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

Department of Chemical and Biochemical Engineering

EDUCATIONAL PROGRAM
6B07215 – Pharmaceutical production technology

the cipher and the name of the educational program

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, 2022

Educational program 6B07215 – Pharmaceutical production technology

Approved by the meeting of the Academic Council of KazNRTU named after K.I.Satpayev.

Protocol № 13 from «28» 04 2022 y.

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

Protocol №7 from «26» 04 2022 г.

Educational program 6B07215 – Pharmaceutical production technology developed by the academic committee in the direction of «6B072 Manufacturing and processing industries for the development, design and improvement of educational programs:

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Content

List of abbreviations and designations

1. Description of the educational program

2. The purpose and objectives of the educational program

The purpose of the educational program "Technology of pharmaceutical production" is to train practice-oriented highly qualified personnel of a new formation, who are able to carry out professional activities at a high professional level in the fields of development, production and manufacture of medicines using pharmaceutical and biomedical technologies in accordance with established requirements and standards in the field of healthcare in the context of global trends in the development of the domestic pharmaceutical industry.

The main professional educational program is focused on the implementation of the following principles:

- application of the results of theoretical training in professional and pedagogical practices;
- implementation of professional activity on the basis of continuous development and introduction of innovations.

In accordance with this mission, the main objectives of this OP are:

– 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

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	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	The purpose of the development of the OP "Pharmaceutical Production Technology" is to train 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:	KK1. Communicativeness KK2. Basic literacy in natural sciences KK3. General engineering competencies KK4. Professional competencies KK5. Engineering and computer competencies KK6. Engineering and working competencies KK7. Socially-economic competencies
12	Learning outcomes of the educational program:	PO1. Demonstrates communication skills in the state, Russian and foreign languages; is able to participate orally or in writing in professional discussions PO2. Knows the basic laws of natural science disciplines and methods of mathematical analysis and modeling in solving problems in the field of pharmaceutical engineering and industry, finds solutions to general technical problems; PO3. Knows and applies modern trends in the development of the industry in production and technological, design, research and organizational and managerial activities; PO4. Applies the main international GMP standards for the quality of medicinal substances, uses the standards of general sanitation and the organization of appropriate conditions at the pharmaceutical enterprise. PO5. Defines and links the action of various microorganisms, viruses and bacteria on physiological processes, describes biological processes using knowledge of modern physiology and anatomy. PO6. Solves problems in the field of creation and use of drugs based on natural and synthetic raw materials, discusses biochemical processes occurring in the body, pharmacokinetics and pharmacodynamics of drugs. PO7. Offers and carries out modeling of new drugs using computer technologies used in technological processes of pharmaceutical production; PO8. Solves various typical practical tasks that require an independent analysis of work situations: conducting the main technological process in the field of his professional activity, of various levels of complexity; PO9. Understanding the impact of engineering solutions in the global, economic, natural and social context; knowledge of the trends of social development of society, the ability to adequately navigate in various social situations.
13	Form of training	Daytime
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:	1. Head of the Department PhD Амитова A.A. 2. Associate professor, PhD Kossalbayev B.D. 3. Associate professor, c.ch.s, Kerimkulova A.Zh. 4. Vice-Rector for Academic Affairs, d.ph.s., Yuldashev Z.A. 5. Assistant, Master degree, 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	PO 9	
The cycle of general education disciplines is a mandatory component													
	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**									
	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**									
	Information and communication technologies (in English)	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	**5**	**v**						**v**			

		skills in using text editors and tabular processors; to create databases and various категории прикладных программ.											
	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**	
	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**	
	Module of socio-political knowledge	The study of the course contributes to the formation of students' theoretical	**3**									**V**	

	(sociology, political science)	knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern 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.											
	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 disciplines University component													
	Fundamentals of anti-corruption culture	The discipline studies the essence, causes, and causes of sustainable development of corruption from both historical and modern points of view. Examines the prerequisites and impacts for the development of an anti-corruption culture. Traces the development of anti-corruption based on social, economic, legal, cultural, moral and ethical norms. Studies the problems of the formation of an anti-corruption culture based on the relationship with various types of social relations and various manifestations.	**5**									**v**	
	Fundamentals of Entrepreneurship and Leadership	The purpose of the discipline is to give students knowledge of the theory and practice of entrepreneurship, leadership, skills of their successful application in future professional activity. The discipline studies the basics of entrepreneurship and leadership from the point of view of science and law; features, problematic aspects and development prospects. Considers the theory and practice of entrepreneurship as a system of economic, organizational and legal relations of business structures, The discipline is aimed at revealing the content of entrepreneurial activity, career stages, qualities, competencies and responsibilities of a modern entrepreneur.	**5**									**v**	
	Ecology and life safety	The discipline studies the tasks of ecology as a science, types (out ecology, population and social	**5**									**v**	

		ecology), environmental terms, laws of functioning of natural systems and aspects of environmental safety in working conditions. Environmental monitoring and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies											
	Cycle of basic disciplines University component												
	Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to explore elementary functions and solve the simplest geometric, physical and other applied problems. The focus is on differential and integral calculus. The course program includes differential calculus of functions of one variable, derivative and differentials, the study of the behavior of functions, complex numbers, and polynomials. Indefinite integrals, their properties and methods of calculation. Definite integrals and their applications. Improper integrals.	**5**		**v**						**v**		
	Physics	The course studies the basic physical phenomena and laws of classical and modern physics, methods of physical research, the influence of physics as a science on the development of technology, the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty. The discipline covers the following sections: mechanics, mechanical harmonic waves, fundamentals of	**5**		**v**						**v**		

