«Geology and Oil-gas Business» Institute named after K. Turyssov

Department of «Chemical and Biochemical Engineering»

EDUCATIONAL PROGRAM
6B07215 «Pharmaceutical production technology»

Code and classification of the field of education: **6B07** «Engineering and manufacturing and construction industries»

Code and classification of training areas: **6B072** «Manufacturing and processing industries»

Group of educational programs: **B072** «Pharmaceutical production technology»

Level according to the NQF: 6

Level according to the IQF: 6

Duration of study: 4 years

Volume of loans: 240

Almaty 2025

The educational program 6B07215 «Pharmaceutical production technology» was approved at the meeting of the Scientific Council of KazNTU named after K.I.Satpayev

Protocol №10 from «06» 03 2025y

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of K.I.Satpayev KazNTU

Protocol №3 from «20» 12 2024y

The educational program 6B07215 «Pharmaceutical production technology» was developed by the academic committee in the : 6B072 «Manufacturing and processing industries»

Name	Academic degree/ academic	Post	Place of work	
Chairman of the Academic Committee:				
Mangazbaeva Rauash Amantaevna	Candidate of Chemical Sciences	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Teaching staff:				
Kerimkulova Aigul Zhadyraevna	Candidate of Chemical Sciences,	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Narmuratova Zhanar Bakhytovna	Doctor phD	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Employers				
Omarova Marzhan Ernarovna	-	Director of "Dolce" LLP	Petro Gas Chemical Association,	
Students:				
Usanchikova Alena Andreevna	-	Student	Kazakh National Research Technical University named after K.I.Satpayev	
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Content

List of abbreviations and designations

EP – Educational program
CC – Communicative competence
LO – Learning Outcomes
NJSC - Non-profit joint stock company

1.Description of the educational program

The educational program is a set of documents developed by the academic committee of the Kazakh National Research Technical University named after K.I. Satpayev. The EP considers the needs of the regional labor market, the requirements of government agencies and relevant industry requirements.

EP includes both theoretical knowledge and practical application from fundamental science through experimental design to production, product analysis and life cycle analysis of the manufactured object. The curriculum provides a cross-platform approach that allows students to acquire a unique and individual experience that will appeal to a wide range of employers. Students train problem solving, project management, and professional communication skills.

The EP is based on the state educational standard for higher professional education in the relevant field.

The EP defines the program educational goals, the results of bachelor's studies, the necessary conditions, content and technologies for the implementation of the educational process, assessment and analysis of the quality of students during training and after graduation.

The EP includes the curriculum, the content of disciplines, learning outcomes and other materials to ensure quality education of bachelors.

2. The purpose and objectives of the educational program

The purpose of the educational program "Technology of pharmaceutical production" is raining of specialists for the organization of technological processes in pharmaceutical production in accordance with GMP requirements in the Republic of Kazakhstan

Objectives of the educational program:

– the formation of the graduate's knowledge, skills and abilities necessary to solve the tasks of professional activity, ensuring control of the level of development of competencies, giving him the opportunity to improve personal and professional qualities;

– social-humanitarian and professional training of bachelors in the field of pharmaceutical engineering in accordance with the development of science and production of pharmaceutical substances and medical devices, as well as with the needs of the pharmaceutical industry of Kazakhstan, national research centers, master's and doctoral studies of higher educational institutions;

– training of bachelor technologists who know the raw materials base, methods of analytical quality control of raw materials and commodity products, technologies for the production and consumption of medicinal substances and medical materials and products with fundamental training in chemistry, mathematics, pharmacology, physico–chemical fundamentals of technologies for the production of the most important classes of medicinal substances, the basics of technologies of synthetic and natural medicines, production of antibiotics, homeopathic medicines, cosmetics, medical products and materials;

– providing knowledge, skills and abilities that allow analyzing problems in the field of pharmaceutical engineering and finding ways to solve them, solving engineering problems of designing pharmaceutical productions according to international standards GLP, GMP and GRP, conducting research in the field of synthesis and studying the properties of new components for medicines and medical materials using information technology, and methods of mathematical planning of the experiment;

– providing knowledge, skills and abilities that allow conducting research in the field of research and creation of new components (substances) for medicines, creation of new dosage forms, improvement of already implemented means, conducting research that is associated with the introduction of new or improved pharmaceutical products to the market.

– preparation of students for professional activity in the conditions of operating production, the formation of skills and abilities to maintain the necessary level of labor and production discipline; to conduct a technical and economic analysis of production; to make and implement management decisions in conditions of different opinions.

3.Requirements for the evaluation of learning outcomes of the educational program

The educational program was developed by the academic committee in accordance with the State Mandatory Standards of Higher and Postgraduate Education of the Republic of Kazakhstan dated July 20, 2022 No. 2 and reflects the learning outcomes on the basis of which curricula (working curricula, individual curricula of students) and working curricula in disciplines (syllabuses) are developed.Formed learning outcomes: applies knowledge of natural science, socio-economic and profile disciplines of biotechnology to solve practical and professional tasks of the biotechnology industry.

Formed learning outcomes: applies the knowledge of natural science, socio-economic and profiling disciplines of technology to develop the technology of medicines.

Evaluation of learning outcomes is carried out according to the developed test tasks within the educational program in accordance with the requirements of the state mandatory standard of higher and postgraduate education.

