



«APPROVE»
Rector of SKMA,
M. Rysbekov

2023 year



EDUCATIONAL PROGRAM

CodeEP: 6B07201
Name of the educational program: Pharmaceutical production technology
Level of educational program: Bachelor course

Shymkent 2023

ONTÜSTIK-QAZAQSTAN
MEDISINA
AKADEMIASY



SOUTH KAZAKHSTAN
MEDICAL
ACADEMY
АО «Южно-Казахстанская медицинская академия»

«Оңтүстік Қазақстан медицина академиясы» АҚ

Educational program

044-09-2023

Developed by the educational programm Committee "Pharmaceutical production technology":

Department of PhTP
Protocol № 9, 17.05 2023 y.

Torlanova B.O.

Agreed with employers:

Director Of the organization of legal entities
"Association of pharmaceutical and medical companies
organizations of South Kazakhstan region "Damu"

Alzhanova Kh. D.

General manager
LLC "PHYTO-APIPHARM"

Korotkov A.V.

Head of the Production Department
Zerde - Phyto LLP

Zhumataev M. Zh.

Approved by the methodological Council of JSC " SKMA»
Vice-rector for EMW

Anartayeva M.U.

Protocol № 12, 26/06 2023 y.

Approved by the Academic Council of JSC " SKMA»
Protocol № 12, 24/06 2023 y.

ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ		SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казakhstanская медицинская академия»
Educational program		044-09-2023

Passport of the educational program 6B07201 - "Technology of pharmaceutical production"

1. Normative documents for the development of a modular educational program (state educational standards, professional standards (if available), etc.)

- "On the approval of the state mandatory standards of higher and postgraduate education" Order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 2.
- professional standard "Production of other basic organic chemicals" (Annex 3 to the order of the Deputy Chairman of the National chamber of entrepreneurs of the Republic of Kazakhstan "Atameken" No. 255 dated 18.12.2019).

2. Purpose of the educational program: Training of specialists for industrial production of medicines and medical products in accordance with GMP requirements in the Republic of Kazakhstan

3. Objects of professional activity:

- chemical and pharmaceutical companies,
- enterprises that produce medical products and medical devices,
- biotechnological production,
- perfume and cosmetics production,
- technical control departments,
- Central factory laboratories,
- laboratories for standardization and quality control of medicines,
- management bodies for standardization, certification and licensing,
- research institutes,
- development and design bureaus,
- departments of chemical and special profile.



General information

№	Name of the field	General tate
1	Registration number	6B07200032
2	Code and classification of area of education	6B07 Engineering Manufacturing and Civil engineering
3	Code and classification of directions of preparation	6B072 Manufacturing and processing
4	Group of the educational programs	B072 "Technology of pharmaceutical production"
5	Name of the educational program	"Technology of pharmaceutical production"
6	Type of the educational program	Operating educational program
7	Aim of the educational program	Preparation of specialists for the industrial production of medicinal facilities and medical products in accordance with the requirements of GMP in Republic of Kazakhstan
8	Level on International standard classification of education	0720
9	Level on the National scope of qualifications	6
10	Level on the branch scope of qualifications	6
11	Distinctive features of the educational program	
	Institution-partner (Joint educational program)	No
	Institution-partner (Two diploma educational program)	No
12	List of competenses	Matrix of correlation of learning outcomes for the educational program in general with the formed competencies in educational program 6B07201 - "Technology of pharmaceutical production" (Appendix 2.1)
13	Results of educating	
14	Form of educating	Internal form of educating
15	Language of educating	State and Russian

ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA АКАДЕМИАСЫ «Оңтүстік Қазақстан медицина академиясы» АҚ	 SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия»
Educational program	044-09-2023

16	Common amount of credits	240credits
17	Awardedacademicdegree	A bachelor of technique and technology on the educational program 6B07201 - "Technology of pharmaceutical production"
18	Presence of Appendix to the license to direction of preparation of specialists	Appendix №19 from 04.04.2019 year 6B072 "Productive and processing industries" to License "Educational activity" № of KZ36LAA00011387 given out from 28.03.2018 year
19	Presence of accreditation of the educational program	2022 year
	Nameofaccreditationorgan	IQAA
	Term of action of accreditation	10.06.2022 y. – 09.06.2027 y.
20	Information about disciplines	Information about disciplines IC/CCh CGD, BD, PD (<i>Appendix 2.2</i>)

