

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

KYIV NATIONAL UNIVERSITY OF TECHNOLOGIES AND DESIGN

APPROVED BY ACADEMIC COUNCIL

Minute's № 11, June 30 2023

Chairman of Academic Council

Ivan GRyshCHENKO

Put into effect by order of the rector

Minute's № 213, July 14 2023

EDUCATIONAL - PROFESSIONAL PROGRAM

Biotechnology of high molecular weight compounds

Level of higher education	second (Master's degree)
Degree	Master
Subject area	16 Chemical Engineering and Bioengineering
Specialty	162 Biotechnology and Bioengineering
Qualification	Master in Biotechnology and Bioengineering

LETTER OF APPROVAL

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Vice-Rector

26.06.2023

Liudmyla HANUSHCHAK-YEFIMENKO

Director of Staff Training Management Centre

26.06.2023

Olena HRYHOREVSKA

Approved by the Academic Council of the Faculty of Chemical and Biopharmaceutical Technologies

Minutes № 11 of « 26th » June 2023

Dean of the Faculty of Chemical and Biopharmaceutical Technologies

26.06.2023

Tetiana DERKACH

Discussed and recommended at the meeting of the Department of Biotechnology, Leather and Fur
Minutes № 17 of « 26th » June 2023

Head of the Department of Biotechnology, Leather and Fur

26.06.2023

Olena MOKROUSOVA

INTRODUCTION

Developed by: Kyiv National University of Technologies and Design

CONTENT BY:

Educational programme support team	Full name, academic degree, academic title, position	Signature	Date
Guarantor of the educational programme	IRYNA VOLOSHYNA, PhD, Associate Professor, Department of Biotechnology, Leather and Fur, Faculty of Chemical and Biopharmaceutical Technologies, Kyiv National University of Technologies and Design		
Working group	OLGA ANDREYEVA, Professor, Dr. Sc., Department of Biotechnology, Leather and Fur, Faculty of Chemical and Biopharmaceutical Technologies, Kyiv National University of Technologies and Design		
	OLGA YUNHIN, PhD, Associate Professor, Department of Biotechnology, Leather and Fur, Faculty of Chemical and Biopharmaceutical Technologies, Kyiv National University of Technologies and Design		
	IHOR HRETSKYI, PhD, Associate Professor of Department of Biotechnology, Leather and Fur, Faculty of Chemical and Biopharmaceutical Technologies, Kyiv National University of Technologies and Design		

Stakeholders are included in the group for the development of the EP:

1. Lupan Kateryna, student, Department of Biotechnology, Leather and Fur, Faculty of Chemical and Biopharmaceutical Technologies, Kyiv National University of Technologies and Design;
2. Savchuk Oleksiy, Dr. Sc., Professor, Head of the Department of Biochemistry, Educational and Scientific Center «Institute of Biology and Medicine» of Taras Shevchenko National University of Kyiv.

1. Profile of the educational-professional program

Biotechnology of high molecular weight compounds

1.1 – General information	
Full name of a higher education institution and structural unit	Kyiv National University of Technologies and Design Department of Biotechnology, Leather and Fur
Higher Education Level	second (Master)
Educational qualification	Master of Biotechnology and Bioengineering
Qualification in diploma	Higher Education Degree - Master Speciality - 162 Biotechnology and Bioengineering Educational program - Biotechnology of high molecular weight compounds
Type of diploma and scope of the educational program	Master's degree, 90 ECTS credits
Accreditation	Certificate of accreditation of the educational and professional programme UD № 7428 dated 19.06.2023
Cycle/level	National Qualifications Framework of Ukraine: Master - Seventh Level
Prerequisites	Bachelor's degree, master's degree, specialist degree
Language (-s) of teaching	Ukrainian
Duration of the educational program	Until July 1 st , 2026
Website for a permanent description of the educational program	http://knutd.edu.ua/ekts/
1.2 – Purpose of the educational program	
Formation and development of professional competencies in the field of biotechnology for the organisation and realisation of biotechnological, scientific-research, and project-technological work related to the use of biological agents and products of their activities, aimed at acquisition by students the knowledge, skills, and abilities necessary to ensure his ability to professional activity and employment, as well as independently perform complex tasks of research and innovation, to be responsible for the results of their professional activities.	
1.3 – Characteristics of the educational program	
Subject matter	<p>Object: Biotechnological processes for obtaining biologically active substances and products through biosynthesis and/or biotransformation, as well as their engineering implementation.</p> <p>Learning Objectives: To train engineers and scientists capable of organizing and conducting research, design, and production-technological work related to the use of biological agents and their metabolic products.</p> <p>Theoretical Content of the Subject Area: Fundamental and applied scientific foundations of the industrial use of the biosynthetic and/or biotransformation potential of living organisms for the production of practically valuable products.</p> <p>Methods, Methodologies, and Technologies: Chemical, physicochemical, biochemical, microbiological, molecular biological, genetic research methods, biotechnological production technologies, information and computer technologies.</p> <p>Tools and Equipment: For the analysis of biological agents and their metabolic products, equipment for cultivating biological agents, isolation and purification of target products, automation tools, and computer-aided design systems for biotechnological production.</p> <p>Compulsory educational components – 73%, of which: practical training – 12%, learning of foreign language – 6%, diploma design – 26%.</p>