When evaluating learning outcomes, uniform conditions and equal opportunities are created for students to demonstrate their knowledge, skills and abilities. To use modern information technologies for the collection, processing and dissemination of scientific information in the field of modern pharmaceutical production technology.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	6B07 «Engineering and manufacturing and construction industries»
2	Code and classification of training areas	6B072 «Manufacturing and processing industries»
3	Group of educational programs	B072 «Pharmaceutical production technology»
4	Name of the educational program	6B07215 «Pharmaceutical production technology»
5	Brief description of the educational program	The educational program of this profile allows you to master the competence in the production of medicines and medical devices and legislation in the field of circulation of medicines; knowledge in the field of engineering and technical disciplines, fundamentals of phytochemistry and chemistry; biopharmaceutical and bioengineering fundamentals of drug technology development, fundamentals of design, equipment of production, modeling of chemical and technological processes; organization of technological process knowledge in the field of modern pharmaceutical production technology, skills in the development, manufacture and production of medicines, quality control, research on the preparation of regulations, obtaining and research of pharmaceutical substances.
6	The purpose of the EP	Training of specialists for the organization of technological processes in pharmaceutical production in accordance with GMP requirements in the Republic of Kazakhstan
7	Type of EP	New
8	Level according to the NQF	6
9	Level according to the IQF	6
10	Distinctive features of the EP	no
11	List of competencies of the educational program:	B - Basic knowledge, skills and abilities: B1 - the use of the basic laws of natural sciences (chemistry, biology and physics) and the use of mathematical analysis and modeling methods in solving problems in the field of analytics and technology, the ability to find solutions for the development of medicines and medical products. B2 - the ability to use modern information technologies, to process information using application programs and databases to calculate technological parameters of equipment, indicators of technological processes in the field of production of medicines, pharmaceutical substances, perfumes, cosmetics and biotechnological products, biologically active additives, therapeutic and preventive drinks, sanitary and hygienic products. B3 - possession communication skills in the state, Russian and foreign languages. B4 - development and quality control of active pharmaceutical substances and preparations B5 - the ability to analyze and make appropriate decisions; B6 - skills of chemical analysis, methods of obtaining and researching substances and materials, studying the nature of medicinal substances.

		B7 - skills of working on equipment during experiments, safe handling of various chemical and biological objects. B8 - knowledge of the basic methods and methods of developing environmental protection measures; understanding the essence and significance of the relationship between GMP production processes and their impact on the safety of industrial production. P - Professional competencies: P1 - a wide range of theoretical and practical knowledge in the field of the production of medicines, pharmaceutical substances, perfumery, cosmetic and biotechnological products, biologically active additives, therapeutic and preventive drinks, sanitary and hygienic products. P2 - the ability to carry out the technological process in accordance with the regulations and use technical means to measure the main parameters of the technological process, the composition and properties of raw materials and finished products. P3 - to develop, organize and conduct the technological process of production of medicinal substances in accordance with the regulatory requirements of the State Budget of the Republic of Kazakhstan, taking into account the relationship of their structure, chemical properties and biological activity. P4 - the ability to carry out technological processes of various levels of complexity, operation of equipment and ensuring their safe functioning. P5 - the ability to apply knowledge of current trends in the development of the industry in production and technological, design, research and organizational and managerial activities. P6 - to organize the production of medicines in various dosage forms using innovative technologies, in accordance with the requirements of Good Pharmaceutical Practices (GMP, GPP, GDP, GVP), to develop regulatory documentation of medicines (drugs), to compile reports on the validation of production technology and to establish stability. P7 - apply modern physico-chemical methods of analysis for qualitative and quantitative determination of substances and excipients in medicines, for quality control and detection of falsified, substandard and counterfeit medicines. O - Universal, social and ethical competencies: O1 - striving for self-development, improving their skills and skills. O2 - the ability to analyze socially significant problems and processes. O3 - the ability to perceive a variety of cultural traditions and customs, the ability to tolerate views. O4 - knowledge of social and ethical values based on public opinion, traditions, customs, social norms and the ability to focus on them in their professional activities. O5 - knowledge of trends in the social development of society, the ability to adequately navigate in various social situations. O6 - understanding and practical use of healthy lifestyle

		norms, including prevention issues. O7 - proficiency in the state, Russian and one of the foreign languages at the level that provides human communication. O8 - the ability to independently acquire new knowledge and skills with the help of information technology and use them in practice, including in new areas of knowledge that are not directly related to the field of activity. C - Special and managerial competencies: C1 - possession of a culture of thinking, the ability to generalize, analyze, perceive information, set goals and choose ways to achieve it. C2 - the ability to find and make managerial decisions in the field of labor organization and implementation of environmental measures; to monitor the execution of tasks. C3 - the ability to analyze the technological process as an object of management and compile technical and economic documentation. C4 - knowledge of the basics of project management and decision-making methods used in the development, design and operation of technological processes. C5 - knowledge of the principles of management, control and correction of activities in the context of teamwork, improving managerial and executive professionalism. C6 - ensuring technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper condition, organization of compliance with safety regulations at work and environmental protection rules.
12	Learning outcomes of the educational program:	PO1. Evaluate the impact of engineering decisions, considering global, economic, environmental, and social aspects, striving for sustainable development, adhering to the principles of social responsibility and inclusiveness, while analyzing the long-term consequences of adopted technological solutions. PO2. Design pharmaceutical production processes and technological units, using modern computer technologies, methods of mathematical analysis and modeling, integrating artificial intelligence tools, ensuring efficiency, sustainability, and compliance with industry standards. PO3. Conduct experiments, analyzing the obtained data and interpreting the results, justifying conclusions based on scientific evidence ; PO4. Design pharmaceutical production equipment and technological processes in compliance with GMP requirements, applying knowledge of chemical and pharmaceutical technology to improve the quality and availability of medicines. ; PO5. Apply knowledge of the equipment and technological design of pharmaceutical manufacturing processes and the production of medical devices to ensure quality, accessibility, and compliance with Good Manufacturing Practice (GMP) standards ;

