CATALOG OF ELECTIVE DISCIPLINES for 2023-2024

1. **Department:** Kazakh, Russian and Latin languages
2. **Level of training:** bachelor degree
3. **Specialty:** Technology of pharmaceutical production
4. **Course:** 1
5. **Name of elective discipline:** Latin
6. **Number of credits:** 3
7. **Purpose:** To equip students of the future pharmacist, pharmacologist specialist with solid knowledge and skills in working with special literature, in practical work with a prescription, professional knowledge of special terms and expressions, the ability to accurately and accurately translate any Latin word or expression used in literature or pharmacist practice.
8. **Objectives:** At the end of the course, the student's vocabulary should be 900 lexical units. The student must be able to correctly translate expressions, aphorisms and recipes that are often used in Latin.
9. **Justification of the choice of discipline:** It is the training of specialists who are able to consciously, competently apply modern pharmaceutical terminology in Latin. The alphabet, phonetic, morphological, word-forming and lexical resources of the Latin language, together with the word-forming and lexical elements of the ancient Greek language, continue to play a leading role in the replenishment of pharmaceutical, microbiological and other terminologies, contributing to their internationalization.
10. **Learning outcomes (competencies):**

Knowledge (cognitive sphere)	Skills and abilities (psychomotor sphere)	Personal and professional competencies (relations)
The student knows: - letters of the alphabet and letter combinations; - features of reading and pronunciation of letters and letter combinations; - declension of nouns and adjectives; - matching adjectives with nouns; - verb conjugation and prescription formulations with verbs; - the structure of the recipe and the rules for the design of its Latin part, prescription abbreviations; - prepositions, numerals, pronouns used in pharmaceutical terminology; - latin expressions and aphorisms often used in medicine and pharmacy; - greek-Latin elements in the structure of terms;	**The student is able:** - read and write in Latin; - translate terms and term combinations from Russian to Latin and vice versa; - correctly formalize the Latin part of the recipe; - identify term elements in the structure of terms, frequency segments in the names of drugs and explain their meanings; - correctly writes the names of international nonproprietary names of medicinal substances; - use deontological precepts, Latin expressions on professional ethics in different situations.	**Student** - finds information on the topic under study in the educational and scientific literature; - evaluates and uses the results of research, explains their causal relationship; - makes its own conclusions, presents them publicly, in information networks; - is guided in the normative documents on the studied material; - able to use computer technology in their work; - complies with ethical and legal standards; - has critical thinking, is creative; - able to work in a team; - seeks to know the equivalents of Latin terms in other languages..

- knows the ways of word formation of trivial names of medicinal substances and the frequency segments in them.		

11. Prerequisites: No

12.Post-requisites: Processes and devices of chemical and pharmaceutical production-1

13. Literature:

Basic:1. 1. M. N.Chernyavsky. Latin language and the fundamentals of pharmaceutical terminology. M.: GEOTAR-Media, 2015.
2. Bukharina T. L., Novodranova V. F., Mikhina T. V. Latin language: textbook. manual-Moscow: GEOTAR-Media, 2015. -496 p.
3. A. N. Kasymbekova. Latin language. Karaganda, "Aknur" 2019.
Additional : 1. Kozybayeva A. K. Latin language: educational and methodical manual. - Karaganda: IP "JSC Nur", 2012
2.M. A. Akhmetov. Dictionary of medical terms. Russian-Kazakh-English. Almaty: Dyk-Press, 2009
3. M. N.Chernyavsky. Latin language and bases of medical terminology. M.: Shiko, 2007.
4. Latin language for medical faculties: studies. manual/ M. N. Nechay.- Rostov n/A: Phoenix, 2007.

Head of the course Salim E. K.

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2. **Level of training:** bachelor degree
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4. **Course:** 1
5. **Name of elective discipline:** Latin
6. **Number of credits:** 3
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8. **Objectives:** At the end of the course, the student's vocabulary should be 900 lexical units. The student must be able to correctly translate expressions, aphorisms and recipes that are often used in Latin.
9. **Justification of the choice of discipline:** It is the training of specialists who are able to consciously, competently apply modern pharmaceutical terminology in Latin. The alphabet, phonetic, morphological, word-forming and lexical resources of the Latin language, together with the word-forming and lexical elements of the ancient Greek language, continue to play a leading role in the replenishment of pharmaceutical, microbiological and other terminologies, contributing to their internationalization.
10. **Learning outcomes (competencies):**

Knowledge (cognitive sphere)	Skills and abilities (psychomotor sphere)	Personal and professional competencies (relations)
The student knows: - letters of the alphabet and letter combinations; - features of reading and pronunciation of letters and letter combinations; - declension of nouns and adjectives; - matching adjectives with nouns;	**The student is able:** - read and write in Latin; - translate terms and term combinations from Russian to Latin and vice versa; - correctly formalize the Latin part of the recipe;	**Student** - finds information on the topic under study in the educational and scientific literature; - evaluates and uses the results of research, explains their causal relationship;

- verb conjugation and prescription formulations with verbs; - the structure of the recipe and the rules for the design of its Latin part, prescription abbreviations; - prepositions, numerals, pronouns used in pharmaceutical terminology; - latin expressions and aphorisms often used in medicine and pharmacy; - greek-Latin elements in the structure of terms; - knows the ways of word formation of trivial names of medicinal substances and the frequency segments in them.	- identify term elements in the structure of terms, frequency segments in the names of drugs and explain their meanings; - correctly writes the names of international nonproprietary names of medicinal substances; - use deontological precepts, Latin expressions on professional ethics in different situations.	- makes its own conclusions, presents them publicly, in information networks; - is guided in the normative documents on the studied material; - able to use computer technology in their work; - complies with ethical and legal standards; - has critical thinking, is creative; - able to work in a team; - seeks to know the equivalents of Latin terms in other languages..

11. Prerequisites: No
12.Post-requisites: Processes and devices of chemical and pharmaceutical production-1
13. Literature:
Basic:1. 1. M. N.Chernyavsky. Latin language and the fundamentals of pharmaceutical terminology. M.: GEOTAR-Media, 2015.
2. Bukharina T. L., Novodranova V. F., Mikhina T. V. Latin language: textbook. manual-Moscow: GEOTAR-Media, 2015. -496 p.
3. A. N. Kasymbekova. Latin language. Karaganda, "Aknur" 2019.
Additional : 1. Kozybayeva A. K. Latin language: educational and methodical manual. - Karaganda: IP "JSC Nur", 2012
2.M. A. Akhmetov. Dictionary of medical terms. Russian-Kazakh-English. Almaty: Dyk-Press, 2009
3. M. N.Chernyavsky. Latin language and bases of medical terminology. M.: Shiko, 2007.
4. Latin language for medical faculties: studies. manual/ M. N. Nechay.- Rostov n/A: Phoenix, 2007.

1. **Department:** Chemical disciplines
2. **Level of training:** bachelor degree
3. **Educational program:** 6B07201 - technology of pharmaceutical production
4. **Course:** 1
5. **Name of elective discipline:** Inorganic and physical chemistry
6. **Number of credits:** 4 credits
7. **Purpose:** to Teach the basics of modern inorganic chemistry and use the theoretical knowledge to describe the properties of elements and their compounds, as well as to understand the chemistry of the basic chemical production processes and phenomena required in the activity of the process engineer in solving practical problems of modern chemical technology.
8. **The content of the discipline:** Basic laws and patterns of inorganic and physical chemistry used in the pharmaceutical industry. Laws of the theory of solutions. Basic provisions of the theory of electrolytic dissociation. The mechanism of hydrolysis reactions in solutions of medicinal substances. Redox reactions. Redox potentials.
9. **Tasks:**

- to form students ' fundamental knowledge of modern chemical science and chemistry of elements and their compounds;

- to form system knowledge about the nature of chemical bonds and the structure of chemical compounds used in pharmacy;
- to teach to predict the possibility of chemical processes;
- to give an idea of the thermodynamics of electrolyte solutions, methods for measuring the pH of solutions, properties of buffer solutions;
- to give an idea of the kinetics of chemical reactions and catalysis.
- to form ideas about disperse systems and surface phenomena.
- to teach the skills of working with literature and electronic databases.

10. Rationale for the choice of discipline:

The discipline "Inorganic chemistry" examines the laws, theoretical positions and conclusions that underlie all chemical disciplines. Upon completion of the discipline, students must learn the basic chemical concepts, laws and modern nomenclature of inorganic compounds and their properties.

The program of inorganic chemistry is supposed to consider the basics of the most important topics of the course of inorganic chemistry. This course is designed to enable students to independently plan and perform various chemical studies, develop schemes and methods of analysis in accordance with the scientific problem posed to them.