Appendix 1

Matrix of correlation of learning outcomes for the educational program in general with the formed competencies in educational program 6B07201 - "Technology of pharmaceutical production"

	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11
CC 1	+						+	+	+		+
CC 2		+	+		+			+	+	+	+
CC 3			+	+	+	+		+	+	+	
CC 4			+		+	+		+		+	+
CC 5	+	+		+			+		+		+
CC 6	+	+	+				+			+	+
CC 7	+	+	+		+	+	+	+	+		+
CC 8		+	+	+	+		+	+		+	

ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ	 SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия»
Educational program	044-09-2023

Formed core competencies

Conditional designations	Learning outcomes (LO)
LO1	Demonstrates knowledge of external and internal regulatory and technical documents and acts in the conditions of technological production and in the process of updating them.
LO2	Collects processing and scientifically-based analysis of information, gives a critical assessment and demonstrates the ability to conduct research / experimental work on the introduction of new technologies, new equipment into production, to expand the range of products.
LO 3	Demonstrates the ability to focus on improving the efficiency of work results based on the analysis of technical and economic indicators of production.
LO 4	Determines the risks and causes of inconsistencies in production, offers in critical situations extraordinary solutions based on the use of production information in terms of choice and variety of methods, takes responsibility for them.
LO5	It ensures the organization and safety of technological processes, the maintenance of technological equipment and the monitoring of the working status of automation equipment and instrumentation, monitors compliance with the documentation requirements in a technological process.
LO 6	Applies the laws of chemical-technological / pharmaceutical processes at a professional level to organize the technological process of production of specific pharmaceutical and medical products.
LO 7	Implements the organization and management of human resources for the implementation of the technological process and solving production problems in accordance with the production strategy.
LO 8	Develops scientifically based projects and business plans for the improvement of technological processes and, arguably (in writing and verbally, reports, presentations, articles) advocates the introduction of innovative technologies into production.
LO9	Has skills for independent continuous professional self-education and effective communication in interactions with different specialists at different levels to solve production problems.
LO10	Carries out the development of internal regulatory and technical documentation on indicators of the quality of raw materials, semi-products, finished products, maintenance of process equipment, automation equipment and instrumentation and ensures their timely updating.
LO11	Demonstrates knowledge and understanding of the issues of the pharmaceutical industry in the relationship and interdependence with other social areas and legal requirements and understanding of current trends and prospects for the development of the pharmaceutical industry.

ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ	 SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия»
Educational program	044-09-2023

Appendix 2.2

**Information on the Courses of the Educational Program
6B07201 – "Pharmaceutical Production Technology"**

№	Name of discipline	Short description of discipline (30-50 words)	Cycle (GED, BD, SD)	Component (Mandatory Component, University Component, Selection Component)	Number of credits	Generate d learning outcomes (codes)
1	2	3		5	6	7
		Cycle of general disciplines – CGD Institution of higher learning component /co mponent on a choice				
1	History of Kazakhstan	Kazakhstan on the way to Independence: the stages of the formation of the idea of a national state. Civil and political confrontation.. Kazakhstan model of economic development. Attracting foreign investment for the development of the economy of Kazakhstan, including the pharmaceutical industry (state programs, decrees, decrees). Spiritual modernization of societyN. Nazarbayev is a person in history.	GED	MC	5	LO 1 LO 7 LO 11
2	Kazakh (Russian) language	Communicative task of scientific texts about pharmacy. Registration and analysis of business papers. The language of the specialty and professional culture of speech of the employee of pharmaceutical production. Rules for use of reference material in the specialty. Fundamentals of scientific and business rhetoric. Business contacts and negotiations in the field of pharmaceutical production. Ethics and etiquette of professional speech of pharmaceutical production engineer.	GED	MC	10	LO 1 LO 7 LO 11