		PO6. Solve mathematical, engineering, and scientific problems arising in the organization and management of technological processes in pharmaceutical production ; PO7. Design a component, process, or system to solve technological problems in pharmaceutical production, taking into account economic, environmental, social, political, ethical, and industrial factors, integrating ESG principles, and fostering an inclusive work environment that promotes equal opportunities and sustainable development ; PO8. Use general hygiene standards and good manufacturing practice standards for the manufacture of pharmaceuticals, diagnostic products, medical devices and products, active ingredients and dietary supplements ; PO9. Apply basic knowledge in the field of creation and use of drugs based on natural and synthetic raw materials to select the best ways/technologies for obtaining drugs ; PO10. Determine the composition and structure of the substances of the products of chemical and biochemical reactions based on knowledge of the reaction mechanism, discusing the biochemical processes occurring in the body ; PO11. Determine the actions of various microorganisms, viruses, and bacteria on physiological processes, describing biological processes using the knowledge of modern physiology and anatomy
13	Form of training	Full-time
14	Duration of training	4 years
15	Volume of loans	240
16	Languages of instruction	Kazakh, Russian, English
17	Academic degree awarded	Bachelor of Engineering and Technology in Pharmaceutical Manufacturing Technology
18	Developer(s) and authors:	Mangazbayeva R.A. Kerimkulova A.Zh.... Narmuratova Zh.B.

4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)										
				PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11
The cycle of general education disciplines is a mandatory component														
1	Foreign language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency. During the transition from level to level, the prerequisites and post-prerequisites of disciplines are observed.	**10**	v										
2	Kazakh (Russian) language	The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course highlights the specifics of scientific style in order to develop and activate professional and communicative skills and abilities of students, allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text.	**10**	v										
3	Physical culture	The purpose of the discipline is to master the forms and methods of forming a healthy lifestyle within the framework of the professional education system. Familiarization with the natural-scientific basics of physical education, knowledge of modern health-improving technologies, basic methods of independent physical education and sports. As part of the course, the student will master the rules of judging in all sports.	**8**											

4	Information and communication technologies	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills in using text editors and tabular processors; to create databases and various категории прикладных программ.	**5**	**v**						**v**				
5	Modern history of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: the steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol conquest (XIII century), medieval states in the XIV-XV centuries. The epoch of the Kazakh Khanate XV-XVIII centuries. Kazakhstan as part of the Russian Empire, Kazakhstan during the Great Patriotic War, during the formation of independence and at the present stage.	**5**									**v**		
6	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and gives them a methodology for solving various theoretical and practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, promotes self-esteem, awareness of the value of human existence. It teaches you to think and act correctly, develops practical and cognitive skills, helps you to search and find ways and ways of living in harmony with yourself, society, and the world around you.	**5**									**v**		
7	Module of socio-political knowledge	The study of the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern	**3**									**v**		

	(sociology, political science)	world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary to understand political processes, to form a political culture, to develop a personal position and a clearer understanding of the measure of one's responsibility.												
8	Module of socio-political knowledge (cultural studies, psychology)	The module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal laws of the formation and development of culture. During the course of cultural studies, the general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of the formation and development of Kazakh culture are considered. It also studies the patterns of the emergence, development and functioning of mental processes, states, properties of a person engaged in a particular activity, patterns of development and functioning of the psyche as a special form of vital activity.	**3**									v		
Cycle of general education subjects Selectable component														
9	Law basics	The purpose of the study: To attain knowledge in legal sphere in order to use them effectively in engineering activity; To make students know about efficient management of a work collective basing on legal mechanisms. Short content: the course allows students to get knowledge about specified directions of law, to organize information about subject and object of legal relations, about the main institutes and functions of	**5**	v						v				

		legal directions. Expected results: After the course studying students should know, how to use legal norms in particular situations, how to make necessary documents and how to use special legal measures to restore broken rights.												
10	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	**5**							**v**				
11	Fundamentals of Economics and entrepreneurship	Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the basics of creating and managing a business, developing business plans, risk assessment, and strategic decision-making.	**5**							**v**				
Cycle of basic disciplines University component														
12	Ecology and life safety	The discipline studies the main approaches to solving environmental problems; sources and types of environmental pollution by transport enterprises; methods of reducing harmful effects on the environment. Natural and man-made emergencies, their causes, methods of prevention and protection. Carrying out rescue and other urgent work, rules of behavior of people in emergency situations.	**5**	**v**										
13	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve	**5**						**v**					

		typical and applied problems of the discipline. Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.													
14	Physics	Purpose:To form ideas about the modern physical picture of the world and scientific worldview, the ability to use knowledge of fundamental laws, theories of classical and modern physics. Contents_ physical fundamentals of mechanics, fundamentals of molecular physics and thermodynamics, electricity and magnetism, vibrations and waves, optics and fundamentals of quantum physics.	**5**						**v**					
15	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations_	**5**						**v**					
16	Engineering and computer graphics	Purpose: To develop students' knowledge of drawing construction and skills in developing graphical and textual design documentation in accordance with standards. Content: Students will study ESKD standards, graphic primitives, geometric constructions, methods and properties of orthogonal projection, Monge's projection, axonometric projections, metric tasks, types and features of connections, creating part sketches and assembly drawings, detailing, and	**5**		**v**				**v**					