11. Learning outcomes (competencies):

Knowledge (cognitive sphere)	**Skills & perks (psychomotor sphere)**	**Personal and professional competences (relations)**
- General theoretical bases of inorganic and physical chemistry for the application of knowledge and skills at all stages of manufacture and quality control of medicines; - connection of chemical properties of substances with the position of their constituent elements in the periodic table; - the main provisions of the theory of solutions, the law of active masses and the law of equivalents in relation to the problems of chemistry; - regularities of physical and chemical processes and conditions for achieving chemical equilibrium; - - knowledge of thermodynamics of surface phenomena, physical and chemical properties of dispersed systems and high-molecular compounds. - the main sections and types of chemical analysis. - fundamentals of mathematical statistics needed to assess the accuracy, reproducibility and correctness of the analysis results.	- work with chemical reagents and equipment niem.; - prepare solutions of a given concentration; --put simple educational research these experiments. - - the skills of various methods of scientific research in the conduct of high-quality tion reactions. - has the skills of experimental determination of the thermal effect of chemical reactions. - complies with the rules of labor protection and safety, has the skills of safe work in the chemical laboratory, is able to provide first aid.	- independent work with educational and reference literature; - - calculation for the preparation of solutions of a given concentration; - - determination and calculation of pH solutions; - handling of chemical equipment; - substantiates information from Internet resources and reference scientific literature for research work in the field of chemistry.

12. Prerequisites. the study of these disciplines is preceded by the development of students of the school program of chemistry, physics, mathematics.

13. Post-requisites. chemistry and technology of synthetic drugs, industrial technology of drugs.

14. Literature:

in Russian:

Basic :

1. Glinka N.L. General chemistry. Volum 1-4.: manual for graduate students /N.L. Glinka, S.S. Babkina. -27th ed.-Almaty: «Evero», 2017.
2. Ferancova L. G., E. V. Nechepurenko Inorganic, physical and colloid chemistry. - Almaty: publishing house "Evero", 2014.
3. A. Belyaev Physical and colloidal chemistry. M.: GEOTAR-Media.2014.
4. Ferancova L. G., E. V. Nechepurenko Inorganic, physical and colloid chemistry. - Almaty: publishing house "Evero", 2014.

Additional:

1. Workshop on inorganic chemistry: training manual. - Electron.text Dan. ((47.2 MB). - M., 2017. - el. wholesale.disk (CD-ROM)
2. Chemistry [Electronic resource]: full multimedia chemistry course + all experiments in inorganic chemistry. - Moscow: Russobit Publishing, 2004. -3 o=El. wholesale. disk (CD-ROM)

1. Department: «Engineering Disciplines»
2. level of education: bachelor's degree
3. name of the educational program 6B07201 – "Technology of pharmaceutical production"
4. Course: 2
5.Number of credits - 4
6. Name of the elective discipline "Descriptive geometry"
7. Purpose: The Monge method. Monge epure. GOST standards 2.307-38, 2.302-68, 2.304-81, 2.303-68, 2.104-68. drawings GOST 2.307-68.geometry. Slope. The plane. Planes in general and independent position, a point and straight lines lying on the plane. Projection drawing. Scenes. GOST 2.305-68. additional type. Local view. Pages. Page definers. Surfaces of rotation. Straight lines with points on the surfaces of rotation. Sections. Cross sections. Types of cross-sections. Complex sections and their types. Find the third scene by two scenes. Performing prominent sections. Axonometric projections. Standard axonometric projections. Axonometry of the circle. They are located parallel to the three projection planes (horizontal, frontal, and profile).Grooved rotating and faceted bodies, their projections and rectangular axonometric projections (isometry, dimetry).
8.The content of the discipline: starting with a simple type of line, mastering the methods of image, projection on the plane, combining a variety of representations, provides for improving the skill of performing cuts and sections and fully ensuring the implementation of projections appearing in space, in accordance with the standard.
9. Tasks: starting with a simple type of line, mastering the methods of image projection on the plane, combining a variety of representations, provides for improving the skill of performing cuts and sections and fully ensuring the execution of projections that appear in space, in accordance with the standard.
10. Justification of the choice of discipline:
* Master drawing techniques; build a point projection;
* Geometric drawing. Slope. The plane. Planes in general and independent position, a point and straight lines lying on the plane. Projection drawing. Scenes. GOST 2.305-68. in accordance with the standard;
* Additional view. Local view.Sections. Zhaytilikter. Cross sections. Types of cross-sections. Complex sections and their types. Find the third scene by two scenes. Performing prominent sections. Axonometric projections. Standard full knowledge of axonometric projections and training in the techniques of self-construction of drawing formats.

Fundamentals of the choice of discipline: bachelors studying in the trajectories "Descriptive geometry" and "computer-engineering graphics in design" in the specialty 6b07201-technology of pharmaceutical production, must perform the following types of professional activities:

* Methods of arbitrary placement of complex types of drawings on the plane and in space, sections and sections;
* Correct selection of the dimensions of each element in accordance with the state standard when performing drawings;
* Manage all types of drawings, including a simple frame and stamp;
* Preparation of projects in accordance with the standards and requirements of the drawing system;
* Completion of finished projects and full implementation in programs;

11. Learning outcomes (competencies):

LO1.	Ensures the organization and safety of technological processes, demonstrates knowledge of technological equipment and monitoring of the working condition of automation and control and measuring devices, is able to monitor compliance with documentation requirements in the conditions of the technological process.
LO3.	Demonstrates knowledge of the nomenclature of parts and assemblies of various mechanisms and machines. He is able to use all the parts and assemblies of various mechanisms in the pharmaceutical industry.
LO4.	Analyzes transients, is able to search, collect, store and process information in the field of professional activity, including computer. He knows the technology of pharmaceutical production, demonstrates knowledge about the implementation of technological schemes using the A0, A1, A3 format.
LO5.	Demonstrates knowledge of the manufacturing technology of parts and structures according to the state, technical specifications, etc., as well as technical terminology used in the pharmaceutical industry.
LO6.	There is able to work in small groups, solve tasks together.
LO7.	This is able to work in small groups, solve tasks together, analyzes risks and causes of inconsistencies in production, offers unique solutions based on the selection and use of production information in difficult conditions under different approaches, takes responsibility for them. He is able to collect, process 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, and expansion of the range of products.
LO11.	Has skills for independent continuous professional self-education and effective communication in interactions with various specialists at different levels to solve production tasks.

12. Prerequisites: «Information and communication technologies», « Mathematics I», « Mathematics II».
13. Post-requirements: "Computer-engineering graphics in design", "Fundamentals of design and equipment of production.
14. Literature:
basic:
1.Zh.Zhanabaev Textbook on descriptive geometry, Almaty 2012y, 507 p.
2. V.A. Korotkiy, L.I. Khmarova, I.V. Butorina Lecture complex on NG, Chelyabinsk, 2014y.
3.Musalimov T.K., Kolbatyr S.A., Algartova G.M. Association of Universities of the Republic of Kazakhstan, 2013y, Textbook on NG.
4.Nabi Y.A. Publisher: Almaty, 2018y, Collection of practical works on the subject of descriptive geometry and computer engineering graphics.
5. Hibbeler, R. Ch. Descriptive geometry: vol. 1: textbook/R.Ch. Hibbeler; 4th edition. Almaty: 2017y - 436 pages.

6. Mirzakulov M.E., Turdaly K.M. Educational and methodical manual on descriptive geometry.- Shymkent 2022y.

additional:

1. Educational and methodical complex for NG G.Izhevsk, 2012y.

Electronic resources

1.http://www.studmedlib.ru

2.http://base.ukgfa.kz/?page_id=7845

1. **Department:** chemical disciplines
2. **Level of preparation:** undergraduate
3. **Specialty:** 6B07201 - "Technology of pharmaceutical production"
4. **Course:** 2
5. **Name of elective discipline:** Organic chemistry
6. **Number of credits.** 3 credits
7. **Purpose:** Formation of students' knowledge of the theoretical foundations of organic chemistry, as well as the systematic laws of the chemical behavior of organic compounds in conjunction with their structure for the ability to solve chemical problems of pharmacology
8. **Tasks:**

- to form knowledge of the fundamentals of the structure and reactivity of organic compounds, which are the objects of studying organic chemistry;
- to give an idea of the relationship between the chemical composition, structure, properties and biological activity of organic substances;
- teach the ability to predict the reactivity of organic compounds;
- teach skills in working with literature and electronic databases.