3	Foreign language	Phonetic standards and grammatical forms and structure of modern English. Development of the educational and professional speech of the technologist of pharmaceutical production: development of skills of reading, hearing, making an abstract of medical literature; drawing up written texts on educational and professional subjects; creation of functional and semantic types of statements in the technology of pharmaceutical production industry.	GED	MC	10	LO 1 LO 7 LO 11
4	Information and communication technology	An ICT role in key sectors of development of society. Standards in the field of ICT. Introduction to computer systems. Architecture of computer systems. Software. Operating systems. Human-computer interaction. Internet technology. Cloud and mobile technology. Multimedia technology.	GED	MC	5	LO 1 LO 7 LO 11
5	Psychology and Cultural Studies	Personality psychology and its role in the system of human sciences. Emotions and volitional processes. Values, interests, norms as the spiritual basis of personality. Business contacts. Professional ethics. Communication Kazakh culture in the context of modern world processes. Cultural policy of Kazakhstan. Implementation of the state program "Digital Kazakhstan" in the field of pharmaceutical industry.	GED	MC	4	LO 1 LO 7 LO 11
6	Philosophy	Philosophy as a science that studies the forms of knowledge of the world, developing a system of knowledge about the fundamental principles and foundations of human existence. A critical approach to the past is a prerequisite for changing the spiritual modernization and national identity of modern Kazakhstan. The place of philosophy in the 3 rd modernization of modern Kazakhstan. The integration of science, education and practice which determines the quality of health care in the Republic of Kazakhstan.	GED	MC	5	LO 1 LO 7 LO 11
7	Sociology and Political Science	Sociology as science of society. Sociology in the understanding of the social world institutions. Sociological theories. Sociological approach to the study of health, medicine and pharmacy. Economic and social aspects of health care. Political science in the system of professional specialists training. The main stages of the formation and development of political science. Politics in the system of public life. World politics and international relations today.	GED	MC	4	LO 1 LO 7 LO 11

		Political development and modernization.				
8	Physical education	Determination of the social role and values of physical culture in professional and personal formation of the future specialist Methodical approaches to the preparation of complexes of physical exercises in accordance with the individual characteristics of physical fitness and health. The use of physical culture for recreational purposes, as well as for the development and improvement of physical qualities and motor abilities. Promotion of a healthy lifestyle and mastering the skills of health saving.	GED	MC	8	LO 1 LO 11
9	Ecology and life safety	The place and role of ecology in solving modern economic and political problems. Nature protection and environmental problems of our time. Problems of eco-development. The concept of sustainable development. Organizational basics of life support. Tasks and organization of the emergency medicine service. Organization of sanitary-hygienic and anti-epidemic measures. Organization and planning of medical supplies. Psychological aspects of emergencies.	GED	EC	5	LO 2 LO 9 LO 11
10	Fundamentals of business and principles of anticorruption cultur	Purpose: Formation of anti-corruption culture and entrepreneurship skills of the future specialist. Content: The essence and theoretical and methodological foundations of the concept of "corruption". Improvement of socio-economic relations of the Kazakh society as a condition for combating corruption. Anti-corruption policy in the Republic of Kazakhstan. Legal, moral and ethical responsibility for corruption in the field of healthcare. The choice of a business idea and a startup, business planning in the system of entrepreneurial activity, the content of the business plan, the skills of their development, start-up in marketing activities.	GED	EC	5	LO 2 LO 9 LO 11
11	Legal bases of life safety	Purpose: Formation of basic ideas about law and state-legal relations in future professional activity. Content: The concept of life safety. Organizational bases of life support. Classification of dangerous and harmful factors. Fundamentals of the organization and conduct of emergency rescue operations. Radiation and chemical hazards. World and historical experience of legislation in the field of life safety. Regulatory and technical base of	GED	EC	5	LO 2 LO 9 LO 11

		labor safety (labor protection).				
12	Mathematics - part 1	Purpose: Formation of skills of using mathematical concepts in solving professional tasks in the workplace. Contents: Application of systems of linear algebraic equations to reflect chemical and physical processes during the preparation of LF. Application of analytical geometry in the design of pharmaceutical industries. Properties of an indefinite integral. Methods of integration of indefinite integrals, rational functions, trigonometric functions.	BD	UC	5	LO2 LO 9 LO 11
13	Mathematics - part 2	Purpose: Formation of skills in the application of mathematical modeling methods in solving production problems and for engineering and economic calculations. Contents: Differential equation of the first order. Differential linear equations of the second order. Inhomogeneous second-order differential equations with constant coefficients. Probability theory and mathematical statistics in solving production problems. Statistical distribution of the sample. Mathematical modeling.	BD	UC	5	LO 2 LO 9 LO 11
14	Processes and apparatuses of chemical-pharmaceutical production-1	Purpose: Formation of skills in applying the basic laws of mechanical, hydromechanical and hydrodynamic processes when choosing equipment in pharmaceutical production. Contents: Classification and design features of machines and apparatuses for mechanical, hydromechanical and hydrodynamic processes in pharmaceutical production, types of calculations, compilation of material and energy balances, determination of the main dimensions of the devices used.	BD	UC	6	LO 1 LO 2 LO 3 LO4 LO 5 LO 6 LO 8 LO 9 LO 10 LO 11
15	Processes and apparatuses of chemical-pharmaceutical production-2	Purpose: Formation of skills in the application of the basic laws of heat exchange, mass transfer, chemical and biochemical processes when choosing equipment in pharmaceutical production. Contents: Study of heat exchange during changes in the aggregate state of substances, compilation of material and energy balances. Classification and design features of heat exchange (evaporating, drying, condensing, etc.) apparatuses. Classification and design	BD	UC	5	LO 1 LO 2 LO 3 LO4 LO 5 LO 6