		molecular kinetic theory and thermodynamics, electrostatics, direct current, electromagnetism, geometric optics, wave properties of light, laws of thermal radiation, photoelectric effect.											
	Mathematics II	The discipline is a continuation of Mathematics 1. The course sections include elements of linear algebra and analytical geometry. The main issues of linear algebra are considered: linear and self-adjoint operators, quadratic forms, linear programming. Differential calculus of a function of several variables and its applications. Multiple integrals. The theory of determinants and matrices, linear systems of equations, as well as elements of vector algebra. The elements of analytical geometry on the plane and in space are included.	**5**		**v**						**v**		
	Cycle of basic disciplines Component of choice												
	Engineering and computer graphics	The course teaches students to depict all possible combinations of geometric shapes on a plane, to conduct research and their measurements, allowing for image transformations, to create technical drawings. The course program includes familiarization of students with the concept of computer graphics, geometric modeling, graphic objects, with modern interactive graphic systems for solving problems of automation of drawing and graphic works on the example of AutoCAD,	5		**v**					**v**	**v**		
	Introduction to the specialty	The course contributes to the formation of students' systematic provision of professional education in	4			**v**	**v**				**v**		

		the field of pharmaceutical engineering. New schemes of drug synthesis using technological equipment and processes are considered. 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; demonstrate the theoretical basic concepts of pharmaceutical engineering, basic terminology.											
	General chemistry	The course program includes the study of the structure of the periodic system of elements and the main characteristics of elements and their compounds arising from it; the nomenclature of chemical compounds, basic chemical laws and concepts, as well as their application in solving professional problems; the study of the properties and physical states of substances and the main classes of inorganic compounds; solutions of electrolytes, electrolytic dissociation and hydrolysis of salts; fundamentals of chemical thermodynamics and kinetics.	5		**v**						**v**		
	Organic Chemistry I	Organic Chemistry I studies the chemistry of linear hydrocarbons and their oxygen- and nitrogen-containing derivatives, the structure and nomenclature, physical and chemical properties of these compounds, methods of production in the laboratory and industry, as well as their use in various sectors of the national economy. Saturated and unsaturated	6		**v**						**v**		

		hydrocarbons, their various derivatives - aldehydes and ketones, alcohols, carboxylic acids, esters and esters, nitro compounds and amines, amino acids are considered. carbohydrates											
	Organic Chemistry II	The purpose of the discipline 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						v		
	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 physico-chemical concepts, laws, theories. The course covers chemical thermodynamics, the first beginning of thermodynamics, thermal effects, Hess's Law, Kirchhoff equations, the second beginning of thermodynamics. Entropy. Chemical equilibrium. The doctrine of solutions. Phase equilibria. Electrochemistry. Solutions of electrolytes. Galvanic cells. Chemical kinetics and catalysis. Surface phenomena. Dispersed systems.	5		v						v		

		Methods of preparation and purification.											
	Analytical Chemistry	The purpose of the course: the development of chemical methods of analysis of substances and their application to solve problems in professional activity. The course discusses ways to identify chemical compounds, principles and methods for determining the chemical composition of substances and their structure. Application of chemical analysis in product quality control in various industries.	5		√						√		
	Theoretical and applied mechanics	Theoretical and applied mechanics includes courses such as theoretical mechanics, theory of mechanisms and machines. Theoretical mechanics deals with the general laws of mechanical movements of material bodies and mechanical interactions between them. In the theory of mechanisms and machines, general methods of research, construction, and kinematics of mechanisms and machines are studied. We also strive to involve students in the development and solution of tasks that contribute to bridging the gap between scientific theories and engineering practice.	5								√		
	Biochemistry	The purpose of mastering the discipline is to acquire 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	5		√				√				

		laboratories of both research and production profile.											
	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		√				√		√		
	Occupational safety of the pharmaceutical industry	The discipline studies a set of measures necessary for the safe production of medicinal substances in pharmaceutical production technology and teaching students safety techniques in pharmaceutical production. Describes the system of preserving the life and health of employees in the course of their work in the pharmaceutical industry, which includes legal, socio-economic, organizational and technical, sanitary and hygienic, therapeutic and preventive, rehabilitation and other measures	5										
	CAD Chemical Engineering I	The purpose of studying the discipline is to consider the basic concepts of computer graphics, the theoretical foundations of the description of geometric objects and their representation in a computer.	5		√					√			

		The issues studied are theoretical and practical foundations for the creation of engineering technical documentation, the creation of graphical computer applications for image processing in the field of chemical technology of organic substances. Theoretical foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by means of computer graphics using the AutoCAD graphics package.											
	Basic processes and devices of chemical technology I	The purpose of studying the discipline is to study the regularities and mathematical description of the hydromechanical and heat exchange processes occurring in various systems and the development of various calculation methods. Issues under consideration: classification of the main processes and devices of chemical technology. The method of calculating the devices. Equations of equilibrium and motion of ideal fluids. Separation of heterogeneous systems. Mixing. Types of mixing. Heat transfer processes. Thermal conductivity. Heating, cooling and condensation processes. Evaporation.	5		**v**					**v**	**v**		
	Technology of dosage forms	Studies toxic and potent substances. Auxiliary substances. Stabilizers of medicinal substances and dosage forms. Preservatives, prolongators, solubilizers, corrigents, etc. Stages of technology of powders of liquid and soft dosage forms. Liniments,	5				**v**		**v**				