8. Justification of the choice of discipline: When studying organic chemistry, students form knowledge of the theoretical foundations of organic chemistry, as well as the systematic patterns of the chemical behavior of organic compounds in conjunction with their structure, in order to solve the chemical problems of pharmacology, which are necessary in the activities of future pharmaceutical manufacturing technologists.

9. **Learning outcomes (competencies):**

Knowledge (cognitive sphere)	**Skills and abilities (psychomotor sphere)**	**Personal and professional competences (relations)**
Demonstrate knowledge and understanding in the study area, including elements of the most advanced knowledge in this area.	Demonstrates knowledge, goals and objectives of the course the theoretical foundations of organic chemistry	Competence in the field of natural and special Sciences
	Knows the principles of nomenclature and isomerism of organic compounds	
	He knows that organic compounds belong to certain classes and groups on the basis of knowledge of classification characteristics and has an idea of the role of biopolymers in the processes of life activity.	
	Knows the relationship of the structure and chemical properties of organic	

	compounds with their biological activity.	
	Demonstrates knowledge of performing chemical calculations during the synthesis of organic compounds	
	Knows the devices and the principle of operation of chemical equipment, devices, rules for their operation	
	Knows the properties of organic substances used in pharmacy, based on the theoretical foundations of organic chemistry.	
Apply this knowledge and understanding in a professional manner.	Knows the rules of labor protection and safety work in the chemical	Competence "Lawyer
Formulate arguments and solve problems in the field of study	Demonstrates knowledge of the research methods of organic products used in pharmacy.	Competence "Research Skills"
Collect and interpret information to form judgments based on social, ethical, and scientific considerations.	She has the skills to organize a workplace for laboratory research.	Competence of entrepreneurship
Communicate information, ideas and problems and solutions, both to specialists and non-specialists.	Carries out a search, selection of information on the properties and application of organic substances in pharmacy from the Internet, educational, chemical reference literature for solving scientific and practical problems.	Computer and information competence
	Uses information from educational, reference books for the development of drugs of organic chemistry.	
Ability to continue further self-study	Demonstrates the ability to work in small groups, discuss the results of laboratory work on topics, conduct discussions.	Competence "Communication skills" (cultural competence, critical thinking, creativity, ability to work in a team, foreign language competence)

10. Prerequisites. the study of these disciplines is preceded by the development of students of the school program of chemistry, physics, mathematics.

11. Post-requisites. chemistry and technology of synthetic drugs, industrial technology of drugs.

12. Literature

in Russian:

Basic :

1. Tyukavkina N.. Bioorganicheskaya chemistry. Textbook for universities. Special course. Book-2, Moscow. Bustard, 2011. -592 p.
2. Patsaev, A. K., Alikhanov, Kh., Akhmetova, Educational and methodical manual for laboratory and practical training in organic chemistry. Educational and methodical manual. Shymkent, 2012, - 164s.
3. Patsaev A. K. Educational and methodical manual on organic chemistry for independent work of students of pharmaceutical faculties. Shymkent, 2007. - 273c.
4. Patsaev, A. K. Biopolymers, lipids: proc. benefit. - Shymkent : UKGM, 2004. - 138 p. - ISBN 9965-667-95-0. :
5. Patsaev, A. K. Heterocyclic compound. Alkaloids: studies. benefit. - Shymkent: B. I., 2004.
6. Patsaev, K. Functional derivatives of hydrocarbons: studies. benefit. - Shymkent: B. I., 2003.
7. Patsaev A. K. Hydrocarbons: a training manual. - Shymkent: B. I., 2002. -152 p.
8. Patsaev, K. K. Theoretical foundations of organic chemistry: studies. benefit. - Shymkent: B. I., 2000. - 151 p.

Additional:

1.Zurabyan S. E. Organic chemistry . Textbook. M: GEOTAR-Media, 2014
2.Azimbayeva, G. T. Organic chemistry : a textbook / G. T. Azimbayeva. - Almaty: [s. n.], 2016. - 313 p.
3.Tulkibayeva, chemistry of functional derivatives of organic molecules [: studybook. - - Almaty: "Evero", 2015. -180 p.

1. Department: of chemical disciplines
2. Level of preparation: baccalaureate
3. Specialty: 6B07201 - "Technology of pharmaceutical production"
4. Course: 2
5. Name of elective discipline: analytical chemistry
6. Amount of credits: 4
7. Purpose: Teaching the general theoretical fundamentals of modern analytical chemistry and the use of the obtained theoretical knowledge in drug development, expertise, standardization and research of the dosage forms necessary in the activity of the process engineer in solving practical problems of modern chemical technology.
8. Tasks:
- to form students' knowledge of basic concepts and methods of analytical chemistry;
- to form the theoretical and practical bases of qualitative and quantitative analysis;
- to form students' knowledge of the properties of chemicals in the analysis of pharmaceuticals;
- teach how to make calculations for the preparation of solutions of predetermined concentrations.

9. Justification of the choice of discipline:

The goal of analytical chemistry as an academic discipline is to develop students' knowledge, skills and abilities of chemical analysis.

The main objective of the course of analytical chemistry for students of pharmaceutical faculties of higher professional education is to familiarize students with the main sections of analytical chemistry, which serve as a theoretical basis for a more complete and in-depth study of biochemistry, pharmaceutical chemistry, physiology, pharmacology, technology of medicinal substances and a number of other special disciplines.

10. Learning outcomes

	Knowledge (cognitive sphere)	Skills and abilities (psychomotor sphere)	Personal and professional competencies (relationships)

	- puts the simplest teaching and research, chemical and analytical experiments; - applies a qualitative analysis of chemical compounds by cations, anions and functional groups; -applies a quantitative analysis of chemical compounds by titrimetric methods; - uses a qualitative and quantitative analysis of chemical compounds by physicochemical methods; - prepares solutions of standard substances, titrants, standardizes titrants; - owns the skills of various methods of scientific research in the preparation of solutions of specified concentrations and the performance of qualitative reactions of cations and anions.	-formulates its own conclusions on the prediction of products of all types of qualitative reactions by cations, anions and functional groups; - argues the principles of correct pH calculation and preparation of buffer solutions, hydrolyzing salts, electrolyte solutions and non-electrolytes; - understands and explains the characteristic properties of acid-base, redox, complexometric and precipitation titration methods; - justifies the results of educational experiments, explains the observed facts and phenomena from a scientific point of view.	-uses information materials and interprets the results of research in the field of qualitative and quantitative analysis for medical and pharmaceutical science; - focuses on modern information flows and makes conclusions on experimental research in the field of analytical chemistry; - reports information obtained from educational reference, scientific literature, Internet resources offering their own judgments and opinions; - publicly speaking with the presentation of their own judgments, analysis and synthesis of information in the field of analytical chemistry.

11. Prerequisites: inorganic chemistry, physics, mathematics, molecular biology.

12. Post requisites: pharmaceutical chemistry, industrial technology of drugs, toxicological chemistry.

13. Literature

The main:

1. Kharitonov L.G. Analytical chemistry. Analytics 1. General theoretical foundations. Qualitative analysis: a textbook - M .: GEOTAR-Media, 2014.
2. Kharitonov L.G. Analytical chemistry. Analytics 2. Quantitative analysis. Physico-chemical (instrumental) methods of analysis: a textbook - M .: GEOTAR-Media, 2014.
3. Kharitonov L.G. Analytical chemistry. Quantitative analysis, physico-chemical methods of analysis: workshop: textbook. allowance. - M .: GEOTAR-Media, 2012.
4. Kharitonov L.G. Analytical chemistry. Workshop. High-quality chemical analysis: studies. allowance.- M .: GEOTAR-Media, 2009.
5. Patsaev, A. K. A Guide to Laboratory Studies in Analytical Chemistry: studies. allowance. - Shymkent, 2010.

Additional:

1. Kharitonov, Yu. Ya. Analytical chemistry. Qualitative analysis. Titrimetry [Electronic resource]: textbook / Yu. Ya. Kharitonov. - Electronic text data. (39.9Mb). - M.: GEOTAR - Media, 2017.
2. Kharitonov, Yu. Ya. Analytical chemistry. Analytics - 1. General theoretical foundations. Qualitative analysis [Electronic resource]: textbook / Yu. Ya. Kharitonov. - Electronic text data. (44.3Mb). - M.: GEOTAR - Media, 2017
3. Kharitonov, Yu. Ya. Analytical chemistry. Analytics - 2. Quantitative analysis. Physical and chemical (instrumental) methods of analysis [Electronic resource]: textbook / Yu. Ya. Kharitonov. - Electronic text data. (43.1Mb). - M.: GEOTAR - Media, 2017.