		features of mass transfer (adsorption, sorption, extraction, crystallization, etc.) apparatuses, fundamentals of kinetic and constructive calculation of apparatuses, determination of their overall dimensions.				LO 8 LO 9 LO 10 LO 11
16	Educational practice	Familiarization with the General structure of the pharmaceutical enterprise, with the functions of structural units (main and auxiliary shops, OCC, CPL, etc.) and their technical equipment, with the device and the principle of operation of machines and machines for packing and packaging of finished dosage forms and semi-finished products, as well as the rules of their operation, with reference and scientific literature for the analysis and calculation of the main technological equipment, with the rules of safety and industrial sanitation.	BD	UC	1	LO 1 LO 2 LO 7 LO 8 LO 11
17	General chemical technology	Purpose: Formation of skills for the preparation of chemical raw materials and equipment, conducting chemical processes for the production of medicinal substances. Contents: General laws of chemical processes. Economic characteristics of the chemical-technological process (CTP). The speed, the equilibrium of the CTP. Industrial catalysis. Preparation of chemical raw materials for processing. The main processes of chemical technology and equipment for them. Classification of chemical reactors. Pharmaceutical technology equipment. Chemical production as a system. CTP features.	BD	UC	5	LO 1 LO 2 LO 4 LO 5 LO 6 LO 9 LO 11
18	Technology of extraction preparations	Purpose: Formation of skills in the preparation of extraction preparations from plant, animal and microbiological raw materials using methods of primary and deep purification based on the use of modern technological equipment. Contents: General concept of galenic preparations. Theoretical foundations of extraction. Molecular diffusion. Convective diffusion. Features of extraction of dried and fresh raw materials. General technology of production of tinctures, extracts, novogalene preparations, preparations of individual substances. Features of primary and deep cleaning of the hood	BD	UC	5	LO 1 LO 2 LO 4 LO 5 LO 6 LO 8 LO 9 LO 10 LO 11

19	Hemistry of natural medicinal compounds	Purpose: Formation of knowledge about the laws of chemistry of natural compounds contained in medicinal plants. Contents: Classification of biologically active substances, distribution and accumulation of biologically active substances in plants. Methods of determining the structure, extraction of medicinal substances from plant sources, separation, purification and identification of biological active substances.	BD	UC	5	LO 1 LO 2 LO 4 LO 5 LO6 LO 9 LO10 LO 11
20	Electrical engineering and basic of industrial electronics	Purpose: Formation of skills for solving problems of industrial electronics in the improvement of technological electrical equipment. Contents: Electrical equipment. Technical characteristics of the main electric motors (asynchronous and synchronous) used in technological complexes, the basic principles of their operation and features when combining innovative and modern technologies. Electronic and digital technologies and devices, their features and principle.	BD	UC	5	LO 1 LO 2 LO 4 LO 5 LO6 LO 9 LO 11
21	Energy resources, the sources and methods of getting	Purpose: Formation of skills in finding energy sources and calculating their capacity to provide electric and thermal energy for pharmaceutical and other industries. Content: Obtaining electrical energy from alternative and traditional sources, its generation, conversion, transmission and consumption. The role of alternative energy sources in providing pharmaceutical industries; search and use of secondary energy resources as an element of waste-free production, methods and means of obtaining secondary energy resources.	BD	UC	5	LO 1 LO 2 LO 3 LO 8 LO 9 LO 11
22	Analytical Chemistry	Purpose: Formation of skills in the application of basic physical and chemical methods of analysis in the production of medicinal products. Contents: The essence of gravimetric analysis. Classification of separation, deposition and distillation methods. The use of titrimetric analysis to determine the composition of medicinal substances used in pharmaceutical technology. Theoretical foundations and classification of electrochemical, optical and chromatographic methods of analysis. The applied value of the	BD	EC	4	LO 2 LO 4 LO 5 LO 9 LO 10 LO 11