		creating complex 3D solid objects in AutoCAD.												
17	Introduction to biotechnology and professional activities	The purpose of teaching the discipline is to familiarize students with modern trends in the development of biotechnology and breakthrough projects for solving a variety of tasks, including medicine, pharmacology, agriculture, ecology, nanobiotechnology, space biotechnology. During the course, students will master the main directions and industries, DNA technology, creation of a gene bank based on cellular technology and cryopreservation, methods of PCR diagnostics of dangerous diseases and the use of molecular markers to identify genes and valuable traits associated with productivity and resistance to biotic and abiotic environmental factors.	**4**	**v**						**v**				
18	Chemistry	Purpose: formation of knowledge on fundamental issues of general chemistry and skills of their application in professional activity. Summary Laws, theoretical propositions and conclusions that underlie chemical disciplines; properties and relationships of chemical elements based on the periodic law of D.I.Mendeleev and on modern ideas about the structure of matter; fundamentals of chemical thermodynamics and kinetics; processes in solutions; structure of complex compounds.	**5**			**v**			**v**					
19	Organic Chemistry I	The purpose of the discipline is to master the complex of knowledge and scientific ideas about the fundamental theoretical and experimental foundations of organic chemistry of aliphatic compounds; in obtaining students' knowledge of the basic concepts of theoretical organic chemistry, mastering the skills to characterize the structure, physico-chemical properties of organic substances, as well as modern methods of synthesis of organic substances. The course forms the basis of chemical reactions and methods of synthesis of organic compounds for the most important branches	**6**										**v**	

		of the chemical and biochemical industry												
20	Organic Chemistry II	The aim of the course is to study the general patterns of organic reactions of cyclic compounds, such as cycloalkanes, aromatic hydrocarbons, and heterocyclic compounds. Each class of compounds is considered in terms of their chemical structure, isomerism and nomenclature, method of preparation, physical and chemical properties, and scope of their application. In the process of mastering this discipline, the student forms and demonstrates competencies that allow applying the acquired basic scientific and theoretical knowledge to solve scientific and practical problems.	**5**										**v**	
21	Physical and colloidal chemistry	The purpose of the course: the formation of students' scientific thinking, in particular, the correct understanding of the limits of applicability of various physical and chemical concepts, laws, theories. The course deals with chemical thermodynamics, the first law of thermodynamics, thermal effects, Hess' Law, Kirchhoff's equations, the second law of thermodynamics. Entropy. chemical balance. The doctrine of solutions. Phase equilibria. Electrochemistry. electrolyte solutions. Galvanic elements. Chemical kinetics and catalysis. surface phenomena. dispersed systems. Methods for obtaining and cleaning.	**5**						**v**					
22	Analytical chemistry in industry	The purpose of the course: to master the methods of qualitative and quantitative analysis of substances used in industry and their application to solve problems in professional activity. The course discusses the principles and methods of determining the chemical composition of substances and their structure, including using physico-chemical research methods. Application of analytical methods for product quality control in the pharmaceutical industry.	**5**						**v**				**v**	
23	Biochemistry	The purpose of mastering the discipline is to acquire	**5**									**v**	**v**	

		knowledge about the structure and properties of chemical compounds that make up living organisms, about the basic laws of biochemical processes and mechanisms of regulation of metabolism. Master the methods and skills of working on devices and equipment used in biochemical laboratories of both research and production profile.												
24	General chemical technology	The purpose of the course: to study the general patterns of chemical and technological processes (CTP) of the most important chemical industries. The course examines the patterns of chemical transformations in industrial production conditions; basic chemical equipment. Calculation of technical and economic indicators of the process, material and energy balances. Industrial catalysis. Basic mathematical models of chemical reactors. Methods of development of effective chemical-technological processes and systems, methods of energy and resource conservation, environmental protection.	**5**					**v**	**v**					
25	CAD Chemical Engineering I	The purpose of studying the discipline is to develop the ability to create effective and optimal technologies for various chemical processes using the modeling computer program CemKad. The issues considered in the course are the study of the laws of hydromechanical and heat exchange processes occurring in various systems, and the development of various calculation methods. The method of calculating chemical technology devices using a modeling program. The course-forms the student's ability to perform engineering and technological calculations using a computer modeling program, encourages the creation of various projects.	**5**		**v**	**v**								
26	Basic processes and apparatus of	Study the regularities and mathematical description of the hydromechanical and heat exchange processes occurring in systems with several phases and several	**5**					**v**	**v**					

	chemical technology I	components and to develop methods for calculating equipment, choosing a rational design and determining the size of the apparatus. Classification of the main processes and devices of chemical technology. The method of calculating the devices. Equations of equilibrium of an ideal fluid. Equations of motion of ideal fluids. Separation of heterogeneous systems. The main regularities of the flow of hydromechanical and heat exchange processes, designs and principles of operation of devices used in these processes.												
27	Basics of designing and equipping pharmaceutical industries	The discipline studies design as a type of engineering activity, legal foundations of design, design estimates, project feasibility study, introduction to the main issues of the life cycle of engineering systems and equipment at a pharmaceutical enterprise. The main stages performed in the development of a conceptual design. Determination of the main characteristics of the designed production. General analysis of the pharmaco-technological process and pharmaco-technological system.	**5**					**v**			**v**			
28	CAD Chemical Engineering II	The purpose of the discipline is to study the modeling of chemical and technological processes using the AspenHysys modeling software package. The course studies the basic concepts of the modeling method, methods of constructing a technological scheme, characteristics of the technological scheme and flows, calculation of parameters of all flows and equipment. The course forms the ability to develop an optimal chemical process technology with a high-quality output of the target product.	**5**		**v**	**v**								
29	Basic processes and apparatus of	The purpose of the discipline is to study the regularities and mathematical description of mass transfer processes occurring in systems with several phases and several components and the formation of knowledge and skills in the field of processes and devices of	**4**					**v**	**v**					

