

162 BIOTECHNOLOGIES AND BIOENGINEERING
EDUCATIONAL AND PROFESSIONAL PROGRAM AT THE
FIRST (BACHELOR) LEVEL
“BIOTECHNOLOGY”



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Branch of knowledge	16 Chemical and Bioengineering
Specialty	162 Biotechnology and Bioengineering
Scope of the program	240 ECTS credits
The duration of the program	3 years 10 months
Form of study	Full-time/part-time

The educational and professional program “Biotechnology” is aimed at the formation and development of general and professional competencies of bachelor's specialists in biotechnologies and bioengineering capable of integrated implementation of design and technological calculations and implementation of production and technological works related to the use of biological agents and products of their vital functions.

Features of the educational and professional program

The educational program of the bachelor provides theoretical, practical and accounting design training; performance of coursework; generalization of results of calculations, execution of drawings and protection of bachelor qualification work in the form of a diploma project or diploma work, which will demonstrate the ability of a future specialist to carry out production and technological works and design biotechnological production for the receipt of products for various purposes (food, pharmaceutical, agriculture, etc.).

The educational-professional program has an integrated and targeted approach to the training of a highly qualified specialist who has the professional competencies ‘

Components of the program:

№	Name of the discipline
Compulsory discipline	
1	Introduction to the profession. History of Biotechnology
2	English

3	Higher mathematics
4	Objects of biotechnology
5	Physics
6	General and inorganic chemistry
7	Engineering and computer graphics
8	History and culture of Ukraine
9	Computational Mathematics and Programming
10	Philosophy
11	Biology of producers of BAI
12	Electrical engineering and electronics basics
13	Analytical chemistry
14	Organic Chemistry
15	Biological chemistry
16	Physical and colloidal chemistry
17	General microbiology and virology <i>Course work on general microbiology and virology</i>
18	Fundamentals of genetic and bioengineering
19	Processes and apparatuses of biotechnological manufactures
20	Automation and control of BT manufacturing
21	General biotechnology
22	Economics and organization of biotechnology production
23	Industrial Biotechnology <i>Course work on industrial biotechnology</i>
24	Fundamentals of designing and equipment of biotechnological manufactures
25	Industrial microbiology
26	Normative provision of biotechnological production
Elective disciplines	
27	Ukrainian language (for prof. Directing) and culture of Ukraine
28	Biosafety and bioethics in biotechnology
29	Biophysics
30	Ecobiotechnology
31	Mathematical modeling and application of computers in biotechnology
32	Fundamentals of Pharmaceutical Biotechnology
33	Theoretical Foundations of Pharmaceutical Technology
34	Fundamentals of scientific research in biotechnology
35	Culture of the scientific language or The history of the modern world or logic either Fundamentals of constitutional law
36	Fundamentals of research in biotechnology or Fundamentals of phyto- and zoobiotechnology or Biotechnology and environmental issues
37	Politics or Sociology
38	Psychology of communication or Ethics and aesthetics
39	Applied Mechanics or Energy technology of biotechnological processes
40	Hygiene and industrial sanitation of biotechnological productions or Hygienic basis of food
41	Technology of cell cultures or Biotest systems

42	Pharmacology of biotechnology or Fundamentals of mechanization and robotics
43	Biotechnology product analysis or Pharmaceutical Chemistry
44	Microbial synthesis technology or Fundamentals of Immunology
Practical training	
1	Industrial technological practice
2	Industrial pre-diploma practice
Graduates certification	
Protection of qualifying bachelor's work	

Employment and competitive advantage of graduates of the program

Graduates of the baccalaureate program will be able to hold such primary positions under the State Classifier of professions DK 003: 2010:

- 3211 specialist in biotechnology;
- 3211 laboratory assistant (biological research);
- 3211 technician-laboratory assistant;
- 3119 laboratory assistant (biotechnology);

In addition, a biotechnology specialist can work in enterprises and industries that are associated with the use of biological agents and products of their livelihoods; in scientific-research institutes of chemical, medical, biological and agricultural profile; in educational institutions specializing in types of economic activity.