		general theoretical foundations of analytical chemistry				
23	Computing equipment on engineering and economic calculations	Purpose: Formation of skills for solving economic problems using enterprise inventory management models. Content: Studying the architecture of a personal computer using the AIDA64 program. Process management. Allocation of investments for the effective use of the enterprise's potential. Minimization of costs for the construction and operation of enterprises. Determination of the efficiency of the use of labor resources in queuing systems.	BD	EC	4	LO 1 LO 2 LO 3 LO 6 LO 8 LO 9 LO11
24	Computer - engineering graphics and design	Purpose: Formation of skills in the use of computer graphics in the design and preparation of drawings of technological and hardware production schemes, workshop plan and equipment layout, master plan of a pharmaceutical enterprise, etc. Content: Elements of computer graphics and their applications. The concept of CAD (computer-aided design) system. The startup dialog box of the AutoCAD system. Methods of constructing a three-dimensional model. 3D visualization. Commands for editing three-dimensional objects. Clipping a part of a three-dimensional model. Geometric drawing. Conjugations. The slope. Projection drawing.	BD	EC	5	LO 1 LO 2 LO 6 LO 8 LO9 LO 11
25	Production practice	The study of the structure and prospects of the company's development (base of practice), the range of products and familiarization with activities aimed at expanding production. Mastering general and special requirements on occupational health, safety and industrial sanitation. The study of the device and the principle of operation of the main devices and machines in the course of technological processes in the production of GLP.	BD	EC	5	LO 1 LO 2 LO 3 LO 5 LO 6 LO 7 LO 8 LO 11
26	Latin language	Purpose: Formation of skills in the use of vocabulary for the preparation of layouts, labels, packaging products for medicinal and medical products. Contents: The role of Latin in the formation of pharmaceutical terminology.. The use of the genitive case (Genetivus) to denote plant, animal raw	BD	EC	3	LO 2 LO 9 LO 11

		materials. Names of dosage forms. Verbs functioning in the terminology of pharmaceutical production.				
27	Methods and equipment for pharmaceutical analysis	Purpose: Formation of skills in the use of physico-chemical (instrumental) methods for pharmaceutical analysis of medicines. Contents: Principles and conditions of work on equipment (devices), sample preparation for analysis, interpretation of the results of instrumental analysis. Refractometry, polarimetry, methods based on the absorption of electromagnetic radiation: in UV spectrum, in the visible spectrum (photoelectrocolorimetry (FEC), in IR spectrum. Chromatographic methods.	BD	EC	4	LO 1 LO 2 LO 4 LO 6 LO 9 LO 10 LO 11
28	Descriptive geometry	Purpose: Formation of skills for performing drawing works of machine parts and mechanisms in general and in the context for understanding their application. Content: Projection methods. Deployable ruled surfaces and non-deployable surfaces. Projection drawing. Types of state standard (ГОСТ 2.305-68). Ruled surfaces. Surface determinants. Types of curves (flat, spatial). The intersection of a polyhedral surface with a straight line, a plane and with each other. Additional views. Local species. Axonometric surfaces. Incisions. Simple cuts. Cross sections.	BD	EC	4	LO 2 LO 9 LO 11
29	Inorganic and physical chemistry	Purpose: Formation of skills in the application of the basic laws and regularities of inorganic and physical chemistry in the production of pharmaceutical products. Contents: Regularities of the theory of solutions. The main provisions of the theory of electrolytic dissociation. The mechanism of hydrolysis reactions in electrolyte solutions. Ways to prevent hydrolysis in solutions of medicinal substances. Redox reactions in various drugs, ways to prevent them. The use of stabilizers-antioxidants.	BD	EC	4	LO 2 LO 4 LO 5 LO 6 LO 9 LO 11
30	Organic chemistry	Purpose: To master important classes of organic compounds that form the basis for the formation of chemical thinking and the development of	BD	EC	3	LO 2 LO 4