4. The course of analytical chemistry [Electronic resource]: studies. / I. K. Tsitovich. - El. text given. (13.5 MB) - M., 2003. - 1 email. wholesale disk

1. Department: Engineering Disciplines
2. level of education: bachelor's degree
3. name of the educational program 6B07201 "Technology of pharmaceutical production»
4. Course: 2
5. Name of the elective discipline "Applied Mechanics»
6. Number of credits - 3
7. Purpose: Formation of students ' theoretical foundations and practical skills in the basics of applied mechanics, principles of engineering calculation, connection of machine parts, mastering the characteristics of mechanisms and machines to the extent necessary for future professional activity in their specialty.
8. Content of the discipline: Machine, mechanism, communication mechanism. Kinematic pairs and their classification. The degree and structure of the kinematic chain and mechanism. Development of the principle of formation of mechanisms of red color.
Machine parts, the main connections of mechanisms and mechanisms; recommendations for the use of certain programs in the manufacture of grinding, mixing, flatbed and other machines.
9. Tasks
* to study the basic methods of structural, kinematic, power and dynamic analysis of mechanisms: the principles of engineering calculation for the strength of typical elements of the product.
* master the basics of designing machine parts and the basics of strength calculation;
* initial skills in the basic design and design of mechanical devices and gain an understanding of the sequence of product design and the main stages of design development;
* formation of tasks within the framework of professional competence and determination of ways to solve them;
10. Justification of the choice of discipline: bachelor's students studying on the tracks "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on the EP 6B07201-Technology of pharmaceutical production must perform the following types of professional activities:
• assembly of machine parts and mechanisms;
• assembly of mechanical devices used in pharmaceutical production during preparation of finished medicines;
• assembly of mechanical devices used in the production of extraction preparations;
• assembly of mechanical devices used in the production of medical/sanitary/ products.

11. Learning outcomes (competencies):

LO1	Demonstrates acquisition of knowledge for the development of applied subjects and for solving engineering problems in a production environment.
LO2	Carries out a structural and kinematic analysis of the mechanisms of machines and equipment and knows the range of parts and assemblies of mechanisms and machines used in the pharmaceutical industry.
LO3	Know the basics of designing and designing machines in the field of creating new machinery and equipment for equipping pharmaceutical production.
LO4	Able to use the principles of engineering calculations to develop technology for the manufacture of medical devices.
LO5	Capable of providing technical information in various forms, i.e. in the form of diagrams, conventional images and symbols, graphically in accordance with the requirements of GOST and ST.RK. and draw up independent work according to the rules of ESKD and ESDP.

LO6	Evaluates the technical conditions of a given moment of production and the tasks set for the development and improvement of technological processes.

12. Prerequisites: "Mathematics I", "Mathematics II", "Information and communication technologies", "Physics".
13. Post-requirements: "Fundamentals of design and equipment of pharmaceutical production", "Machines and automatos for packaging and packaging of medicinal forms".
14. Literature:
1. Polyakhov N. N. Theoretical mechanics. Textbook M., Yurayt, 2016 – 593 p.
2. Vasko N. G. Theoretical mechanics. Textbook. - Rostov-on-Don: Phoenix, 2016. - 302 p.
3. Olofinsky V. P. Technical mechanics. Training manual. - M:Forum., 2013 – 352 p.
4. Kirsanov M. Solution of problems in theoretical mechanics. Textbook. - M., SIC INFRA, 2015. - 216 p.
5. Mirolyubov I. N. et al. Strength of materials: A guide to problem solving. 7th ed. - St. Petersburg: Ed. "Lan", 2017. - 512 p.
6. Kopnov V. A. Krivoshapko S. N. Resistance of materials. Manual for solving problems and performing laboratory and computational and graphic works. - M.: Higher School 2011. – 351p.
7. Erdedi A. A. Theoretical mechanics. Resistance of materials: A textbook for machinists. Text. Institutions/ A. A. Erdedi, N. A. Erdedi-4 ed. - M.: Higher school, 2012. – 318p.
8. Minin L. S. Khromatov V. E., Samsonov Yu. P. Calculation and test tasks on the resistance of materials. M.: Higher School, 2013. – 224p.
9. Ponomarev A. T., Zorin V. A. Resistance of materials. Course of lectures. Textbook. - M.: 2012. – 336p.

1. Department: Engineering Disciplines
2. Level of training: Bachelor
3. Specialty: 6B07201- Technology of Pharmaceutical Production
4. Course: 2
5. Name of elective discipline: “Theoretical mechanics and materials resistance”
6. Number of credits - 6
7. Purpose: formation of students' theoretical foundations and practical skills on the foundations of theoretical mechanics, on principles of engineering calculations, connection of machine parts, characteristics of mechanisms and machines to the extent necessary for future professional activities in their specialty
8. Content of the discipline
Fundamentals of statics, kinematics, dynamics. General principles calculation of structural elements; types of stress States, the strength of the hypothesis, the combined effect of torsion and bending. Concepts of ultrasonic strength, dynamic loads and endurance limit; stability under axial compression of the rod. Basic design parameters for the selection of structural material and the calculation of elements for strength. Chemical factors affecting the choice of design and material.
9. Tasks:
- study of the fundamentals of the methods of structural, kinematic, force and dynamic analysis of mechanisms: principles of engineering calculations for the strength of typical elements of products.
- mastering the basics of strength calculations and the basics of designing machine parts.
- getting an idea of sequence of product design and main stages of design development, primary skills in basics of designing and designing mechanical devices.
- formation of tasks and determination of ways to solve them within framework of professional competence.

10. Justification of the choice of discipline: bachelor's students studying on the tracks "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on EP 6B07201-Technology of pharmaceutical production must perform the following types of professional

activities:
• development of technical specifications for the design of new and modernization of existing technologies, processes, technological lines or technological equipment;
• development of technological regulations for the production of finished drugs (laboratory, pilot, industrial, standard);
• development of design estimates for pharmaceutical and medical products;
• analysis and evaluation of alternative technological process options and individual stages using mathematical models;
• support and participation in commissioning.

11. Learning outcomes (competencies):

LO1	Demonstrates knowledge of the basic principles of theoretical mechanics and strength of materials and the theory of solid deformed bodies.
LO2	Knows methods for calculating the equilibrium and stress state of structural elements, kinematic and dynamic parameters of the movement of machine parts.
LO3	Draws up calculation schemes in accordance with the technical requirements for engineering structures of pharmaceutical production and schemes for calculating the strength, rigidity and stability of parts of production equipment.
LO4	Conducts analysis of transient processes, searches, collects, stores and processes information, including in Internet resources, and analyzes for the scope of professional activity.
LO5	Able to analyze drawings, diagrams and graphs obtained in the conditions of state and industrial laboratories as a result of research work.

12. Prerequisites: Mathematics I, Mathematics II, Information and communication technologies, Physics.
Related disciplines: Drowing geometry, Processes and apparatuses of chemical-pharmaceutical production-2
13. Post requisites: "Machines and automatos for packaging and packaging of medicinal forms", "Fundamentals of design and equipment of pharmaceutical production".
14. Reference

1. Mirolyubov I. N. et al. Strength of materials: Guide to problem solving. 7th ed. - St. Petersburg: Ed. "Lan", 2017. - 512 p.
2. Chernavskiy S. A., Bokov K. N., Chernin M. I. et al. Course design of machine parts. - M.: Mashinostroenie, 2015. - 416 p.
3. Dunaev P. F., Lelikov O. P. Design of units and parts of machines / Textbook. allowance for tech. specialist. universities. – M.: Higher School, 2015. – 447 p.
4. Duzelbaev S. T. Laboratory workshop on the strength of materials. - Almaty: RIC for UML MES RK, 2016. - 95 p.

1. Department: «Engineering Disciplines»
2. level of education: bachelor's degree
3. name of the educational program 6B07201 – "Technology of pharmaceutical production"
4. Course: 2
5.Number of credits - 4
6. Name of the elective discipline "Drawing geometry"
7. Purpose: The Monge method. Monge epure. GOST standards 2.307-38, 2.302-68, 2.304-81, 2.303-68, 2.104-68. drawings GOST 2.307-68.geometry. Slope. The plane. Planes in general and independent position, a point and straight lines lying on the plane. Projection drawing. Scenes. GOST 2.305-68. additional type. Local view. Pages. Page definers. Surfaces of rotation. Straight lines with points on the surfaces of rotation. Sections. Cross sections. Types of cross-sections. Complex sections and their types. Find the third scene by two scenes. Performing prominent sections. Axonometric projections. Standard axonometric projections.

Axonometry of the circle. They are located parallel to the three projection planes (horizontal, frontal, and profile).Grooved rotating and faceted bodies, their projections and rectangular axonometric projections (isometry, dimetry).