		ointments, suppositories. Dosage forms for injection. Solvents for injectable dosage forms. Be able to classify dosage forms. Have the skills to distinguish the nomenclature of medicinal substances.											
	Technology of extraction preparations	Studies the main trends in the development of pharmaceutical production. Industrial regulations. Alcoholimetry. Syrups flavoring and medicinal. Theoretical foundations of drying, extraction, and preparation of biogenic stimulants. Features of technology, purification and isolation of individual substances. Be able to manage the technological process of production of finished medicines and possess the skills of carrying out the technological process of production of extraction preparations.	5						v		v		
	Automation of control systems in chemical and technological processes	Expected results: mastering by students: scientific foundations of new technological processes, principles of ecologization and resource conservation of petrochemical processes, technical and economic aspects of the development of petrochemical industries in the Republic of Kazakhstan, calculation methods, basic technological parameters of automated control systems.	5			v					v		
	Ecology and environmental protection of pharmaceutical enterprises	This course includes the study of the essence of ecology and the basics of nature protection, 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	5			v	v						

		pharmaceutical industry on the environment and suggest 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 habitat.											
	CAD Chemical Engineering II	Summary of the course: Basic concepts of the modeling method, computer modeling of chemical and technological processes using the AspenHysys modeling software package. Methods of building a technological scheme. Characteristics of the technological scheme and flows, calculation of parameters of all flows and equipment, Optimization of the heat exchange process in heat exchangers. Calculation of material and thermal balances in the development of technology and design of production, analysis of parametric sensitivity, total mass and thermal balance, optimization of the process.	5			v				v			
	Basic processes and devices of chemical technology II	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. Summary: The essence and theoretical foundations of the main processes of chemical	4		v					v	v		

		technology. Mass transfer processes, calculation and selection of devices and structures. Comparative analysis of the operation of devices, finding optimal conditions for technological processes. Methods of calculation of the main processes and devices. Approach to graphic design of design objects. Familiarity with the current regulatory and technological documentation, reference literature, The course project is the final stage in the study of the discipline.											
	Cycle of profile disciplines University component												
	Pharmaceutical Chemistry	The discipline is aimed at systematization of scientific knowledge about the methods of obtaining medicinal substances, the relationship of their chemical structure with pharmacological activity, methods of quality control of pharmaceutical substances and medicines. Examines the issues of biotransformation of medicinal substances in the body and biochemical aspects of pharmanalysis, pharmacynthesis, technology of dosage forms for the creation of medicines.	5		**v**						**v**		
	Fundamentals of enterprise design	The main provisions of the organization of design work for the construction of new enterprises of reconstruction or technical re-equipment of existing enterprises of food industries are considered. This course is designed to familiarize you with the basic concepts of chemical engineering. The study of this discipline will allow the student to	5							**v**			

		correctly apply the rules of development on the design of technological schemes, drawings of plans and sections of industrial enterprises of the food industry.											
	Chemistry and technology of synthetic and natural medicinal substances	The discipline deals with general issues of industrial production, basic concepts and theoretical foundations of the discipline, state regulation of the production of medicines and quality control, modern requirements for the production of medicines, technology of medicines, including the main provisions and requirements of good practices, problems, achievements.	4			√		√		√			
	Industrial Medicine technology	The discipline is a core discipline among specialized pharmaceutical disciplines. She studies the processes and devices of pharmaceutical technology, the theoretical foundations and methods of drug production, as well as the prospects for the creation and production of new dosage forms.	6			√					√		
	Cycle of profile disciplines Component of choice												
	Biotechnology of medicines	Studies the prospects for the development of biotechnology. Nutrient media. Methods of sterilization of nutrient media. Fermenters. Criteria for the selection of fermenters. Isolation, concentration and purification of biotechnological medicines. Medications as a source of toxic effects on the body. The contribution of biotechnology to solving common environmental problems. The ability to develop industrial regulations and possess the	5					√	√				

		skills to produce biotechnological medicines.											
	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 medicines, antibiotics, essential amino acids, phenolic compounds, alkaloids, vitamins, enzymes, insulin, interferon and vaccines. Special attention will also be paid to the study of methods of cultivation of medicinal plants in liquid and solid nutrient medium for obtaining valuable biologically active substances and medicines, methods and methodologies related to the isolation, purification and identification of obtained biotechnological preparations based on biotechnological processes in culture in vitro are considered.	5					v	v		v		
	General pharmacology	The purpose of the discipline is to form students' understanding of the general laws of the action of drugs to ensure a rational choice of drugs for various diseases. Teaches the general principles of prescribing and composing prescription prescriptions, introduces the general principles of choosing dosage forms and methods of drug use, identifies groups of medicines based on ideas about their properties.	5					v	v		v		
	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	5					v	v		v		

		methods of prevention, microbiological, molecular biological diagnostics. The course is aimed at forming students' general ideas about the structure and functioning of microbes as living systems, their role in ecology and decontamination methods, including the basics of disinfection and sterilization techniques											
	Economic aspects of pharmaceutical production technology	The discipline includes the training of a qualified employee with a system of economic aspects, universal, professional and professionally specialized competencies, capable and ready for independent professional activity in the field of circulation of medicines.Formation of creative and scientific thinking, combining fundamental knowledge of the basic laws and methods of 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		
	Principles of chemical engineering	The formation of highly qualified specialists with general scientific and professional training, capable of independent creative work, to introduce the latest and progressive results into the production process and having an integral system of knowledge, the student should learn: skills and practical skills. the student should know: physico-chemical fundamentals of chemical technology processes; methods of calculating devices; correctly evaluate the results	6			v					v		