		orientation in the problem of "Structure-properties". Content: The significance of classes of organic compounds in pharmaceutical production. Application of the properties of organic substances to ensure the safety of certain medicines.				LO 5 LO 6 LO 9 LO 11
31	Fundamentals of pharmaceutical technology	Purpose: Formation of skills in the preparation of prescription drugs in a pharmacy. Contents: Technology of solid dosage forms (powders), liquid dosage forms (solutions for external and internal use, solutions of high molecular weight compounds and colloidal solutions, suspensions, emulsions, drops, infusions and decoctions), soft dosage forms (ointments, suppositories, liniments), sterile dosage forms (solutions for injection, eye ointments and drops, with antibiotics, children's dosage forms) in the conditions of the pharmacy's production department.	BD	EC	5	LO 1 LO 2 LO 5 LO 6 LO 9 LO 10 LO 11
32	Theoretical mechanics and materials resistance	Purpose: Formation of skills for carrying out basic calculations of parameters for the selection of structural material and calculation of elements for strength. Contents: Fundamentals of statics, kinematics, dynamics. General principles of calculation of structural elements; types of stress states, strength hypotheses, joint action of torsion and bending. Concepts of fatigue strength, dynamic loads and endurance limit; stability under axial compression of the rod.	BD	EC	6	LO 1 LO 2 LO 4 LO 6 LO 9
33	Technology of medical and cosmetic and veterinary products	Purpose: Formation of skills in the preparation of medical, cosmetic and veterinary products, taking into account the requirements of the GMP standard. Contents: Actual problems of the creation of medical and cosmetic products State rationing of the production of medical and cosmetic products, their classification and features of their industrial technology. Actual problems of veterinary drugs technology. State regulation of the production of veterinary drugs, the requirements of the GMP standard for them	BD	EC	5	LO 1 LO 2 LO 5 LO 6 LO 9 LO 10 LO 11

		(Appendices No. 4 and No. 5). Classification of veterinary drugs and features of drugs industrial technology for animals and birds.				
34	Pharmaceutical biotechnology the basics of Microbiology	Purpose: Formation of skills for obtaining medicines for the diagnosis, treatment and prevention of diseases based on microorganisms and culture of tissues and cells of medicinal plants. Contents: Objects of medical biotechnology. General characteristics of the biotechnological process. The use of cell culture in biotechnological production. GMP system of production and quality control of medicinal products of biotechnological production. Recombinant DNA technology or genetic engineering in medical biotechnology. Biotechnology of steroid hormones, antibiotics, vitamins, amino acids.	BD	EC	4	LO 1 LO 2 LO 4 LO 5 LO 6 LO 8 LO 9 LO 10 LO 11
35	Physics	Purpose: Formation of skills in the application of optical, acoustic, mechanical, electrical phenomena and processes in pharmaceutical production. Contents: Kinematics and dynamics of translational and rotational motion, work and energy, conservation laws, vibrations and waves, sound and ultrasound, hydrodynamics, molecular kinetic theory, transport phenomena, direct and alternating electric current. Optical processes. Acoustic processes. Infrared rays. Ultraviolet. High-frequency alternating current.	BD	EC	5	LO 2 LO 6 LO 8 LO 9 LO 11
36	Chemistry and technology of synthetic medicinal substances	Purpose: Formation of skills in the application of industrial methods for the production of biologically active compounds of synthetic origin. Contents: Classification and nomenclature of synthetic drugs. The main directions of the search for synthetic drugs. The relationship of chemical structure with pharmacological activity. Technological scheme of production and hardware design. Pharmaceutical production control.	BD	EC	4	LO 1 LO 2 LO 4 LO 6 LO 9 LO 10 LO 11