8.The content of the discipline: Projection methods. Expandable ruled surfaces and non-expandable surfaces. Projection drawing. Types of GOST 2.305-68. Ruled surfaces. Determinants of the surface. Types of curves (flat, spatial). The intersection of a multifaceted surface with a straight line, a plane and between themselves. Additional views. Local species. Axonometric surfacesCuts. Simple cuts. Sections.

9. Tasks: students mastering regulatory documents and state standards, which are the basis for compiling design and technical documentation

10. Justification of the choice of discipline:

bachelor's students studying on the tracks "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on the EP 6B07201-Technology of pharmaceutical production must perform the following types of professional activities:

* Ways of arbitrary placement of complex types of drawings on the plane and in space, sections and cuts;
* The correct choice of the dimensions of each element in accordance with the state standard when making drawings;
* Management of any type of drawings, including a simple frame and stamp;
* Preparation of projects in accordance with the standards and requirements of the drafting system;
* Refinement of finished projects and full implementation in programs.

11. Learning outcomes (competencies):

LO 1	Knows the design features of products used in the pharmaceutical industry
LO 2	Knows to use technical regulations, standards and other regulatory documents
LO 3	Knows to use methods for constructing images (drawings) of spatial figures on a plane
LO 4	Possess methods of developing technical documentation for the observance of technological discipline in the conditions of existing production
LO 5	Able to independently make sketches and make drawings of various technical details and structural elements of product assemblies of his future specialty

12. Prerequisites: «Information and communication technologies», « Mathematics I», « Mathematics II».

13. Post-requirements: "Computer-engineering graphics in design", "Fundamentals of design and equipment of production.

14. Reference:

1. Baidibekov, A. K. Engineering graphics (in projection with digital symbols): textbook / Almaty: Evero, 2011. - 140 p.
2. Moldekov, I. O. Drawing geometry: textbook Almaty: Evero, 2019 – 240 p.
3. Ormanov, N. J. Pharmacology in the table and scheme: textbook. YuKFA scientific. approved by the Council. - Almaty: Evero, 2011. - 368 p.
4. Hibbeler, R. Ch. Statics and mechanics of materials [Text]: v.1: Textbook / R. Ch. Hibbeler; Kazakh language translation. E.B. Dauseitov, S. Zhunusbekov. - 4th edition. - Almaty: LLP RPBC "Daur", 2017. - 436 p.

1. Department: Engineering disciplines

2. level of education: bachelor's degree

3. name of the educational program 6B07201-Technology of Pharmaceutical production

4. Course: 3

5. Name of the elective discipline «Pharmaceutical biotechnology the basics of Microbiology»

6. Number of credits: 4

7. Purpose: students ' study of the discipline "Pharmaceutical biotechnology the basics of Microbiology" is aimed at training specialists in the field of pharmaceutical production. The program provides students with the practical skills necessary for analytical thinking and performing professional tasks in the field of pharmaceutical technologies.

8. The content of the discipline: 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, enzymes, vitamins, amino acids. The conditions of cultivation.

9. Tasks:

- cellular engineering. Application of cell engineering methods in the creation of biological objects.
- cultivation of cells and tissues of plants and animals.
- preparation of medicines based on tissue plant cultures.
- biotechnology of primary metabolites. Production of amino acids and vitamins by bio-technological methods.
- recombinant proteins and polypeptides. Insulin. Growth hormone. Erythropoietin. Determination of peptide growth factors.
- quality control of medical immunobiological preparations.

10. Justification of the choice of discipline: bachelors studying in the trajectories "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on EP 6B07201-Technology of pharmaceutical production should perform the following types of professional activities:

- Preparation of medicines in accordance with the requirements of the NTD and GMP standards;
- The right choice of packaging materials for the manufacture of primary packaging for LF;
- The correct choice of types of packaging, capping agents and dosing devices for specific drugs, taking into account the physico-chemical and technological properties of drugs and short-circuit devices;
- The right choice of machines and automatic machines for disassembling and packaging specific explosives, taking into account the physical, chemical and technological properties of drugs and short-circuit equipment;
- Assessment of the quality of packaging and packaging for DDZ;
- correct design, labeling and labeling of packaged pharmaceutical and medical products,
- calculation of the consumption rates of packaging materials and economic efficiency;
- Analysis of the state of technological equipment for packaging and packaging of DT, MMB/SMB;

11. Learning outcomes (competencies):

LO1	An in-depth study of the theoretical and practical foundations of the achievements of biomedical science, biochemistry and molecular biology and knowledge of new technologies in the field of medical biotechnology, modern diagnostic tools, biocompatible materials and cellular technologies.
LO2	Knowledge of the main and priority areas of development of general and medical biotechnology, the main sources of medicinal, diagnostic, preventive agents and related products, as well as innovative biotechnological methods and ways to improve drug producers and biotechnological processes.
LO3	To be able to put into practice theoretical knowledge about the main biotechnological methods used in the field of translational and practical medicine.
LO4	Knowledge of the functioning of the general scheme of biotechnological production, obtaining highly efficient producers.
LO5	Knowledge of the main equipment used in the industrial practice of biotechnological production.

LO6	Development of microbial technology for obtaining various amino acids, quality control of amino acids, chemical and chemical-enzymatic synthesis of amino acids, industrial types of bioreactors for immobilized enzymes and producer cells.

12. Prerequisites: "processes and devices of chemical and pharmaceutical production", "Latin language", "technology of extraction preparations", production practice.
13. Postrequisites: "good manufacturing practice and rules for waste-free production", machines and automata for disassembling and packaging of dosage forms, Pre-graduate practice, completion of a diploma project.
14. Reference:

1. Gavrilov, A. S. Pharmaceutical technology. Production of medicinal preparations: textbook / - M.: GEOTAR - Media, 2016.-760 p.
2. Grossman VA. Technology of medicinal forms. textbook / V. A. Grossman — M.: GEOTAR-Media, 2018. — 336 p.
3. Moiseev, D.V., Lukashov, R.I., Veremchuk, O.A., Moiseeva, A.M. Pharmaceutical biotechnology: manual / D.V. Moiseyev, R.I. Lukashov, O.A. Veremchuk, A.M. Moiseeva // pod ed. D.V. Moiseeva. - Vitebsk: VGMU, 2019. - 293 p.
4. Orekhov S.N. Pharmaceutical biotechnology: ruk. k prakt. my occupation: учеб po sobie / S. N. Orekhov; under ed. V. A. Bykova, A. V. Katlinskogo. — M. : GEOTARMedia, 2012. — 384 p.
5. Sagyndykova B.A. Pharmaceutical technology. Technology of dosage forms: textbook / ed. I. I. Krasnyuk.; M.: GEO-TAR - Media, 2015.- 656p.
6. Krasnyuk I.I., Demina N.B., Bakhrushina E.O., M.N. Anurova Pharmaceutical technology. Industrial production of medicines. Volume 1: textbook / ed. I.I. Krasnyuk, N.B. Demina. - Moscow: GEO-TAR - Media, 2020. - 352 p.
7. Pharmaceutical technology: a short course of lectures for students of the IV course of the specialty 36.05.01 - "Veterinary"/Comp. T.N. Rodionova // FSBOU VO "Saratov SAU". – Saratov, 2016. - 68 p.

1. Department: Engineering disciplines
2. level of education: bachelor's degree
3. name of the educational program 6B07201- Technology of pharmaceutical production
4. Course: 3
5. Name of the elective discipline «Computer facilities in engineering and economic calculations»
6. Number of credits: 4
7. Purpose: The main purpose of the course "Computer facilities in engineering and economic calculations" is to teach students the skills and methods in preparing and solving engineering and economic problems on a computer; get acquainted with the structure and economic calculations of business planning and projects in the field of pharmaceutical production
8. The content of the discipline: Studying the architecture of a personal computer using the AIDA64 (Everest) program. Process management. Distribution of investments for the effective use of the potential of the enterprise. Minimizing the cost of construction and operation of enterprises. Determination of the efficiency of use of labor resources in mass service systems. Solving economic problems using enterprise stock management models.
9. Tasks:
• Application of PC architecture using AIDA64 program.
• Use of distribution of investments for effective use of the potential of the enterprise.
• Accounting and planning of the main production resources.
• Pricing of pharmaceutical companies.
• Determination of the results of economic activity of pharmaceutical industry enterprises.
• Study of the functioning of organizational and legal forms of entrepreneurial activity.

