specialists and non-specialists the results of research, scientific and applied problems of biotechnology in state and foreign languages, qualified to reflect the results of research in scientific publications in leading international scientific journals.

PLO 9	Develop new and improve existing biotechnologies for obtaining practically valuable biotechnological products for various purposes and environmental biotechnologies.
PLO 10	Plan and perform experimental and / or theoretical research in biotechnology and related interdisciplinary areas using modern specialized knowledge and instrumental methods, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge on the problem.
PLO 11	Understand the goals, objectives and methods of educational activities in higher education, be able to choose and structure appropriate educational material, plan and conduct various types of classes, analyze educational and teaching literature and use it in pedagogical practice.
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.
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, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05.2018.
Logistics	In accordance with the technological requirements for material and technical support of educational activities of the appropriate level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05.2018.
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, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05.2018.
9 – Academic mobility	
National credit mobility	Possibility of concluding agreements on academic mobility and double graduation
International credit mobility	Possibility of concluding agreements on international academic mobility (Erasmus + K1), on double graduation, on long-term international projects that include inclusive student education
Training of foreign applicants for higher education	Teaching in a foreign language

2. LIST OF COMPONENTS OF THE EDUCATIONAL COMPONENT OF THE EDUCATIONAL AND SCIENTIFIC PROGRAM

Code	Components of the educational program (academic disciplines, practices, qualification work)	Credit	Form of final control
I. Mandatory (regulatory) components of the EP			
General preparation			
GM 1	Philosophical principles of scientific activity	6	Test, exam
GM 2	Foreign language for scientific activity	6	Test, exam
GM 3	Integration and differentiation of modern scientific knowledge in biotechnology	4	Exam
GM 4	Problematic issues of ecobiotechnology and bioenergy	4	Exam
GM 5	Modern achievements of bioengineering and bioinformatics	4	Exam
GM 6	Organization of scientific and innovative activities	4	Test
GM 7	Pedagogical practice	2	Test
II. Selective components of EP			
S 1	Educational component 1 F-Catalog	5	Exam
S 2	Educational component 2 F-Catalog	5	Exam
The total amount of regulatory components:		**30**	
The total amount of selective components:		**10**	
TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		**40**	

3. STRUCTURAL-LOGICAL SCHEME



4. SCIENTIFIC COMPONENT

Year	The content of the graduate student's scientific work	Form of control
1	Conducting a literature review on research topics; if necessary, installation design for research, development of methods to be used in experimental work. Participation in scientific and practical conferences and seminars	Approval of the individual plan of the graduate student's work at the academic council of the faculty, reporting on the progress of the individual graduate student's plan twice a year
2	Conducting research on the topic of the dissertation, analysis of the results and their design in the form of articles (not less than 1) and abstracts, participation in scientific and practical conferences.	Report on the progress of the individual plan at the department twice a year
3	Conducting research on the topic of the dissertation; substantiation of scientific novelty of the obtained results, their theoretical and practical significance. Preparation and publication of at least 1 article in scientific professional publications on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Report on the progress of the individual plan at the department twice a year
4	Generalization of research results and design of dissertation work, summarizing the results of publications (at least three) on the topic of the dissertation in accordance with current requirements. Implementation of the obtained results and receipt of supporting documents. Submission of documents for preliminary examination of the dissertation. Preparation of a scientific report for final certification (defense of the dissertation).	Report on the progress of the individual plan at the department twice a year. Providing an conclusion on the scientific novelty, theoretical and practical significance of the dissertation results.

5. FORM OF GRADUATE CERTIFICATION OF HIGHER EDUCATION APPLICANTS

The final certification of candidates for the degree of "Doctor of Philosophy" for the educational and scientific program "Biotechnology" is conducted in the form of open defense of the dissertation according to law and ends with the issuance of a standard document on awarding the degree of Doctor of Philosophy with the qualification "Doctor of Philosophy in biotechnology and bioengineering" on specialty 162 Biotechnology and Bioengineering.

The dissertation is subject to mandatory plagiarism testing and must be published on the official website of the higher education institution or its department and after the defense is placed in the repository of the University NTB for free access.

The dissertation is defended openly and publicly.

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

	GM 1	GM 2	GM 3	GM 4	GM 5	GM 6	GM 7	Scientific component
GC 1			•	•	•			•
GC 2	•		•			•		•
GC 3			•	•	•			•
GC 4		•						•
GC 5			•	•	•			•
GC 6	•		•					•
PC 1				•	•			•
PC 2			•	•	•	•		•
PC 3				•	•			•
PC 4				•				•
PC 5				•	•			•
PC 6			•				•	•
PC 7						•	•	•
PC 8						•	•	•

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

	GM 1	GM 2	GM 3	GM 4	GM 5	GM 6	GM 7	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							•	•