37	Economics of the pharmaceutical industry	Purpose: Formation of skills for analyzing the development of the pharmaceutical industry of the Republic of Kazakhstan and determining the results of economic activity of pharmaceutical enterprises. Content: Organizational and legal forms of entrepreneurial activity. Accounting and planning of fixed assets. Calculation of production costs and production costs in the pharmaceutical industry. Pricing of pharmaceutical industry enterprises. Marketing at the pharmaceutical industry enterprise.	BD	EC	5	LO 1 LO 2 LO 3 LO 6 LO 7 LO 8 LO 9 LO 11
38	fundamentals of design and equipment of pharmaceutical production	Purpose: Formation of skills for the development of projects for the production of specific medicinal and medical products in accordance with the requirements of the terms of reference. Content: Familiarization with the systems of regulatory documents in construction (СНиПы, ГОСТы, ЕСКД). Requirements for the structure and content of the project. Feasibility study of pharmaceutical production design. The general plan of pharmaceutical production. Design of production buildings for pharmaceutical enterprises in accordance with the requirements of the GMP standard. Design of production and auxiliary areas/premises. Layout/placement of technological equipment in industrial buildings.	PD	UC	6	LO 1 LO 2 LO 4 LO 5 LO 6 LO 8 LO 9 LO11
39	Industrial Drug Technology	Purpose: Formation of skills for the development of technological regulations for the industrial production of a specific drug, taking into account the requirements of regulatory documents and introduction into pharmaceutical production. Contents: Classification of finished dosage forms (drug). Industrial production of sterile LFS, taking into account the requirements of the GMP for production facilities. Industrial production of hard and soft drug, the equipment used. Biopharmaceutical as an integral part of drug technology. Pharmaceutical factors. The applied value of biopharmaceutical research.	PD	UC	6	LO 1 LO 2 LO 4 LO 5 LO 6 LO 8 LO 9 LO10 LO11

40	Control system of chemical and technological processes (automation)	Purpose: Formation of skills in the use of modern software for automatic process control systems of chemical and pharmaceutical industries. Content: Structure and functioning of the software and hardware complex of the automation system. Automatic measuring systems. Types of automatic control systems. Classification of automatic control systems. General information about industrial automatic control systems in the field of drug manufacturing technology. Mathematical models of automatic regulators.	PD	UC	6	LO 1 LO 2 LO 4 LO 5 LO 6 LO 8 LO 9 LO 10 LO 11
41	Machines and automatos for filling and packaging dosage forms	Purpose: Formation of skills in choosing the optimal packaging for each specific type of pharmaceutical products and solving the problem of complex mechanization and automation of the processes of packaging and packaging of medicinal products. Contents: Basic concepts about containers and packaging. Basic requirements Standard requirements for packaging and containers for drugs, special requirements for packaging. Requirements for the external design of the packaging. Special types of packaging. The main machines and machines for packing and packing of drugs. Rationing of packaging materials.	PD	EC	6	LO 1 LO 2 LO 3 LO 4 LO 5 LO 6 LO 9 LO 10 LO 11
42	Modeling of chemical-technological processes	Purpose: Formation of skills for constructing a model of the kinetics of a chemical reaction for obtaining a medicinal substance using experimental data. Contents: Mathematical methods of modeling the chemical-technological process. Tasks of optimal process management. Determining the parameters of the regression model. Building models of object statics. Identification of the dynamic characteristics of the object. Basic techniques for working with the ChemCad program.	PD	EC	6	LO 1 LO 2 LO 4 LO 5 LO 8 LO 9 LO 11
43	Good manufacturing practice and	Objective: To develop the skills of organization and management of pharmaceutical production of medicinal and medical products in accordance with the requirements of good pharmaceutical practices (GxP) and taking	PD	EC	6	LO 1 LO 2 LO 3

	non-waste production principles	into account the requirements of environmental protection. Content: The concept of Good Practices in Pharmacy (GxP). The life cycle of medicines (drugs). Methodology of the quality assurance system of medicinal and medical products. Good Manufacturing Practice (GMP), basic principles. Methodological principles of waste-free/low-waste production and ways to minimize waste generation, ventilation emissions, harmful sewage drains.				LO 4 LO 5 LO 6 LO 8 LO 9 LO 11
44	Health and safety	Purpose: Formation of safety skills at pharmaceutical enterprises for personnel and the environment in the design, construction, equipment production and operation of equipment. Contents: Regulatory and legal documents of labor protection and safety. Safety and labor protection requirements in the design and construction of pharmaceutical enterprises, industrial buildings and premises, auxiliary and warehouse, premises, laboratory control zones, corridors, etc. in accordance with the requirements of the GMP standard. Ensuring the safety of operation of technological equipment.	PD	EC	5	LO 1 LO 2 LO 4 LO 5 LO 6 LO 9 LO 10 LO 11
45	Pneumatic automation systems in pharmaceuticals	Purpose: Formation of skills for solving professional tasks based on the principles of building elements and systems of pneumatic automation. Contents: Purpose of pneumatic systems, conditional graphic designations of elements of pneumatic circuits, control systems for pneumatic actuators, implementation of sequential functions, pneumatic automation in pharmaceuticals: cylinders, position sensors, valves, disc valves.	PD	EC	4	LO 1 LO 2 LO 4 LO 5 LO 6 LO 9 LO 10 LO 11
46	Applied mechanics	Purpose: Formation of skills for optimal selection of technological equipment, taking into account the principle of operation of key components and elements. Contents: Machine, mechanism, mechanism link. Kinematic pairs and their classification. Structure and number of degrees of freedom of the kinematic chain and mechanism. Classification and principle of	PD	EC	3	LO 1 LO 2 LO 4 LO 5 LO 6