	Disciplines of free choice of students: 27% are selected from the university catalogue in accordance with the approved procedure at the University.
Orientation of the program	Educational and professional program for master's degree. The educational program is aimed at training professionals capable of using at a high professional level living objects, their fragments, and products of their life as a means of production for drugs, products, and materials by biological synthesis and/or biotransformation for medicine, pharmacy, ecology, energy, light industry, agriculture, etc.
The main focus of the program and specialization	Emphasis is on the formation and growth of professional competencies in the field of development, creation, research, and production of biotechnological products, molecular design and modification of macromolecular compounds for biomaterials and cosmeceutical products, biotransformation and development of ecobiotechnologies based on bioinformatics methods and biosafety, development and creation of bioanalytical engineering structures (biosensors, test systems). Keywords: biotechnology, environment biotechnology, macromolecular compounds, molecular construction, biomaterials, cosmeceutical products, biotransformation, biosensors, biosafety, biosecurity.
Features of the program	The program provides in-depth theoretical, special practical and research training, summarizing the results of research, project decisions, implementation, and defence of a master's thesis. The program is realized in an active research environment. It develops prospects for internships and employment at modern enterprises in Ukraine, whose activities are based on biotechnological principles. The program provides opportunities for the implementation of the program of international academic mobility of participants in the educational process.
1.4 – Graduates' suitability for employment and further study	
Suitability for employment	The graduate is suitable for independent employment and at enterprises, organizations, and institutions with a biotechnological profile; control, diagnostic, forensic, environmental laboratories; authorities of sanitary and hygienic control, customs, departments for consumer protection; research institutes of the National Academy of Sciences of Ukraine; as well as in state institutions at the level of the Ministry of Education and Science of Ukraine, the Ministry of Health, the Ministry of Energy and Environmental Protection of Ukraine, relevant State Committees. Professional titles of works: research engineer, laboratory engineer, technological engineer, standardization and quality engineer; biologist-researcher, junior researcher; biotechnologist, assistant, state expert, product quality control inspector, biotechnology specialist.
Academic rights for graduates	Lifelong learning to improve professional, scientific and other activities. There is a possibility to continue training according to the educational-scientific program of the third (educational-scientific) level of higher education (doctor of philosophy), advanced training, retraining and postgraduate education.
1.5 – Teaching and assessment	
Teaching and learning	Student-centered and problem-oriented learning, research practice, pre-diploma practice and self-study are used. The system of teaching methods is based on the principles of purposefulness, binary – active direct participation of staff and students. Forms of organization of the educational process are lectures, seminar, practicals, laboratory classes, practical training, independent work, and consultation.
Assessment	Exams, tests, test questions, tasks, presentations, reports, and Master's thesis.