		of laboratory research and implement them in production conditions											
	Physico-chemical methods of analysis	General characteristics of physico-chemical methods of analysis. Advantages and disadvantages of physico-chemical methods of analysis. The main techniques used in the identification of new materials. The use of the most important physico-chemical methods in the technology of obtaining chemical products and new materials: spectral and other optical; chromatographic; electrochemical, etc. Mass spectrometric methods. Electronic paramagnetic resonance (EPR) method. Nuclear magnetic resonance (NMR) method. Radiometric methods.	5			v	v						
	Biopharmaceutical analysis of finished medicines	Studies biopharmaceutical analysis as a scientific direction of drug technology. The influence of pharmaceutical factors on the therapeutic effectiveness of drugs. Bioavailability of drugs in the "invitro" and "invivo" experiments. Biopharmaceutical analysis of finished medicines. Be able to analyze the production processes of biopharmaceutical drugs and possess the skills of analyzing biopharmaceutical drugs.	5				v	v	v				
	Quality control of the production of medicines and medical products	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 analysis methods are used for this purpose. In other words,	5				v		v		v		

		standardization of methods for assessing the quality of medicines is necessary. Exact observance of the same conditions in the implementation of quality control of medicines is achieved by standardization of methods for preparing solutions of reagents used in the analysis, a sufficient degree of purity of solvents, compliance with the temperature regime, the required pH values and other conditions. Standardization of devices used in pharmaceutical analysis is very important, strict observance of identical conditions during changes and calculations of physical and physico–chemical constants											
	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 resolutions, orders in the field of public health protection and activities in the field of circulation of medicines.	5				v		v		v		
	Production of medical devices	Materials for the manufacture of medical products, determination of the influence 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						
	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,	5			v					v		

		practical skills in assessing the quality of dosage forms and knowledge on compliance with the rules of sanitary regime, labor protection and SP											
	Nomenclature of medicines	The ATS classification system (anatomicaltherapeuticchemicalcassification system), along with specially developed units of drug consumption - established daily doses (DDD - DefinedDailyDoses), has been adopted by WHO as the basis of an international methodology for conducting statistical research in the field of drug consumption. Currently, the PBX/DDD system is widely used by both government agencies and pharmaceutical companies in many countries of the world	5				v		v				
	Fundamentals of design and equipment of organic synthesis enterprises	Study of the composition of the project (working draft), design and estimate documentation, the grounds for its development, the organizational foundations of the 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.	5			v					v		

4.4. Information about disciplines

№	Name of the discipline	Brief description of the discipline (30-50 words)	Number of credits	Formed competencies (codes)
The cycle of general education disciplines is a mandatory component				
	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.	10	**КК1**
	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	**КК1**
	Information and communication technologies (in English)	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	**КК1, КК5**
	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	**КК7**
	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	**КК7**
	Module of socio-political knowledge (sociology, political science)	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 world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of	3	**КК7**

		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.		
	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.	3	**КК7**
Cycle of general education disciplines University component				
	Fundamentals of anti-corruption culture	The discipline studies the essence, causes, causes of sustainable development of corruption from both historical and modern points of view. Examines the prerequisites and impacts for the development of an anti-corruption culture. Traces the development of anti-corruption on the basis of social, economic, legal, cultural, moral and ethical norms. Studies the problems of the formation of an anti-corruption culture based on the relationship with various types of social relations and various manifestations.	5	**КК7**
	Fundamentals of Entrepreneurship and Leadership	The purpose of the discipline is to give students knowledge of the theory and practice of entrepreneurship, leadership, skills of their successful application in future professional activity.	5	**КК7**
	Ecology and life safety	The discipline studies the tasks of ecology as a science, types (out ecology, population and social ecology), environmental terms, laws of functioning of natural systems and aspects of environmental safety in working conditions. Environmental monitoring and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5	**КК7**
Cycle of basic disciplines University component				
	Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to explore elementary functions and solve the simplest geometric, physical and other applied problems. The main focus is on differential and integral calculus. The course program includes differential calculus of functions of one variable, derivative and differentials, the study of the behavior of functions, complex numbers, polynomials. Indefinite integrals, their properties and methods of calculation. Definite integrals and their applications. Improper integrals.	5	**КК2, КК6**
	Physics	The course studies the basic physical phenomena and laws of classical and modern physics, methods of physical research, the influence of physics as a science on the development of technology, the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty. The	5	**КК2**, **КК6**