	chemical technology II	chemical technology and practical calculations of processes and devices. Mass transfer processes, calculation and selection of devices and structures; comparative analysis of the operation of devices, finding optimal conditions for technological processes.												
30	Pharmaceutical Chemistry	The discipline is aimed at systematizing scientific knowledge about the methods of obtaining medicinal substances, the relationship of their chemical structure with pharmacological activity, methods for controlling the quality of pharmaceutical substances and medicines. Considers the issues of biotransformation of medicinal substances in the body and the biochemical aspects of pharmacoanalysis, pharmaceutical synthesis, technology of dosage forms for the creation of medicines.	**5**										**v**	
31	Educational practice	Passing an instruction on familiarization with the requirements of labor protection, safety, fire safety, and the rules of the internal labor regulations of the enterprise. Conducting a general tour of the enterprise, studying the structure. The stage of collecting, processing and analyzing technical or technological information on the technology being implemented.	**2**			**v**	**v**							
Cycle of basic disciplines Selectable component														
32	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	**5**	**v**	**v**									

33	Occupational safety of the pharmaceutical industry	The discipline studies a set of measures necessary for the safe production of medicinal substances in the technology of pharmaceutical production and teaching students safety in pharmaceutical production. Describes the system for preserving the life and health of workers in the course of their work in the pharmaceutical industry, which includes legal, socio-economic, organizational, technical, sanitary and hygienic, medical and preventive, rehabilitation and other measures	**5**	**v**							**v**			
34	Theoretical and applied mechanics	To involve students in the development and solution of tasks that help bridge the gap between scientific theory and engineering practice.Contents_ Theoretical mechanics, theory of mechanisms and machines. Theoretical mechanics deals with the general laws of mechanical movements of material bodies and the mechanical interactions between them. In the theory of mechanisms and machines, general methods of research, construction, and kinematics of mechanisms and machines are studied_	**5**						**v**					
35	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	**5**	**v**										
36	Technology of dosage forms	Studying poisonous and potent substances. Excipients. Stabilizers of medicinal substances and dosage forms. Preservatives, prolongators, solubilizers, corrigents, etc. Stages of technology for powders of liquid and soft	**5**					**v**				**v**		

		dosage forms. Liniments, ointments, suppositories. Dosage forms for injections. Solvents for injection dosage forms. Be able to classify dosage forms. Have the skills to distinguish the nomenclature of medicinal substances.												
37	Technology of extraction preparations	He studies the main trends in the development of pharmaceutical production. Industrial regulation. Alcoholimetry. Syrups flavoring and medicinal. Theoretical bases of drying, extraction, obtaining preparations of biogenic stimulants. Features of technology, purification and isolation of individual substances. To be able to manage the technological process for the production of finished medicinal products and to master the skills of conducting the technological process for the production of extractive preparations.	**5**					**v**				**v**		
38	Automation of control systems in chemical engineering processes	Automation of control systems in chemical and technological processes. The purpose of studying the discipline is to acquire the knowledge necessary for effective use in the development of modern automatic control systems. Possession of sections of containers necessary for solving research and applied tasks. The course "ASUHTP" provides a presentation of the sections of the basics of TAR, measuring elements, functional circuits. The study of this discipline will allow the student to acquire the skills to choose the types of switching devices and regulators depending on the law of regulation, to develop a functional and mathematical model of the control system, to analyze the operation of the system based on qualitative indicators of regulation.	**6**		**v**	**v**								
39	Mathematics and Statistics	The course deals with mathematical models, methods and tools of linear algebra, mathematical analysis and probability theory, which are used in software engineering and the field of artificial intelligence. The	**5**		**v**				**v**					

		issues of mathematical formalization of applied problems, the use of adequate mathematical tools in solving specific engineering and technical problems, mathematical modeling and interpretation of the obtained quantitative and qualitative results of solving these problems are considered.												
40	Ecology and environmental protection of pharmaceutical enterprises	This course includes the study of the essence of ecology and the fundamentals of nature conservation, as well as the basic principles of the organization and functioning of ecological systems at different levels of organization. The discipline makes it possible to determine the negative impact of the pharmaceutical industry on the environment and propose ways to reduce this impact, while tracing the impact of ecology on human health. Establishes the role of ecology in the life of modern society, the need to comply with the principles of sustainable development of territories, the need to maintain the biological diversity of the biosphere, the importance of using the results of environmental research to harmonize the relationship between society and its environment.	**6**	**v**										
41	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.	**5**	**v**										
42	ESG principles in inclusive culture	Purpose of the course: It focuses on studying ESG (Environmental, Social, Governance) principles and	**5**	**v**						**v**				

		their interaction with the creation of an inclusive culture within an organization. Content: Students will gain knowledge on how implementing ESG principles contributes to corporate social responsibility, sustainable development, and equal opportunities for all employees, including those who may face various forms of discrimination. The course will help students understand the importance of an inclusive culture in achieving long-term business goals and ensuring sustainable organizational development.											
43	The basics of anti-corruption culture	The course introduces students to the improvement of socio-economic relations of Kazakhstan society, psychological features of corrupt behavior. Special attention is paid to the formation of an anti-corruption culture, legal responsibility for acts of corruption in various spheres. The purpose of studying the discipline "Fundamentals of anti-corruption culture" is to increase public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Expected results: to realize the values of moral consciousness and follow moral norms in everyday practice; to work on improving the level of moral and legal culture; to use spiritual and moral mechanisms to prevent corruption.	**5**						**v**				
44	Programming on Python language	This course is intended for students to study the relevant sections of methods for solving optimization problems, the formation of skills in the application of optimization methods in the development and application of numerical methods for solving problems from many areas of knowledge, as well as the formation of skills for constructing and researching mathematical models of such problems.	**5**		**v**				**v**				