10. Justification of the choice of discipline: bachelors studying in the trajectories "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on EP 6B07201-Technology of pharmaceutical production should perform the following types of professional activities:

• Using the AIDA64 (Everest) program, study the architecture of a personal computer (PC), familiarize yourself with the main devices of a computer, and familiarize yourself with the main characteristics of computer devices. Acquire the skills of practical installation of operating systems;
• Choosing the right skills for practical installation of operating systems;
• Ability to use and choose economic and mathematical methods in solving specific analytical problems;
• the right choice of using the method of dynamic programming in solving problems of distribution of investments for the effective use of the potential of the enterprise;
• Calculation of capital costs for construction and the cost of equipment. Definition of investments;
• Planning the number of employees, integer programming, TFP.
• Determination of the enterprise's production program under conditions of risk and uncertainty;
• Calculations by types of costs, determination of the cost of production;

11. Learning outcomes (competencies):

LO1	the formation of students' skills in working with computers, with software in making engineering decisions and analyzing projects;
LO2	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;
LO3	Applies dynamic programming methods, elements of queuing systems, inventory management models, simulation methods, optimization methods in solving engineering and economic problems;
LO4	Conducts tabular analysis of factors in engineering and economic calculations, searches, collects, stores and processes information, including computer information, in the field of professional activity.
LO5	Able to present personal judgments on evaluating the economic efficiency of projects using various indicators, arrange in the form of an abstract, presentation and present at laboratory classes, student scientific circles, conferences, etc.
LO6	Assesses the ability to work in small groups, jointly solve engineering and economic calculations in spreadsheets (Excel)

12. Prerequisites: Informatics, Fundamentals of economic theory.
13. Postrequisites: Economics of the pharmaceutical industry, Development of design-estimates documentation and business plan, Undergraduate practice, graduation project.
14. Reference:

1. Ovchinnikov I.D., Lomakina N.S. Economics of engineering solutions. M.: Litres. 2019-111 p.
2. Economy and innovations: textbook / Ekshikeev T. K. - Moscow: GEOTAR-Media, 2019. - 146 p.
3. Krasilnikova L. E., Sysueva E. G., Farenyuk M. S. Economic analysis: textbook / L. E. Krasilnykova, E.G. Sysueva, M.S. Fareniuk; Ministry of Agriculture of RF, federal state. budget organization higher education "Perm state agr. Acad. D.N. Pryanishnikov". - Perm: IPC "Prokrost", 2016. - 257 p.
4. Ivanov I.N. Economic analysis of the activity of the enterprise: Textbook / I.N. Ivanov. - M.: NIC INFRA-M, 2013. - 348 p.

1. Department: «Engineering Disciplines»
2. Level of training: Bachelor
3. Specialty: 6B07201- Technology of Pharmaceutical Production
4. Course: 3
5. Number of credits - 5

6. Name of elective discipline: "Computer-engineering graphics in design"

7. Purpose: Study of the theoretical foundations and the acquisition of knowledge, skills in the automated preparation of drawing and design documents using the AutoCAD graphic system.

8.The content of the discipline: Computer graphics and its scope. The concept of CAD (computer-aided design). AutoCAD system start dialog. Ways to build a three-dimensional model. 3D visualization. Commands for editing three-dimensional objects. Clipping part of a three-dimensional model. Geometric drawing. Co-stresses. Bias Projection drawing. Types of projections.

9. Tasks:

- Familiarization with the goal, main tasks, content, theoretical foundations and principles of computer graphics implementation, in relation to computer-aided design and preparation of drawing and design documentation on a personal computer;
- Studying the basics of automated preparation of the graphic part of design documents in AutoCAD;
- The acquisition of knowledge and skills in the automated execution, editing and design of product images in drawings;
- Acquisition of skills in the automated preparation of product drawings and creation of their 3-dimensional models, also formation of drawing files and their output to printer or plotter.

10. Justification of the choice of discipline: bachelors studying in the trajectories "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on EP 6B07201-Technology of pharmaceutical production should perform the following types of professional activities:

• use of the computer design program of pharmaceutical enterprises and large pharmaceutical productions;
• performing the simplest operations in the AutoCAD environment;
• application of the nomenclature of parts and components of various mechanisms and machines, capable of being used in the pharmaceutical industry;
• implementation of technological schemes using a computer program

.

11.Learning outcomes (competencies):

LO 1	Demonstrates knowledge of basic principles of organization and computer design of pharmaceutical enterprises and large pharmaceutical productions.
LO 2	Performs simple operations in the AutoCAD environment, modern CAD systems.
LO 3	Knows the nomenclature of parts and assemblies of various mechanisms and machines, using in the pharmaceutical industry.
LO 4	Conducts analysis of transitional processes, conducts search, collection, storage and processing of information, including computer information, in the field of professional activity. A student of the production technology of pharmaceutical production demonstrates knowledge of the implementation of technological schemes using a computer program
LO 5	Demonstrates knowledge of manufacturing technology of parts and structures in accordance with GOST, TC, etc. Knows the technical terminology used in the pharmaceutical industry, knows the nomenclature of parts and components of various mechanisms and machines. used in the pharmaceutical industry.
LO 6	Assesses ability to work in small groups and solve problems together.
LO 7	Able to provide students / teachers with their knowledge and skills in planning and conducting laboratory work, explain the observed facts and phenomena, their cause-and-effect relationships, methods for conducting scientific research in the field of computer and engineering graphics when designing, reading assembly drawings, working drawings of parts demonstrates knowledge of execution, can determine the projections of the parts included in it with the help of a computer program.

12. Prerequisites: Information and communication technologies, Descriptive geometry.
13. Post requisites: Fundamentals of design and illumination of production.
14. Reference

1. Tanenbaum, E. S. Computer systems. 2-part. Study guide Almaty: Association of Kazakhstan Higher Educational Institutions, 2014 - 532 p.
2. Tanenbaum, E. S. Computer systems. Part 1. Study guide Almaty: Association of Kazakhstan Higher Educational Institutions, 2013 - 552 p.
3. Musalimov T.K., Shashtygarin M., Akhmetov E., Kolbatyr S., Algartova G. - Drawing and descriptive geometry. Textbook Nur-Sultan: Tome, 2019.-360 p.
4. Nabi Y.A. Collection of tasks and tasks on descriptive geometry and engineering graphics [Text] / Y.A. Nabis; Ministry of Education and Science of the Republic of Kazakhstan. - Almaty: Bastau, 2011. - 200 p.

1. Department: Technologies of pharmaceutical production
2. Training level: bachelor's
3. Specialty: 6B07201- Technology of pharmaceutical production
4. Course: 3
5. Name of the elective discipline: Modeling of chemical-technological processes
6. Amount of credits - 6
7. Target: "Modeling of chemical-technological processes" is to develop a mathematical model and implementation the identification process of automated technological process (TP), and the main task model building based on observations, which was one of the main tasks of the theory of auto-nomic control.
8. The content of the discipline:
Mathematical methods of modeling of chemical-technological process. Optimal process control problems. Determination of the parameters of the regression model. characteristics of the object. Basic methods of working with the program ChemCad. Construction of a model of chemical reaction kinetics using experimental data
9. Tasks: In the course of mastering the discipline "Modeling of chemical and technological processes", students should study the following.
Classification of models and types of modeling; examples of models of communication and telecommunications systems; stages of mathematical modeling; principles of construction and basic requirements for mathematical models of systems; goals and objectives of research of mathematical models of systems; General scheme of mathematical models development; formalization of the system functioning process; construction of mathematical models of objects and systems based on experimental data; structural and parametric identification; methods of construction of static and dynamic models of control objects; criteria and indicators of identification quality; identification methods; conditions for object identifiability; structural identification; General assessment scheme, software tools for modeling objects and systems.
10. Justification of the choice of discipline: bachelors studying in the trajectories "maintenance of technological equipment of pharmaceutical production" and "design of pharmaceutical production" on EP 6B07201-Technology of pharmaceutical production should perform the following types of professional activities:
• creation of model based on the results of control for the transition to automatic production control;
• application of basic methods and algorithms of modeling and comparison;
• conducting scientific and industrial research in the field of identification and modeling of technical systems;
• reasonable use of modeling methods and algorithms;
• conducting research and processing the results in order to obtain mathematical models within the framework of the process of designing and creating control systems for various physical natural objects;
• use of computer technologies for the implementation of the developed or mastered modeling and

identification algorithms.