		discipline covers the following sections: mechanics, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, electrostatics, direct current, electromagnetism, geometric optics, wave properties of light, laws of thermal radiation, photoelectric effect.		
	Mathematics II	The discipline is a continuation of Mathematics 1. The course sections include elements of linear algebra and analytical geometry. The main issues of linear algebra are considered: linear and self-adjoint operators, quadratic forms, linear programming. Differential calculus of a function of several variables and its applications. Multiple integrals. The theory of determinants and matrices, linear systems of equations, as well as elements of vector algebra. The elements of analytical geometry on the plane and in space are included.	5	**КК2, КК6**
Cycle of basic disciplines Component of choice				
	Engineering and computer graphics	The course teaches students to depict all possible combinations of geometric shapes on a plane, to conduct research and their measurements, allowing for image transformations, to create technical drawings. The course program includes familiarization of students with the concept of computer graphics, geometric modeling, graphic objects, with modern interactive graphic systems for solving problems of automation of drawing and graphic works on the example of AutoCAD,	5	**КК2, КК6**
	Introduction to the specialty	The course contributes to the formation of students' systematic provision of professional education in the field of pharmaceutical engineering. New schemes of drug synthesis using technological equipment and processes are considered. 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; demonstrate the theoretical basic concepts of pharmaceutical engineering, basic terminology.	4	**КК3, КК4, КК6**
	General chemistry	The course program includes the study of the structure of the periodic system of elements and the main characteristics of elements and their compounds arising from it; the nomenclature of chemical compounds, basic chemical laws and concepts, as well as their application in solving professional problems; the study of the properties and physical states of substances and the main classes of inorganic compounds; solutions of electrolytes, electrolytic dissociation and hydrolysis of salts; fundamentals of chemical thermodynamics and kinetics.	5	**КК 2**
	Organic Chemistry I	Organic Chemistry I studies the chemistry of linear hydrocarbons and their oxygen- and nitrogen-containing derivatives, the structure and nomenclature, physical and chemical properties of these compounds, methods of production in the laboratory and industry, as well as their use in various sectors of the national economy. Saturated and unsaturated hydrocarbons, their various derivatives - aldehydes and ketones, alcohols,	6	**КК2, КК6**

		carboxylic acids, esters and esters, nitro compounds and amines, amino acids are considered. carbohydrates		
	Organic Chemistry II	The purpose of the discipline 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	**КК2 , КК6**
	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 physico-chemical concepts, laws, theories. The course covers chemical thermodynamics, the first beginning of thermodynamics, thermal effects, Hess's Law, Kirchhoff equations, the second beginning of thermodynamics. Entropy. Chemical equilibrium. The doctrine of solutions. Phase equilibria. Electrochemistry. Solutions of electrolytes. Galvanic cells. Chemical kinetics and catalysis. Surface phenomena. Dispersed systems. Methods of preparation and purification.	5	**КК2, КК6**
	Analytical Chemistry	The purpose of the course: the development of chemical methods of analysis of substances and their application to solve problems in professional activity. The course discusses ways to identify chemical compounds, principles and methods for determining the chemical composition of substances and their structure. Application of chemical analysis in product quality control in various industries.	5	**КК2, КК6**
	Theoretical and applied mechanics	Theoretical and applied mechanics includes courses such as theoretical mechanics, theory of mechanisms and machines. Theoretical mechanics deals with the general laws of mechanical movements of material bodies and mechanical interactions between them. In the theory of mechanisms and machines, general methods of research, construction, and kinematics of mechanisms and machines are studied. We also strive to involve students in the development and solution of tasks that contribute to bridging the gap between scientific theories and engineering practice.	5	**КК6**
	Biochemistry	The purpose of mastering the discipline is to acquire 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.	5	**КК2, КК4**
	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	5	**КК2, КК4, КК6**

		mathematical models of chemical reactors. Methods of development of effective chemical-technological processes and systems, methods of energy and resource conservation, environmental protection.		
	Occupational safety of the pharmaceutical industry	The discipline studies a set of measures necessary for the safe production of medicinal substances in pharmaceutical production technology and teaching students safety techniques in pharmaceutical production. Describes the system of preserving the life and health of employees in the course of their work in the pharmaceutical industry, which includes legal, socio-economic, organizational and technical, sanitary and hygienic, therapeutic and preventive, rehabilitation and other measures	5	**КК3, КК4**
	CAD Chemical Engineering I	The purpose of studying the discipline is to consider the basic concepts of computer graphics, the theoretical foundations of the description of geometric objects and their representation in a computer. The issues studied are theoretical and practical foundations for the creation of engineering technical documentation, the creation of graphical computer applications for image processing in the field of chemical technology of organic substances. Theoretical foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by means of computer graphics using the AutoCAD graphics package.	5	**КК2, КК5**
	Basic processes and devices of chemical technology I	The purpose of studying the discipline is to study the regularities and mathematical description of the hydromechanical and heat exchange processes occurring in various systems and the development of various calculation methods. Issues under consideration: classification of the main processes and devices of chemical technology. The method of calculating the devices. Equations of equilibrium and motion of ideal fluids. Separation of heterogeneous systems. Mixing. Types of mixing. Heat transfer processes. Thermal conductivity. Heating, cooling and condensation processes. Evaporation.	5	**КК2, КК5, КК6**
	Technology of dosage forms	Studies toxic and potent substances. Auxiliary substances. Stabilizers of medicinal substances and dosage forms. Preservatives, prolongators, solubilizers, corrigents, etc. Stages of technology of powders of liquid and soft dosage forms. Liniments, ointments, suppositories. Dosage forms for injection. Solvents for injectable dosage forms. Be able to classify dosage forms. Have the skills to distinguish the nomenclature of medicinal substances.	5	**КК4**
	Technology of extraction preparations	Studies the main trends in the development of pharmaceutical production. Industrial regulations. Alcoholimetry. Syrups flavoring and medicinal. Theoretical foundations of drying, extraction, and preparation of biogenic stimulants. Features of technology, purification and isolation of individual substances. Be able to manage the technological process of production of finished medicines and possess the skills of carrying out the technological process of production of extraction preparations.	5	**КК4, КК6**
	Automation of control systems in	Expected results: mastering by students: scientific foundations of new technological processes, principles	5	**КК3, КК6**