45	Ecology and life safety	The discipline studies the main approaches to solving environmental problems; sources and types of environmental pollution by transport enterprises; methods of reducing harmful effects on the environment. Natural and man-made emergencies, their causes, methods of prevention and protection. Carrying out rescue and other urgent work, rules of behavior of people in emergency situations.	**5**	**v**	**v**			**v**						
46	Fundamentals of electrical engineering and electronics	The discipline "Fundamentals of electrical engineering and electronics" studies the units of measurement of current strength, voltage, electric current power, conductor resistance; methods for calculating and measuring the main parameters of simple electrical, magnetic and electronic circuits; properties of direct and alternating electric current; principles of serial and parallel connection of conductors and current sources; electrical measuring instruments (ammeter, voltmeter), their device, principle of operation and rules for inclusion in an electrical circuit; properties of the magnetic field; motors of direct and alternating current, their device and principle of operation; rules for starting and stopping electric motors installed on equipment in operation.	**5**						**v**					
47	Industrial sanitation and occupational health of pharmaceutical production	Considers the basics of industrial sanitation. Production conditions: temperature, pressure, humidity, thermal study and air velocity. Industrial dust and its classification. Measures to ensure the sanitary cleanliness of the production air. Lighting and noise. To be able to observe the conditions of industrial sanitation and hygiene and the skills to determine the conditions for ensuring industrial sanitation.	**5**	**v**							**v**			
Cycle of profile disciplines University component														
48	Chemistry and technology of	The discipline deals with general issues of industrial production, the basic concepts and theoretical	**4**				**v**	**v**			**v**	**v**		

	synthetic and natural medicinal substances	foundations of the discipline, state regulation of the production of medicines and quality control, modern requirements for the production of medicines, drug technology, including the main provisions and requirements of good practices, problems, achievements.												
49	Industrial drug technology	The discipline is the core discipline amon g specialized pharmaceutical disciplines. She studies the processes and devices of pharmaceutical technology, the theoretical foundations and methods for the production of medicines, as well as the prospects for the creation and production of new dosage forms.	**6**					**v**		**v**				
50	Technology for the production of medical devices	The purpose of the course is to study modern achievements of fundamental and applied research in the field of obtaining medical devices from various sources. The course also studies technologies for the manufacture of prototypes, technical, metrological, software design work, organization of production and industrial production of products, setup and repair of biomedical devices, devices, systems and complexes of training principles and patterns of design of medical equipment, all modern methods and methodologies in the field of medical devices.	**4**				**v**	**v**			**v**			
51	Fundamentals of pharmacognosy	The discipline considers the issues of rational use of medicinal plant resources, taking into account recommendations for the procurement, standardization, quality control, storage and processing of medicinal plant materials, as well as ways to use raw materials and use herbal medicines in pharmaceutical practice.	**4**			**v**					**v**	**v**		
52	Production practice I	The production practice I is of an introductory nature. During the internship, students will get acquainted with the work of the production enterprise, they will observe the production process.	**2**				**v**			**v**				

53	Production practice II	Goals and objectives of the practice: 1. To ensure the formation of professional knowledge, skills and abilities in the information and communication field. 2. To acquaint students with the methods of work and the specifics of the activities of specialists in the production process. 3. To demonstrate the relationship between theoretical courses taught in the learning process and practical activities. 4. Consolidate students' knowledge	**3**				**v**			**v**				
Cycle of profile disciplines Selectable component														
54	Pharmaceutical biotechnology	The course summarizes the results of fundamental and applied research in the field of pharmaceutical biotechnology, methods and methodology of in vitro cultivation of producers of valuable biologically active substances and drugs, antibiotics, essential amino acids, phenolic compounds, alkaloids, vitamins, enzymes, insulin, interferon and vaccines. Also, special attention will be paid to the study of methods for cultivating medicinal plants in liquid and solid nutrient media to obtain valuable biologically active substances and drugs. Methods and methodologies related to the isolation, purification and identification of obtained biotechnological preparations based on biotechnological processes in in vitro culture will be considered	**5**									**v**		**v**
55	General pharmacology	The purpose of the discipline is to form students' understanding of the general patterns of action of medicinal substances, to ensure a rational choice of drugs for various diseases. Teaches the general principles of preparing prescriptions and compiling prescriptions, introduces the general principles for choosing dosage forms and methods of using a drug,	**5**										**v**	

		identifies groups of drugs based on ideas about their properties.												
56	Microbiology and Virology	The purpose of studying the discipline is for students to master modern methods and methodology used in the field of microbiology and virology. The discipline is aimed at mastering by students the theoretical foundations and patterns of interaction of micro- and macroorganism, practical skills in methods of prevention, microbiological, molecular biological diagnostics. After completing the course, students should acquire the knowledge, skills and competencies that will allow them to competently plan and conduct experiments with the use of microorganisms to solve their tasks.	**5**											**v**
57	Economic aspects of pharmaceutical production technology	The discipline includes the training of a qualified employee who has a system of economic aspects, universal, professional and professionally specialized competencies, capable and ready for independent professional activity in the field of drug circulation. Formation of creative and scientific thinking, combining fundamental knowledge of the basic laws and methods of conducting biochemical and pharmaceutical research, followed by mathematical processing and analysis of research results related to the development of biotechnological and pharmaceutical processes, materials and equipment.	**6**			**v**		**v**		**v**		**v**		
58	Principles of chemical engineering	The purpose of the discipline is the development of disciplinary competencies in the field of physico-chemical processes of chemical technology, their devices and calculation methods of devices designed to carry out these processes. The fundamentals of chemical technology processes, including the production and processing of polymers, are considered. The absorption process. Types of absorbers. Hydrodynamic modes of packing columns. Periodic	**6**			**v**			**v**					