1.6 – Program competencies		
Integral competency (IC)		The ability to solve complex tasks and problems of biotechnology and bioengineering that involves conducting research and/or innovation and is characterized by uncertain conditions and requirements
General competencies (GC)	GC 1	The ability to conduct researches at the appropriate level
	GC 2	The ability to search, process and analyze the information from various sources
	GC 3	The ability to motivate people and move to the common goal
	GC 4	The ability to work in an international context
	GC 5	The ability to show initiative and enterprise
	GC 6	The ability to act socially responsible and consciously
Professional competencies (PC)	PC 1	The ability to protect intellectual property, in particular to patent inventions in biotechnology
	PC 2	The ability to search for necessary information in scientific and technical literatures, databases and other sources
	PC 3	The ability to select and analyze relevant data including using modern methods of data analysis and specialized software
	PC 4	The ability to develop and implement commercial and scientific and technical plans and projects in the field of biotechnology, with regard to all aspects of solving problem, including technical, industrial, operational, commercial, legal, labor and environmental protection issues
	PC 5	The ability to develop new biotechnological objects and technologies and increase the effectiveness of the present technologies based on experimental and/or theoretical studies and/or computer modelling
	PC 6	The ability to plan and perform experimental studies in the field of biotechnology using modern equipment and methods, to interpret obtained results based on the set of modern knowledge and ideas about object and subject of research, to draw reasonable conclusions
	PC 7	The ability to develop and improve complex biotechnologies based on the understanding of scientific modern facts, concepts, theories, principles and methods of bioengineering and natural sciences
	PC 8	The ability to predict the directions of modern biotechnology development in the context of the general development of science and technology
	PC 9	The ability to apply modern methods of systems analysis to study and develop effective biotechnological processes
	PC 10	The ability to apply problem-oriented methods of analysis and optimization of biotechnological processes, and production management, have the skills of practical implementation of scientific developments.
	PC 11	The ability to justify, implement and optimize design solutions in the field of biotechnology
	PC 12	The ability to organize production and manage biotechnological processes under the terms of industrial production and research laboratories
	PC 13	The ability to analyze and justify specific features of interactions between macromolecular compounds and pro- and eukaryotic organisms for the development of biotechnological products as the carriers and matrices, considering their biological properties according to modern methods
	PC 14	The ability to use modern knowledge of biochemical structure, targeting and biological activity of macromolecular compounds to develop new biomedical and environment biotechnologies

	PC 15	The ability to use micro- and nanobiotechnologies to develop biomaterials and cosmeceuticals in accordance with the biosafety and biosecurity requirements
	PC 16	The ability to carry out molecular construction and modification of macromolecular compounds with prescribed properties, activity and specificity
1.7 – Program learning outcomes		
PLO 1	To be familiar with the local and international legislation in the field of copyright and intellectual property	
PLO 2	To know and evaluate methods of eukaryotic cell (animal and plant origin) cultivation for the development of new technologies	
PLO 3	To know the molecular organization and regulation of gene expression, replication, recombination and repair, restriction and modification of genetic material in pro- and eukaryotes, the strategy of creating recombinant DNA for targeted construction of biological agents	
PLO 4	To have the skills to develop and implement marketing programs and strategies, analysis and evaluation of options for promoting biotech products to consumers, setting optimal prices for it.	
PLO 5	To be able to perform a patent search, find and process the necessary scientific and technical information; independently make an application for the invention.	
PLO 6	To be able to choose and apply methods of mathematical modelling and optimization for scientific and technical projects.	
PLO 7	To realize technical and economic calculations and to estimate the efficiency of design decisions in the field of biotechnology	
PLO 8	To have the skills of isolation, identification, storage, cultivation, and immobilization of biological agents, optimize nutrient media, choosing the best methods of analysis, isolation and purification of the target product, using modern biotechnological methods and techniques specific to a particular area of biotechnology.	
PLO 9	To be able to develop, justify and apply methods and means of protecting humans and the environment from hazardous factors of technogenic and biological origin.	
PLO 10	To implement the most effective biotechnological methods and techniques in industrial activities based on the evaluation of the effectiveness of advanced biotechnologies and taking into account the general trends in the development of new biotechnologies in leading countries.	
PLO 11	To be able to compile production, technological and analytical documentation for biotechnological products for various purposes.	
PLO 12	Be able to use knowledge of biochemical structure, targeting, biological activity and features of macromolecular compound interactions with pro- and eukaryotic organisms to develop new biotechnological products and environment biotechnologies.	
PLO 13	To be able to apply knowledge of micro- and nanotechnologies to create and develop biomaterials and cosmeceuticals according to the requirements of biosafety and biosecurity.	
PLO 14	To perform molecular designing and modification of high molecular weight compounds with certain properties, activity, and specificity	
PLO 15	Fluently communicate and write in state and foreign languages, discuss with professionals and non-specialists the results of research, innovation and/or production management and biotechnology.	
PLO 16	To plan and manage research, scientific and technical and/or production projects in the field of biotechnology, based on current trends in science, technology and society.	
PLO 17	To analyze development trends in the biotechnological industry and to include them in practical activities	
PLO 18	To formulate and evaluate requirements, and justify raw materials, materials and intermediates in accordance with the conditions of biotechnological production, taking into account technological and other uncertainties.	
PLO 19	To analyze the terms and conditions of trade contracts, assess and analyze it.	