	chemical and technological processes	of ecologization and resource conservation of petrochemical processes, technical and economic aspects of the development of petrochemical industries in the Republic of Kazakhstan, calculation methods, basic technological parameters of automated control systems.		
	Ecology and environmental protection of pharmaceutical enterprises	This course includes the study of the essence of ecology and the basics of nature protection, 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 suggest 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 habitat.	5	**КК3, КК4**
	CAD Chemical Engineering II	Summary of the course: Basic concepts of the modeling method, computer modeling of chemical and technological processes using the AspenHysys modeling software package. Methods of building a technological scheme. Characteristics of the technological scheme and flows, calculation of parameters of all flows and equipment, Optimization of the heat exchange process in heat exchangers. Calculation of material and thermal balances in the development of technology and design of production, analysis of parametric sensitivity, total mass and thermal balance, optimization of the process.	5	**КК3, КК5**
	Basic processes and devices of chemical technology II	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. Summary: The essence and theoretical foundations of the main processes of chemical technology. Mass transfer processes, calculation and selection of devices and structures. Comparative analysis of the operation of devices, finding optimal conditions for technological processes. Methods of calculation of the main processes and devices. Approach to graphic design of design objects. Familiarity with the current regulatory and technological documentation, reference literature, The course project is the final stage in the study of the discipline.	4	**КК2, КК5, КК6**
Cycle of profile disciplines University component				
	Pharmaceutical Chemistry	The discipline is aimed at systematization of scientific knowledge about the methods of obtaining medicinal substances, the relationship of their chemical structure with pharmacological activity, methods of quality control of pharmaceutical substances and medicines. Examines the issues of biotransformation of medicinal substances in the body and biochemical aspects of pharmanalysis, pharmacynthesis, technology of dosage forms for the creation of medicines.	5	**КК2, КК6**
	Fundamentals of enterprise design	The main provisions of the organization of design work for the construction of new enterprises of	5	**КК5**

		reconstruction or technical re-equipment of existing enterprises of food industries are considered. This course is designed to familiarize you with the basic concepts of chemical engineering. The study of this discipline will allow the student to correctly apply the rules of development on the design of technological schemes, drawings of plans and sections of industrial enterprises of the food industry.		
	Chemistry and technology of synthetic and natural medicinal substances	The discipline deals with general issues of industrial production, basic concepts and theoretical foundations of the discipline, state regulation of the production of medicines and quality control, modern requirements for the production of medicines, technology of medicines, including the main provisions and requirements of good practices, problems, achievements.	4	**КК3, КК4, КК6**
	Industrial Medicine technology	The discipline is a core discipline among specialized pharmaceutical disciplines. She studies the processes and devices of pharmaceutical technology, the theoretical foundations and methods of drug production, as well as the prospects for the creation and production of new dosage forms.	6	**КК3, КК6**
Cycle of profile disciplines Component of choice				
	Biotechnology of medicines	Studies the prospects for the development of biotechnology. Nutrient media. Methods of sterilization of nutrient media. Fermenters. Criteria for the selection of fermenters. Isolation, concentration and purification of biotechnological medicines. Medications as a source of toxic effects on the body. The contribution of biotechnology to solving common environmental problems. The ability to develop industrial regulations and possess the skills to produce biotechnological medicines.	5	**КК4**
	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 medicines, antibiotics, essential amino acids, phenolic compounds, alkaloids, vitamins, enzymes, insulin, interferon and vaccines. Special attention will also be paid to the study of methods of cultivation of medicinal plants in liquid and solid nutrient medium for obtaining valuable biologically active substances and medicines, methods and methodologies related to the isolation, purification and identification of obtained biotechnological preparations based on biotechnological processes in culture in vitro are considered.	5	**КК4, КК6**
	General pharmacology	The purpose of the discipline is to form students' understanding of the general laws of the action of drugs to ensure a rational choice of drugs for various diseases. Teaches the general principles of prescribing and composing prescription prescriptions, introduces the general principles of choosing dosage forms and methods of drug use, identifies groups of medicines based on ideas about their properties.	5	**КК4, КК6**
	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	5	**КК4, КК6**

		diagnostics. The course is aimed at forming students' general ideas about the structure and functioning of microbes as living systems, their role in ecology and decontamination methods, including the basics of disinfection and sterilization techniques		
	Economic aspects of pharmaceutical production technology	The discipline includes the training of a qualified employee with a system of economic aspects, universal, professional and professionally specialized competencies, capable and ready for independent professional activity in the field of circulation of medicines.Formation of creative and scientific thinking, combining fundamental knowledge of the basic laws and methods of 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	**КК2, КК6**
	Principles of chemical engineering	The formation of highly qualified specialists with general scientific and professional training, capable of independent creative work, to introduce the latest and progressive results into the production process and having an integral system of knowledge, the student should learn: skills and practical skills. the student should know: physico-chemical fundamentals of chemical technology processes; methods of calculating devices; correctly evaluate the results of laboratory research and implement them in production conditions	6	**КК3, КК6**
	Physico-chemical methods of analysis	General characteristics of physico-chemical methods of analysis. Advantages and disadvantages of physico-chemical methods of analysis. The main techniques used in the identification of new materials. The use of the most important physico-chemical methods in the technology of obtaining chemical products and new materials: spectral and other optical; chromatographic; electrochemical, etc. Mass spectrometric methods. Electronic paramagnetic resonance (EPR) method. Nuclear magnetic resonance (NMR) method. Radiometric methods.	5	**КК3, КК4**
	Biopharmaceutical analysis of finished medicines	Studies biopharmaceutical analysis as a scientific direction of drug technology. The influence of pharmaceutical factors on the therapeutic effectiveness of drugs. Bioavailability of drugs in the "invitro" and "invivo" experiments. Biopharmaceutical analysis of finished medicines. Be able to analyze the production processes of biopharmaceutical drugs and possess the skills of analyzing biopharmaceutical drugs.	5	**КК4**
	Quality control of the production of medicines and medical products	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 analysis methods are used for this purpose. In other words, standardization of methods for assessing the quality of medicines is necessary. Exact observance of the same conditions in the implementation of quality control of medicines is achieved by standardization of methods for preparing solutions of reagents used in the analysis, a sufficient degree of purity of solvents, compliance with the temperature regime, the required pH values and other conditions. Standardization of devices used in pharmaceutical analysis is very	5	**КК4, КК6**