It is possible to continue further education at the second level (master's programs) of higher education, as well as advanced training and obtain additional postgraduate education.

Program learning outcomes

Upon graduation from the educational-professional program, applicants of higher education will:

- apply modern mathematical methods for solving practical problems related to the research and design of biotechnological processes. Use the knowledge of physics to analyze biotechnological processes.

- To carry out qualitative and quantitative analysis of substances of inorganic, organic and biological origin, using appropriate methods. Using knowledge about the physical and chemical properties of organic and inorganic substances, to calculate the composition of nutrients, to determine the peculiarities of their preparation and sterilization, to control the quality of raw materials and finished products.

- apply the provisions of regulatory documents that regulate the procedure for certification of products, certification of production, requirements for the organization of quality management systems at enterprises, the rules for the execution of technical documentation and the conduct of the technological process. To be able to analyze normative documents (state and industry standards, technical specifications, guidelines, etc.), separate sections of technological and analytical documentation for biotechnological products of different purposes; analyze technological situations, choose rational technological solutions.

- be able to identify and analyze the basic physical and chemical properties of organic compounds that are part of biological agents (proteins, nucleic acids, carbohydrates, lipids). Be able to apply the knowledge of the composition and structure of cells of various biological agents to determine the optimum conditions of cultivation and the potential use of the studied cells in biotechnology.

- be able to isolate from natural substrates and identify microorganisms of different systematic groups. Determine the morphological-cultural and physiological and biochemical properties of various biological agents. To form basic nutrient media for the cultivation of various biological agents. To evaluate the peculiarities of the growth of biological agents on different media.

- be able to conduct experimental studies to determine the influence of physico-chemical and biological factors of the environment on the vital functions of living organisms.

- be able to carry out basic genetic and cytological studies to improve and enhance the biosynthetic capacity of biological agents, taking into account the principles of biosecurity, bio-protection and bioethics (induced mutagenesis using physical and chemical mutagenic factors, selection and accumulation of auxotrophic mutants, transfer of genetic information, etc.).

- using microbiological, chemical, physical, physico-chemical and biochemical methods; be able to carry out chemical control (determination of concentration of solutions of disinfectants, titrating agents, concentration of components of the nutrient medium, etc.), technological control (concentrations of carbon and nitrogen sources in the culture fluid during the process; concentration of the target product); microbiological control (determination of microbiological purity of nutrient media after sterilization, microbiological purity of a biological agent, etc.), microbiological purity and sterility of biotechnological products of various applications.

- to carry out a feasibility study on the production of biotechnological products of various designation (determination of requirements for the target product and calculation of production capacity).

- be able to substantiate the choice of biological agent, composition of the nutrient medium and the method of cultivation, the necessary support work and the main stages of the technological process.

- based on knowledge of the laws of mechanical, hydromechanical, heat and mass transfer processes and the main design features to be able to choose the appropriate equipment in the process of designing production of biotechnological products of various applications to ensure their maximum efficiency.

- carry out a food calculation and calculation of technological equipment. To make a material balance for one cycle of the production process, a specification of the equipment and a map of step-by-step control with the guidance of control points of production.

- be able to justify and select the appropriate technological equipment and graphically depict the technological process in accordance with the requirements of regulatory documents.

- use automated design systems to develop a technological and hardware scheme for biotechnology production.

- be able to calculate the main criteria for assessing the effectiveness of the biotechnological process (parameters of growth of biological agents, the rate of synthesis of the target product, the synthesis ability of biological agents, the economic factor, the yield of the target product, the type of substrate, productivity, the cost of the nutrient medium, etc.).

- be able to analyze the level of automation of the existing system of biotechnology production, as well as evaluate the solutions offered for the construction of new or modernization of existing automation systems and their conformity to modern world standards, and to formulate tasks for the development of automated control systems taking into account the possibilities of modern technical and software automation.

- be able to formulate the tasks for the development of automation systems for the production of biotechnological products for various purposes.