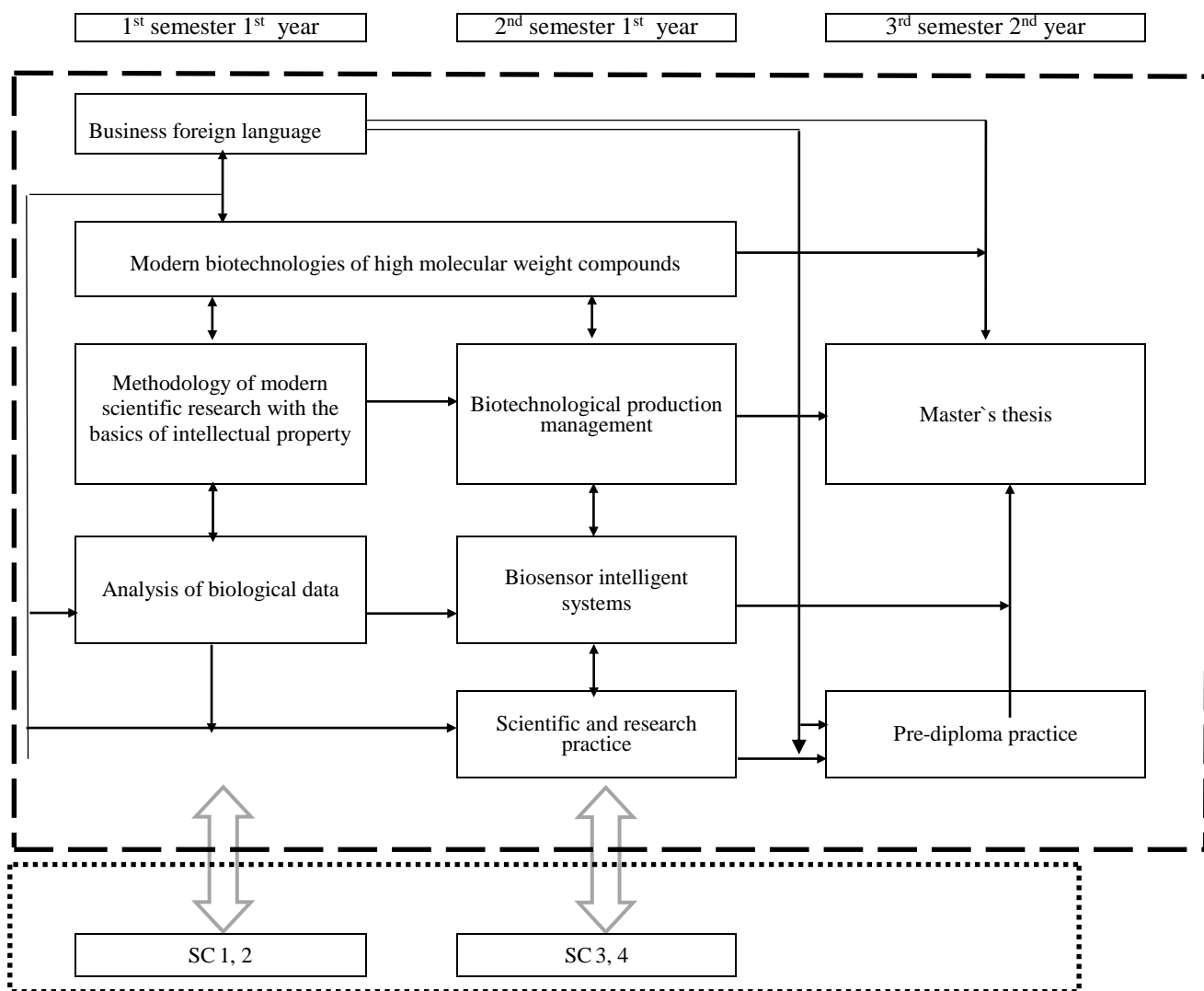
PLO 20	To evaluate, analyze and select solutions for the management of complex biotechnological processes, taking into account the goals, constraints, forecasts and risks.
1.8 – Resource support for program implementation	
Staffing	All scientific and pedagogical workers who provide the educational program have a corresponding qualification to the profile and direction of the educational components, which are taught; and have the necessary experience of pedagogical and practical work. Professionals with experience in research/management/innovation / creative work and/or work in the speciality of biotechnology are involved in the organization of the educational process that will provide the necessary quality of training for masters in biotechnology and bioengineering.
Material and technical support	Material logistics allow to provide completely the educational process during the entire cycle of training in the speciality. The equipment of the educational and scientific laboratory includes: complex equipment for the development of production and characterization of biotechnological products of different origins according to their structure and functions; complex analytical manipulations with protein and peptide molecules (electrophoretic, functional analysis using modern equipment for electrophoresis, equipment that analyzes optical density, specific parameters of protein interactions); a set of equipment for the study of molecular properties (PCR) and the microbiological component and specificity of the studied objects; necessary technical support, equipped with computer and multimedia equipment, application programs. The condition of the rooms is certified by sanitary-technical passports that meet the current regulations.
Information and methodological support	The program is fully equipped with an educational and methodological complex of all components of the educational program, the availability of which is presented in the modular environment of the educational process of the University.
1.9 – Academic mobility	
Internal academic mobility	Provides the possibility of academic mobility, which ensures the acquisition of general and/or professional competencies. Educational program provides the possibility of academic mobility of some its components, which ensure the acquisition of general and/or professional competencies.
International credit mobility	The program opens up prospects for participation and internships in research projects and academic mobility programs abroad (Belgium, Lithuania); conducted in an active research environment.
Education for foreign higher education applicants	Training the foreign students for higher education is carried out according to accredited educational programs.