		important, strict observance of identical conditions during changes and calculations of physical and physico–chemical constants		
	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 resolutions, orders in the field of public health protection and activities in the field of circulation of medicines.	5	**КК4, КК6**
	Production of medical devices	Materials for the manufacture of medical products, determination of the influence 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	**КК3, КК4**
	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 on compliance with the rules of sanitary regime, labor protection and SP	5	**КК3, КК6**
	Nomenclature of medicines	The ATS classification system (anatomicaltherapeuticchemicalcassificationsystem), along with specially developed units of drug consumption - established daily doses (DDD - DefinedDailyDoses), has been adopted by WHO as the basis of an international methodology for conducting statistical research in the field of drug consumption. Currently, the PBX/DDD system is widely used by both government agencies and pharmaceutical companies in many countries of the world	5	**КК4**
	Fundamentals of design and equipment of organic synthesis enterprises	Study of the composition of the project (working draft), design and estimate documentation, the grounds for its development, the organizational foundations of the 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.	5	**КК3, КК6**

5. Curriculum of educational program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

-APPROVED
Chairman of the Management Board-
Rector of KazNRTU named after K.I.Satpayev
M.M. Begentaev
04 2022 y.

CURRICULUM
of Educational Program on enrollment for 2022-2023 academic year

Educational program 6B07215 - "Pharmaceutical production technology"
Group of educational programs B072 — «Pharmaceutical production technology»

Form of study: full-time | Duration of study: 4 years | Academic degree: Bachelor of Technique and Technology

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters							
								I course		II course		III course		IV course	
								1 semester	2 semester	3 semester	4 semester	5semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-1. Module of language training															
LNG 108	English language	GED, RC	10	300	0/0/6	210	E	5	5						
LNG 104	Kazakh (Russian) language	GED, RC	10	300	0/0/6	210	E	5	5						
M-2. Module of physical training															
KFK 101-104	Physical Culture	GED, RC	8	240	0/0/8	120	Difcredit	2	2	2	2				
M-3. Module of information technology															
CSE 677	Information and communication technologies (in English)	GED, RC	5	150	2/1/0	105	E			5					
M-4. Module of socio-cultural development															
HUM 100	Modern History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE	5							
HUM 132	Philosophy	GED, RC	5	150	1/0/2	105	E			5					
HUM 120	Socio-political knowledge module (sociology, politology)	GED, RC	3	90	1/0/1	60	E			3					
HUM 134	Socio-political knowledge module (culturology, psychology)		5	150	2/0/1	150	E				5				
M-5. Module of anti-corruption culture, ecology and life safety base															
HUM 133	Fundamentals of anti-corruption culture	GED, CCH	5	150	2/0/1	150	E				5				
MNG 488	Fundamentals of Entrepreneurship and Leadership														
CHE 656	Ecology and life safety														
CYCLE OF BASIC DISCIPLINES (BD)															
M-6. Module of physical and mathematical training															
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	E	5							
PHY 468	Physics	BD, UC	5	150	1/1/1	105	E	5							
MAT 102	Mathematics II	BD, UC	5	150	1/0/2	105	E		5						
M-7. Module of basic general technical training															
GEN 429	Engineering and computer graphics	BD, UC	5	150	1/0/2	105	E		5						
CHE692	Introduction to speciality	BD, UC	4	120	2/0/1	75	E	4							
CHE494	Chemistry	BD, UC	5	150	1/1/1	105	E		5						
CHE665	Organic Chemistry I	BD, UC	6	180	2/1/1	120	E			6					
CHE639	Organic Chemistry II	BD, UC	5	150	1/1/1	105	E				5				
CBI108	Analytical Chemistry	BD, UC	5	150	1/1/1	105	E			5					
CHE921	Pharmaceutical chemistry	BD, UC	5	150	2/0/1	105	E			5					
CHE869	Physical and colloidal chemistry	BD, UC	5	150	2/0/1	105	E				5				
CHE499	Biochemistry	BD, UC	5	150	2/1/0	105	E					5			
GEN411	Theoretical and applied mechanics	BD, UC	5	150	2/1/0	105	E				5				
CHE695	CAD Chemical engineering I	BD, UC	5	150	0/1/2	105	E					5			
CHE816	Main processes and apparatus of chemical engineering I	BD, UC	5	150	2/0/1	105	E					5			
3201	Elective	BD,COC	5	150	2/0/1	105	E					5			
CHE570	General chemical technology	BD, UC	5	150	2/1/0	105	E					5			
ELC570	Fundamentals of electrical engineering and electroni	BD, UC	5	150	1/2/0	105	E					5			
CHE699	CAD Chemical engineering II	BD, UC	5	150	0/1/2	105	E						5		
CHE817	Main processes and apparatus of chemical engineering II	BD, UC	4	120	2/0/1	75	E						4		
3202	Elective	BD,COC	5	150	2/0/1	105	E						5		
4201	Elective	BD,COC	6	180	2/1/1	120	E							6	
CIV784	Educational practice	BD, UC	2						2						
CYCLE OF PROFILE DISCIPLINES (PD)															
M-8. Module of professional chemical and technological activity															
CHE927	Fundamentals of pharmacognosy	PD, UC	4	120	2/0/1	75	E						4		
CHE928	Basics of designing and equipping pharmaceutical industries	PD, UC	5	150	2/0/1	105	E						5		
CHE929	Chemistry and technology of synthetic and natural medicinal substances	PD, UC	4	120	2/0/1	75	E						4		
CHE930	Industrial drug technology	PD, UC	6	180	2/0/2	120	E							6	
4301	Elective	PD,COC	5	150	2/0/1	105	E							5	
4302	Elective	PD,COC	5	150	2/0/1 1/1/1	105	E							5	
4303	Elective	PD,COC	6	180	2/0/2	120	E							6	
4304	Elective	PD,COC	5	150	2/0/1	105	E							5	