		and continuous processes.												
59	Automatic machines for filling and packaging of dosage forms	The concept of the discipline includes the study of technologies for the distribution and packaging of dosage forms. Consolidates knowledge on drawing up regulations and working with them, practical skills in assessing the quality of dosage forms and knowledge of compliance with the rules of the sanitary regime, labor protection and TB.	**5**					**v**			**v**			
60	Physico-chemical methods of analysis	The course is designed to understand the principles of research and experimental work on modern analytical tools and practical use of the results and the data obtained. The purpose of the course is to teach students how to use FHMA to study the properties and composition of new organic materials and substances.Theoretical principles of methods, methods of computer processing of experimental results are described. Mass spectrometric methods. Electronic paramagnetic resonance (EPR) method. Nuclear magnetic resonance (NMR) method. Radiometric methods.	**5**										**v**	
61	Manufacturing of medical devices	Materials for the manufacture of medical devices, determining the effect of storage conditions, type of packaging on the quality of medical and pharmaceutical products, the possibility of using products in medical and pharmaceutical practice.	**5**				**v**	**v**						
62	Biopharmaceutical analysis of finished medicines	He studies biopharmaceutical analysis as a scientific direction of drug technology. The influence of pharmaceutical factors on the therapeutic efficacy of drugs. Bioavailability of drugs in the "invitro" and "invivo" experiments. Biopharmaceutical analysis of finished drugs. Be able to analyze the processes of production of biopharmaceutical drugs and have the skills to analyze biopharmaceutical drugs	**5**									**v**	**v**	

63	State regulation of medicines	The discipline studies the main ways and principles of legal and state regulation of relations in the field of circulation of medicines; the main provisions of legislative acts, government decrees, orders in the field of public health protection and activities in the field of circulation of medicines	**5**							v	v			
64	Quality control of the production of medicines and medical devices	The discipline "Quality Control and Standardization of Medicinal Substances" is based on an objective assessment of the quality of medicines, which is possible only if sufficiently sensitive and accurate methods of analysis are used for this purpose. In other words, it is necessary to standardize methods for assessing the quality of medicines. The exact observance of the same conditions in the implementation of drug quality control is achieved by standardizing the methods for preparing solutions of reagents used in the analysis, a sufficient degree of purity of the solvents, observing the temperature regime, the necessary pH values and other conditions. The standardization of instruments used in pharmaceutical analysis is very important, strict adherence to identical conditions for changes and calculations of physical and physics - chemical constant	**5**			v					v		v	
65	Machine Learning	Within the framework of the discipline, methods for analyzing large amounts of information, creating models for forecasting in business, medicine, and industry are studied. The issues of training a neural network, creating analytical systems and recommender services based on machine learning algorithms, natural language processing and/or computer vision are considered.	**5**	v	v									
66	Fundamentals of design and equipment of	Study of the composition of the project (working draft), design and estimate documentation, the grounds for its development, the organizational foundations of the	**5**					v				v		

	organic synthesis enterprises	design of organic synthesis enterprises, the study of structures, the principle of operation of basic and special equipment for the production and processing of organic substances, familiarization with its main components and details, the development of methods and features of calculating the strength of elements of apparatuses and machines. Classification of equipment. Materials used for the manufacture of equipment. Design, technical projects, technological, mechanical calculations. Calculation of elements of devices.													
67	Nomenclature of medicines	The ATC (Anatomical Therapeutic Chemical Classification System) classification system, along with specially designed drug consumption units - defined daily doses (DDD - Defined Daily Doses), is adopted by WHO as the basis of the international methodology for conducting statistical studies in the field of drug consumption. Currently, the ATC / DDD system is widely used by both government agencies and pharmaceutical companies in many countries around the world.	**5**	**v**		**v**									

5. Curriculum of educational program

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year	2025-2026 (Autumn, Spring)
Group of educational programs	B072 - "Pharmaceutical production technology"
Educational program	6B07215 - "Pharmaceutical production technology"
The awarded academic degree	Bachelor of engineering and technology
Form and duration of study	full time - 4 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisites
									1 course		2 course		3 course		4 course		
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M-1. Module of language training																	
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E	5								
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5								
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E		5							
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5							
M-2. Module of physical training																	
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2								
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2							
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2						
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2					
M-3. Module of information technology																	
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E			5						
M-4. Socio-cultural development module																	
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE		5							
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E			5						
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E				3					
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E				5					
M-5. Module on the basis of anti-corruption culture, ecology and life safety																	
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E				5					
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E				5					
HUM159	Law basics	1	GED, CCH	5	150	30/0/15	105	E				5					
CYCLE OF BASIC DISCIPLINES (BD)																	
M-6. Module of physical and mathematical training																	
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5								
PHY468	Physics		BD, UC	5	150	15/15/15	105	E	5								
MAT102	Mathematics II		BD, UC	5	150	15/0/30	105	E		5							MAT101
M-7. Module of basic training																	
CHE894	Introduction to biotechnology and professional activities		BD, UC	4	120	30/0/15	75	E	4								