2. List of components of the educational-professional program "Biotechnology of high molecular weight compounds" and their logical sequence

2.1 List of components of the educational-professional program of the second (Master's) level of higher education

Code of the course	Components of the educational program (educational subjects, course papers, practical training, qualification work)	Number of credits	Form of final control
Compulsory components CC			
CC 1	Business foreign language	3	credit
CC 2	Methodology of modern scientific research with the basics of intellectual property	3	exam
CC 3	Modern biotechnologies of high molecular weight compounds	9	exam
CC 4	Biotechnological production management	6	credit
CC 5	Analysis of biological data	6	exam
CC 6	Biosensor intelligent systems	3	exam
CC 7	Scientific and research practice	6	credit
CC 8	Pre-diploma practice	9	credit
CC 9	Preparation and defense of qualification work	21	attestation
	Total for the cycle	66	
The total amount of required components		66	
Selective components of the educational program			
SC	Disciplines of free choice for higher education students	24	credit
The total amount of sample components		24	
TOTAL CREDITS		90	

2.2. Structural-logical scheme of the educational-professional program of the second (Master's) level of higher education in the specialty 162 Biotechnology and Bioengineering



3. Form of certification of students for higher education

Form of certification of students for higher education	Certification is carried out in the form of defense of qualification work
Requirements for qualifying work and/or requirements for the qualifying examination in the specialty	During the preparation and defense of the qualification work, the graduate must exhibit the capability to address intricate challenges in biotechnology, which entails performing research and/or executing innovations, characterized by ambiguous conditions and requirements. The qualification work must be checked for plagiarism. The qualification work must be published in the KNUTD repository.

4. Correspondence matrix of program competencies to the components of the educational-professional program

	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	PC 9	PC 10	PC 11	PC 12	PC 13	PC 14	PC 15	PC 16
CC 1				+			+	+														
CC 2	+	+					+	+				+				+						
CC 3											+		+	+	+				+	+	+	+
CC 4										+						+	+	+				
CC 5								+	+		+				+							
CC 6												+				+			+			
CC 7		+					+												+	+	+	+
CC 8			+	+	+												+					
CC 9	+	+			+	+				+		+	+				+	+	+	+	+	+

5. Correspondence matrix of the program learning outcomes to the corresponding components of the educational-professional program

	IC	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	PLO 14	PLO 15	PLO 16	PLO 17	PLO 18	PLO 19	PLO 20
CC 1	+		+								+	+									
CC 2	+	+	+						+						+						
CC 3	+					+	+	+			+								+	+	+
CC 4	+			+					+						+	+		+			
CC 5	+			+	+	+															
CC 6	+					+		+		+									+		
CC 7	+	+	+			+		+		+			+					+	+	+	+
CC 8	+										+	+		+		+	+				
CC 9	+			+		+	+		+	+			+	+		+	+	+	+	+	+