11. Learning outcomes (competencies):

LO1	Demonstrates knowledge of mathematical models of pharmaceutical production
LO2	Knows the simplest operations in the ChemCad environment
LO3	Knows how to model specific CTP devices
LO4	Knows how to determine the adequacy of a mathematical model to a real object
LO5	Owns the basic principles of modeling chemical-technological processes, selects a mathematical model for individual devices of chemical production
LO6	Analyzes the effectiveness of the application of modeling and optimization of CTP
LO7	Able to transfer to students / teachers / examiners own knowledge and skills in planning and conducting laboratory work, explain the observed facts and phenomena, their cause-and-effect relationships, methods for conducting scientific research in the field of automation and control of chemical and technological processes, knowledge on the development and implementation of innovative technologies in the field of automation and control

12. Prerequisites: Mathematics I, Mathematics II, Information and communication technologies.
Related disciplines: Computer technology in engineering and economic calculations.
13. Post-requisites: Fundamentals of design and equipment of pharmaceutical industries, Special technology of drug and fundamentals of pharmacology.
14. Reference

1. Automatic control in the chemical industry: textbook for universities. Ed. Dudnikova E.G. -M.: Chemistry, 2017. -368 p.
2. Stephanie E.P. Fundamentals of building automated process control systems: - M .: Energy, 2015. - 352 p.
3. Tsirlin A.M. Optimal process control. - M:. Energo pub., 2011. 400 p.
4. Vasilkov Yu.V., Vasilkova N.N. Computer technology computing mathematical modeling: tutorial. - M: Finance and statistics, 2017 - 265 p.
5. Yarmukhamedova Z.M. Physico-chemical foundations and mathematical models of typical technological processes: Textbook for universities. - Almaty: KazNTU, 2020. 163 p.
6. Olson G., Piani D.Digital automation and control systems. - St. Petersburg: Nevsky dialect, 2021. -557 p.
7. Mathematical modeling of chemical-technological systems using the ChemCad program: Teaching aid / Kazan. state those. un-t. Comp.: N.N. Ziyatdinov, T.V. Lapteva, D.A. Ryzhov. -Kazan, 2018. - 160 p.

1. Department: «Engineering Disciplines»
2. Level of training: Bachelor
3. Specialty: 6B07201- Technology of Pharmaceutical Production
4. Course: 3
5. Number of credits - 5
6. Name of elective discipline: “Computer-engineering graphics in design”
7. Purpose: Study of the theoretical foundations and the acquisition of knowledge, skills in the automated preparation of drawing and design documents using the AutoCAD graphic system.
8.The content of the discipline: Computer graphics refers to disciplines that provide fundamental knowledge that is necessary for the acquisition of knowledge, skills and abilities for the automated execution of coursework and projects in the study of technical and special disciplines, as well as for the automated solution of design, engineering, technological and operational tasks in practice using computer technology and information technology.
9. Tasks: mastering the theoretical foundations of electrical engineering, electronics and electrical equipment;
- Familiarization with the goal, main tasks, content, theoretical foundations and principles of computer graphics implementation, in relation to computer-aided design and preparation of drawing and design

documentation on a personal computer;
- Studying the basics of automated preparation of the graphic part of design documents in AutoCAD;
- The acquisition of knowledge and skills in the automated execution, editing and design of product images in drawings;
- Acquisition of skills in the automated preparation of product drawings and creation of their 3-dimensional models, also formation of drawing files and their output to a printer or plotter.

10. Justification of the choice of discipline. Bachelors in specialty 6B07201-Technology of pharmaceutical production of trajectories "Maintenance of technological equipment" should perform the following professional activities:
manufacture of finished medicines in accordance with the requirements of regulatory documents and GMP standards;
• implementation of step-by-step quality control of pharmaceutical products;
• organization of the technological process for the production of finished drugs;
• pharmaceutical process control;
• implementation of technical control of the production process;
• conducting feasibility study of chemical and pharmaceutical production;
• quality control and standardization of finished medicines;
• organization and provision of incoming control of raw materials and materials in accordance with the requirements of regulatory documentation.

11.Learning outcomes (competencies):

LO1.	Demonstrates knowledge of the basic principles of computer-aided design and organization of pharmaceutical enterprises and large pharmaceutical industries.
LO2.	Performs simple operations in the AutoCAD environment, modern CAD systems.
LO3.	Knows the nomenclature of parts and assemblies of various mechanisms and machines. used in the pharmaceutical industry.
LO4.	Analyzes transient processes, searches, collects, stores and processes information, including computer information, in the field of professional activity. The study of pharmaceutical production technology using a computer program demonstrates knowledge of the implementation of technological schemes.
LO5.	GOST, TU, etc. owns the technology for manufacturing the corresponding parts and structures, owns the technical terminology used in the pharmaceutical industry. knows the nomenclature of parts and assemblies of various mechanisms and machines. used in the pharmaceutical industry.
LO6.	It assesses the ability to work in small groups and solve problems together.
LO7.	Able to provide students / teachers with their knowledge and skills in planning and conducting laboratory work, explain the observed facts and phenomena, their cause-and-effect relationships, methods for conducting scientific research in the field of computer and engineering graphics when designing, reading assembly drawings, working drawings of parts demonstrates knowledge of execution, can determine the projections of the parts included in it with the help of a computer program.

12. Prerequisites: Information and communication technologies, Descriptive geometry.
13. Post requisites: Fundamentals of design and illumination of production.
14. Reference
Main:
1. Tanenbaum, E. S. Computer systems. Part 2 Almaty: 2014 y. - 532 pages.
2. Tanenbaum, E. S. Computer systems. Part 1 Almaty: 2013y. - 552 pages.
additional:

3. Musalimov T.K., Kolbatyr S.A., Algartova G.M. Association of Kazakhstani Universities 2013, Textbook on computer graphics and descriptive geometry
4.Nabi Y.A. Publisher: Almaty 2018, Collection Collection of tasks for drawing geometry and engineering graphics

1. Department: Pharmaceutical Production Technologies
2. Level of training: Bachelor's degree
3. Specialty: 6B07201-Pharmaceutical production technology
4. Course: 3
5. Name of the elective discipline: "Development of design and estimate documentation and business plan»
6. Number of credits: 5
7. Purpose: to give the student the basics of business planning and drawing up design and estimate documentation for solving problems: the student must acquire knowledge and skills in preparing and solving engineering and economic problems in business; get acquainted with the basic mathematical methods for solving problems.
8. The content of the discipline: Fundamentals of Marketing. Study of the pharmaceutical industry market. SMART goal setting. Business idea evaluation. Market analysis. SWOT analysis. Preparation of design and estimate documentation. Feasibility study, calculation and analysis of predicted technical and economic indicators. The main sections of the business plan. Methodology for compiling a business plan for pharmaceutical companies. Project summary. Description of the product or service. Organizational and managerial plan. Development of a financial plan. Defense and presentation of the business plan.
9. Tasks:
- acquire skills in the functional responsibilities of the designer, the use and completion of the necessary documentation;
- using regulatory and technical documents to design the overall structure of the workshop, and the traffic flows in it.
10. Justification of the choice of discipline: Bachelors in the specialty 6B07201-Technology of pharmaceutical production trajectories "Maintenance of technological equipment" must perform the following types of professional activities •
• Analysis of the market and the pharmaceutical industry
• Determination of the procedure for development, approval, approval and composition of design documentation for construction
• Choice of tax regime.
• Calculation of taxes, socio-economic effect and analysis of project risks
• Carrying out financial calculations in Excel. Drawing up a financial model of a business plan
• Preparation of pre-project documentation containing the main initial data with descriptions of the purpose of investment
• Justification of investment efficiency, including: expected economic, social and commercial effect from the operation of the facility
• Description of the production and technological process
• Information about the main technical and technological parameters of the construction object and calculations with the determination of the technical and economic indicators of the object
• Forecast of sales volumes, balance of cash costs and receipts
• Calculation of fixed and variable costs
• Determination of product profitability, types of project risks
• Types and methods of risk reduction
11. Learning outcomes (competencies):

LO 1	Knows the basic concepts and terms, features of the development of design and estimate documentation and a business plan in the field of pharmaceutical production
LO 2	Knows the methodology for developing a business plan and the mechanism for obtaining permits for the construction, operation and technical conditions for the infrastructure of enterprises, accounting for costs and profits in the field of pharmaceutical production, as well as measures of state support for SMEs
LO 3	Able to draw up a marketing, organizational and managerial, production, technological and financial plan for pharmaceutical production, as well as a predictive calculation of design estimates
LO 4	Able to process information for further application in the field of pharmaceutical production, demonstrates knowledge of searching, collecting, storing and processing information for scientific purposes and professional activities.
LO 5	Assesses the ability to work in small groups, jointly solve tasks. setting SMART goals, evaluating business ideas and analyzing the market.
LO 6	Able to present personal judgments, arrange in the form of an abstract, presentation and present at laboratory classes, student scientific circles, conferences, etc.
LO 7	Able to transfer to students / teachers / examiners own knowledge and skills in planning and conducting practical work, explain the observed facts and phenomena, their cause-and-effect relationships, methods of conducting scientific research in the field of economics and finance with chemical and technological processes, knowledge on the development of design estimates documentation and business plan in the field of pharmaceutical production