		formation of lever mechanisms. Synthesis of lever mechanisms according to the specified positions of the input and output links. The main connections of machine parts, gears and mechanisms.				LO 9 LO 11
47	Design of systems for intra-factory transportation of materials	Purpose: Formation of skills in designing systems for the transportation of materials, taking into account the requirements of GMR and the requirements of electrical engineering and electronics. Content: Goals and objectives of designing in-plant pipeline systems and equipment for transporting materials to the farm. production. Horizontal and vertical movement of liquids, gases, solid materials: pumps, compressors, conveyors, pneumatic transport, etc.	PD	EC	4	LO 1 LO 2 LO 4 LO 5 LO 6 LO 9 LO10 LO 11
48	Development of design-estimates documentation and business plan	Purpose: Formation of skills for the development, presentation and protection of a business plan based on the prepared design and estimate documentation and organizational and management plan. Content: Fundamentals of marketing and principles of studying the pharmaceutical market segment. Setting goals for SMART. Evaluation of a business idea. SWOT analysis. Preparation of design and estimate documentation. Feasibility study, calculation and analysis of projected technical and economic indicators. The main sections of the business plan. Methodology for drawing up a business plan for pharmaceutical companies. Summary of the project. Description of the product or service. Development of a financial plan.	PD	EC	5	LO 1 LO 2 LO 3 LO 5 LO 6 LO 7 LO 8 LO 9 LO 11
49	Special technology of drugs and the basics of pharmacology	Objective: To develop skills in the field of creating separate groups of drugs (children's, geriatric, with prolonged action, with directed delivery of API to the target organ, with controlled release of API in the body), taking into account the achievements of modern pharmaceutical science. Content: Features of the technology of individual groups of drugs. Fundamentals of	PD	EC	5	LO 1 LO 2 LO 4 LO 6 LO 8 LO 9

		pharmacology. The importance of pharmacology in the process of creating new drugs. Principles of classification of medicines. The applied value of pharmacokinetic research for the industrial production of drugs.				LO 10 LO 11
50	Technology of dosage forms	Purpose: Formation of skills of preparation of various dosage forms. Contents: State rationing in the technology of dosage forms (of drugs). Basic concepts and objectives of the technology of dosage forms. Features of solid LF technology, requirements for them. Features of the technology of aqueous and non-aqueous solutions. Features of the technology of colloidal solutions. Features of heterogeneous drugs technology (suspensions and emulsions). Features of soft of drugs technology (ointments, suppositories, liniments). Sterile and aseptically prepared drugs.	PD	EC	5	LO 1 LO 2 LO 5 LO 6 LO 8 LO 9 LO 11
51	Pre-graduate practice	Consolidation of knowledge on the requirements of the PMR at each specific site / in a specific workshop. Substantiation of the principle of operation of the main devices and machines during the technological process in the production of GLF. To consolidate the skills of conducting patent search when working with reference and scientific literature in the course of collecting the necessary theoretical material to complete a diploma project on an approved topic.	PD	EC	6	LO 1 LO 2 LO 3 LO 5 LO 6 LO 7 LO 8 LO 9 LO 10 LO 11
52	Final certification writing and defending diploma projects	The application of theoretical knowledge and practical skills in independent work when solving topical issues of creating new /improving existing production facilities for the production of specific products with a given productivity developed in the diploma design. Demonstration of computational and graphical skills, solving complex engineering and technical problems taking into account the achievements of progress, science and technology.			8	LO 1 LO 2 LO 3 LO 4 LO 5 LO 6 LO 7 LO 8