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV

SATBAYEV UNIVERSITY

APPROVED
Director of the Institute GAOGB
_____ A. Syzdykov
«__» _____ 2022y.

MAJOR ELECTIVE DISCIPLINES educational program for the 2022-2023 academic year admission
Educational program 6B07215 – "Pharmaceutical production technology"
Group of Educational programs B072-"Pharmaceutical production technology"

Full-time study Study duration : 4 years Academic degree: bachelor of natural sciences

Year of study	Code of elective	Code of discipline	Name of discipline	Semestr	Cycle	Credits	Total hours	lec/lab/pr	SIW (including SIWT) in	Prerequisites
M-7. Module of basic general technical training										
3	2201	CHE922	Technology of dosage forms	5	B	5	150	2/0/1	105	
		CHE923	Technology of extraction preparations					2/0/1		
4	3201	CHE924	Occupational safety in the pharmaceutical industry	6	B	5	150	2/0/1	105	
		CH925	Industrial sanitation and occupational health of pharmaceutical production					2/0/1		
	4201	AUT434	Automation of control systems in chemical engineering processes	7	B	6	180	2/1/1	120	
		CHE926	Ecology and environmental protection of pharmaceutical enterprises					2/1/1		
M-8. Module of professional chemical and technological activity										
4	4301	CHE931	Biotechnology of drugs	7	S	5	150	2/0/1	105	
		CHE940	Pharmaceutical biotechnology					2/0/1		
	4302	CHE932	General pharmacology	7	S	5	150	2/0/1	105	
		BIO442	Microbiology and virology					1/1/1		
	4303	CHE933	Economic aspects of pharmaceutical production technology	7	S	6	180	2/0/2	120	
		CHE829	Principles of chemical engineering					2/0/2		
	4304	CHE893	Physical and chemical methods of the analysis	7	S	5	150	2/0/1	105	
		CHE934	Biopharmaceutical Analysis of Finished Medicines					2/0/1		
	4305	CHE935	Quality control of the production of medicines and medical devices	8	S	5	150	2/0/1	105	
		CHE936	State regulation of medicines					2/0/1		
	4306	CHE937	Manufacturing of medical devices	8	S	5	150	2/0/1	105	
		CHE938	Automatic machines for filling and packaging dosage forms					2/0/1		
	4307	CHE939	Nomenclature of medicines	8	S	5	150	2/0/1	105	
		CHE485	Basics of designing and equipment of enterprises of organic synthesis					2/0/1		

Credits numbers of elective disciplines over the entire period of study	
Cycle of disciplines	Credits
Cycle of basic disciplines (B)	16
Cycle of special disciplines (S)	36
Overall:	52

Head of the Department of Chemical and Biochemical Engineering Amitova A.A.

Representative of Specialty council Anapiyaev B.B.

4305	Elective	PD,COC	5	150	2/0/1	105	E									5
4306	Elective	PD,COC	5	150	2/0/1	105										5
4307	Elective	PD,COC	5	150	2/0/1	105	E									5
CIV785	Production practice I	PD, UC	2									2				
CIV786	Production practice II	PD, UC	3											3		
M-9. Module of final attestation																
ECA003	Preparation and writing of a thesis (project)	FA	6													6
ECA103	Defense of the thesis (project)	FA	6													6
M-10. Module of additional types of training																
AAP500	Military affairs	ATT	0													
	Total based on UNIVERSITY:							31	29	31	29	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		5	56
BD	Cycle of basic disciplines		96	16	112
PD	Cycle of profile disciplines		24	36	60
	Total for theoretical training:	*51*	*120*	*57*	*228*
FA	final attestation	12			12
	TOTAL:	63	120	57	240

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 13 от "28" 04 2022 г.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 7 от "26" 04 2022.

Decision of the Academic Council of the Institute_____. Protocol № 4 от "30" 12 2021 г.

Vice-Rector for Academic Affairs — Zhautikov B.A.

Director of IGaOGB — Syzdykov A.H.

Head of the Department of Chemical and Biochemical — Amitova A.A.

Specialty Council representative from employers — Anapiyaev B.B.

6. Additional educational programs (Minor)

Name of additional educational programs (Minor) with disciplines	Total number of credits	Recommended semesters of study	Documents on the results of the development of additional educational programs (Minor)