GEN429	Engineering and computer graphics		BD, UC	5	150	15/0/30	105	E	5								
CHE495	Chemistry		BD, UC	5	150	15/30/0	105	E		5							
AAP173	Practical training		BD, UC	2				R		2							
CHE665	Organic Chemistry I		BD, UC	6	180	30/15/15	120	E			6						
HBI127	Analytical chemistry in industry		BD, UC	5	150	15/15/15	105	E			5						
CHE921	Pharmaceutical chemistry		BD, UC	5	150	30/0/15	105	E			5						
CHE639	Organic chemistry II		BD, UC	5	150	15/15/15	105	E				5					
CHE869	Physical and colloidal chemistry		BD, UC	5	150	15/15/15	105	E				5					
CSE608	Mathematics and Statistics	1	BD, CCH	5	150	30/15/0	105	E				5					
GEN411	Theoretical and applied mechanics	1	BD, CCH	5	150	30/15/0	105	E				5					
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	1	BD, CCH	5	150	30/0/15	105	E				5					
CSE880	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	30/0/15	105	E				5					
HUM158	The basics of anti-corruption culture	1	BD, CCH	5	150	30/0/15	105	E				5					
CHE950	ESG principles in inclusive culture	1	BD, CCH	5	150	30/0/15	105	E				5					
IDD427	Ecology and life safety	1	BD, CCH	5	150	30/0/15	105	E				5					
CHE499	Biochemistry		BD, UC	5	150	30/15/0	105	E					5				
CHE695	CAD Chemical engineering I		BD, UC	5	150	0/15/30	105	E					5				
CHE816	Basic processes and apparatus of chemical technology I		BD, UC	5	150	30/0/15	105	E					5				
CHE570	General chemical technology		BD, UC	5	150	30/15/0	105	E					5				
CHE922	Technology of dosage forms	1	BD, CCH	5	150	30/0/15	105	E					5				
CHE923	Technology of extraction preparations	1	BD, CCH	5	150	30/0/15	105	E					5				
MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E					5				
CSE199	Programming on Python language	2	BD, CCH	5	150	30/15/0	105	E					5				CSE105, CSE109, MAT101
ELC570	Fundamentals of electrical engineering and electronics	2	BD, CCH	5	150	15/30/0	105	E					5				
CHE699	CAD Chemical Engineering II		BD, UC	5	150	0/15/30	105	E						5			
CHE817	Basic processes and apparatus of chemical technology II		BD, UC	4	120	30/0/15	75	E						4			
CHE924	Occupational safety in the pharmaceutical industry	1	BD, CCH	5	150	30/0/15	105	E						5			
CHE925	Industrial sanitation and occupational health of pharmaceutical production	1	BD, CCH	5	150	30/0/15	105	E						5			
AUT434	Automation of control systems in chemical engineering processes	1	BD, CCH	6	180	30/15/15	120	E							6		
CHE926	Ecology and environmental protection of pharmaceutical enterprises	1	BD, CCH	6	180	30/0/30	120	E							6		
CYCLE OF PROFILE DISCIPLINES (PD)																	
M-8. Module of professional activity																	
AAP102	Production practice I		PD, UC	2				R				2					
CHE927	Fundamentals of pharmacognosy		PD, UC	4	120	30/0/15	75	E						4			
CHE928	Basics of designing and equipping pharmaceutical industries		PD, UC	5	150	30/0/15	105	E						5			
CHE929	Chemistry and technology of synthetic and natural medicinal substances		PD, UC	4	120	30/0/15	75	E						4			
AAP183	Production practice II		PD, UC	3				R						3			
CHE930	Industrial drug technology		PD, UC	6	180	30/0/30	120	E							6		
CSE178	Machine Learning	1	PD, CCH	5	150	15/15/15	105	E							5		CSE439, CSE446
CHE940	Pharmaceutical biotechnology	1	PD, CCH	5	150	30/0/15	105	E							5		
CHE932	General pharmacology	2	PD, CCH	5	150	30/0/15	105	E							5		
BIO442	Microbiology and virology	2	PD, CCH	5	150	15/15/15	105	E							5		
CHE933	Economic aspects of pharmaceutical production technology	3	PD, CCH	6	180	30/0/30	120	E							6		

CHE829	Principles of chemical engineering	3	PD, CCH	6	180	30/0/30	120	E							6		
CHE893	Physico-chemical methods of analysis	4	PD, CCH	5	150	30/15/0	105	E							5		
CHE934	Biopharmaceutical Analysis of Finished Medicines	4	PD, CCH	5	150	30/0/15	105	E							5		
HBI104	Technology for the production of medical devices		PD, UC	4	120	30/0/15	75	E								4	
CHE935	Quality control of the production of medicines and medical devices	1	PD, CCH	5	150	30/0/15	105	E								5	
CHE936	State regulation of medicines	1	PD, CCH	5	150	30/0/15	105	E								5	
CHE937	Manufacturing of medical devices	2	PD, CCH	5	150	30/0/15	105	E								5	
CHE938	Automatic machines for filling and packaging dosage forms	2	PD, CCH	5	150	30/0/15	105	E								5	
CHE939	Nomenclature of medicines	3	PD, CCH	5	150	30/0/15	105	E								5	
CHE485	Fundamentals of design and equipment for organic synthesis enterprises	3	PD, CCH	5	150	30/0/15	105	E								5	
M-9. Final certification module																	
ECA103	Final examination		FA	8												8	
Additional type of training (ATT)																	
AAP500	Military training																
Total based on UNIVERSITY:									31	29	28	32	30	30	33	27	
									60		**60**		**60**		**60**		

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	51	0	5	56
BD	Cycle of basic disciplines	0	86	26	112
PD	Cycle of profile disciplines	0	28	36	64
Total for theoretical training:		**51**	**114**	**67**	**232**
FA	Final attestation				8
TOTAL:					**240**

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 28.11.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs — Uskenbayeva R. K.

Approved:

Vice Provost on academic development — Kalpeyeva Z. Б.

Head of Department - Department of Educational Program Management and Academic-Methodological Work — Zhumagaliyeva A. S.

Director - Geology and Oil-gas Business Institute named after K. Turyssov — Auyelkhan Y. .

Department Chair - Chemical and biochemical engineering — Mangazbayeva R. A.

Representative of the Academic Committee from Employers ____Acknowledged____ — Seytenova G. Z.