12. Prerequisites: Basics of economic theory

13. Postrequisites: economics of the pharmaceutical industry, marketing and management of the pharmaceutical industry, undergraduate practice

14. Basic literature:

1. Civil Code of the Republic of Kazakhstan;
2. The Law of the Republic of Kazakhstan "On Taxes and Other Mandatory Payments to the Budget" (Tax Code) (as amended.
3. The Law of the Republic of Kazakhstan "On Private Entrepreneurship" (with amendments.
4. Law of the Republic of Kazakhstan № 377-IV of January 6, 2011 " On State Control and Supervision in the Republic of Kazakhstan»
5. Zhuldyzbayev N.E. Fundamentals of entrepreneurship.Educational and methodical manual.- Shymkent: 2015-132 pages
6. A. Abdirova, partner of "SRATA" Law Firm, member of the Chamber of Tax Consultants of the Republic of Kazakhstan, expert of the "Accountant" IP system/ Memo for an individual entrepreneur/ Yurist Publishing House, Almaty, 2015
7. Dilara Baykanova. How to work properly in the field of public procurement. Methodological guide. ALBAGROUP LLP/http: //gzakupki.kz
8. User's guide to obtaining the registration certificate of the NUCRC. / portal of electronic government e-gov.kz
9. On amendments and additions to some legislative acts of the Republic of Kazakhstan on State property issues/Law of the Republic of Kazakhstan № 414-IV of March 1, 2011
10. The Law of the Republic of Kazakhstan of January 6, 2011 "On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on issues of State control and supervision. two thousand fifteen
11. On public procurement / Law of the Republic of Kazakhstan dated July 21, 2007 N 303-II
12. Express course of entrepreneurship. FRP "Damu" 2014
13. Zhakenova, S.R. Bitenova. - Karagandy: АҚҢҰR, 2019. - 236 bet p.
14. Dzhakupova, D.Y.Fundamentals of Entrepreneurship: training manual Основы

предпринимательства: учебное пособие/D.Y.Dzhakupova-Ministry of Education and Science Republic of Kazakhstan. - Almaty : Bastau, 2018. - 296 p
15. Котлер, Ф. Маркетинг негіздері Principles of Marketing: оқулық/Ф.Котлер, Г.Армстронг; Қаз.тіл.ауд.Б.Абдулхалим.-17-басылым-Алматы: Ұлттық аударма бюросы, 2019-736 бет. с.: (Рухани Жаңғыру).
16. Хилл, Ч. Халықаралық бизнес:Жаһандық нарықтағы бәсеке [Мәтін] = International Business:competing in the global marketplace : оқулық / Ч. Хилл,Т. Халт ; Қаз.тіл.ауд.А.Алманова [және т.б.]. - 12-басылым. - Алматы : Ұлттық аударма бюросы, 2019. - 720 бет. с. : (Рухани Жаңғыру)
17. Гриффин, Р. Менеджмент [Мәтін] = Management : оқулық / Р. Гриффин ; Қаз.тіл.ауд. Г.А. Абдуллина [және т.б.]. - 12- басылым. - Алматы : Ұлттық аударма бюросы, 2018. - 768 б. с. : сур.- (Рухани жаңғыру).
18. Бове, К. Қазіргі бизнес-коммуникация [Мәтін] = Business communication today : оқулық / К.Л. Бове, Д.В.Тилл ; Қаз. тіл ауд А. Куанышбекова [және т.б.]. - 14-ші бас. - Алматы : Ұлттық аударма бюросы, 2019. - 736 бет. с. : (Рухани жаңғыру)
19. Арыстанов Ж.М. Менеджмент и маркетинг в фармации: учебное пособие/Ж. М.Арыстанов, А. Т.Токсеитова.-Алматы:Эверо, 2016.-532с
20. Шертаева, К. Д. Фармацевтикалық маркетинг :оқулық / К. Д. Шертаева, К. Ж. Мамытбаева ; ҚР денсаулық сақтау және әлеуметтік даму министрлігі. ОҚМФА. - Шымкент : [б. и.], 2016. - 152 б. с.
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22. Шертаева, К. Д. Фармацевтический маркетинг: учебник / К. Д. Шертаева ; М-во здравоохранения РК; Респ. центр инновационных технологий мед. образования; ЮКГФА. - Шымкент : Б., 2012. - 152 с.
23. Арыстанов, Ж. М. Фармация саласындағы менеджмент негіздері: практикум / Ж. М. Арыстанов. - ; Кітапты ОҚММА орталық әдістемелік кеңесі бекіткен. - Алматы : Эверо, 2012. - 156 бет. с.
24. Шертаева, К. Д. Фармацевтикалық маркетинг [Электронный ресурс] : оқулық / К. Д. Шертаева, К. Ж. Мамытбаева ; ҚР денсаулық сақтау және әлеуметтік даму министрлігі. ОҚМФА. - Электрон. текстовые дан. - Шымкент : [б. и.], 2016. - эл. опт. диск (CD-ROM)(
25. Аскарова, Жанар Аккаловна Бизнесті бағалау [Мәтін] : оқу құралы / Ж. А. Аскарова; Әл-Фараби атын. ҚазҰУ. - Алматы : Қазақ ун-ті, 2019. - 221 б. - 100 (таралым) http://elib.kaznu.kz
26. Бизнесті ұйымдастыру [Мәтін] : оқу құралы / Н. Әліпбеков [және т.б.]. - Толықт., өңд. 3-бас. - Астана : Фолиант, 2016. - 195 б.) http://elib.kaznu.kz
27. Бове, Куртланд Л.Қазіргі бизнес-коммуникация = Business Communication Today : монография / К. Бове, Д. Тилл ; [ауд. А. Қуанышбекова ; жауапты шығ. М. Бисенбаева]. - 14-бас. –
28. Алматы : "Ұлттық аударма бюросы" ҚҚ, 2019. - 735 б.) http://elib.kaznu.kz
29. Мартынов, Денис Создай СВОЙ бизнес [Текст] : Советы для эффективного бизнеса и счастливой жизни / Д. Мартынов. - СПб. : Весь, 2016. - 263, [3] с http://elib.kaznu.kz

1. Department: Pharmaceutical Production Technologies
2. level of education: bachelor's degree
3. Name of the educational program: 6B07201-pharmaceutical production Technology
4. Course: 3
5. Name of the elective discipline "Manufacturing technology of drugs»
6. Number of credits: 6
7. Objective: To study the theoretical foundations and acquire professional skills for the preparation of dosage forms in production conditions, taking into account the intermediate links of general engineering and profile disciplines, step control, biopharmaceutical evaluation, improvement and development of new dosage forms with effective therapeutic activity. Responsibilities: it consists in simultaneously ensuring the convenience of employees and their working capacity, minimal elimination of their injuries or diseases.

8. The content of the discipline: Classification of finished dosage forms (DF). Industrial production of solid dosage forms Industrial production of sterile dosage forms - GMP requirements for production facilities. Industrial production of soft dosage forms. Biopharmacy as an integral part of drug technology. pharmaceutical factors. Applied value of biopharmaceutical research.

9. Tasks:

- get acquainted with the general technological concepts and terms, as well as the classification of finished dosage forms (FDF);
- to master the theoretical foundations of the production process of FDF;
- master modern special equipment for technological processes,
- master the methods and techniques of stage-by-stage control of the technological process,
- to master the methods and techniques of standardization and quality assessment of FDF and semi-finished products;
- to master the methods and techniques of biopharmaceutical analysis of FDF.

10. Justification of the choice of discipline:

- familiarization with general technological concepts and terms, as well as the classification of finished dosage forms (FDF) ;
- Mastering the theoretical foundations of the FDF production process;
- mastering of modern equipment for technological processes;
- mastering modern methods and techniques of step control during the technological process;
- Mastering modern methods and techniques for standardization and quality assessment of DDT and intermediates;
- Mastering modern methods and techniques of biopharmaceutical evaluation of DDT.

According to the state standard of the Republic of Kazakhstan, the content of this discipline includes a full course of biopharmaceuticals. Biopharmaceuticals are the final part of drug technology. This science justifies the biopharmaceutical aspects of improving known drugs and studying new dosage forms that have maximum therapeutic effectiveness with minimal side effects.

11. learning outcomes (competencies):

LO1	Demonstrates the basic technological concepts and terms of industrial production of FDF, regulatory documentation, classification and properties of excipients permitted for use in the production of FDF in the Republic of Kazakhstan and theoretical patterns of drug production.
LO2	Performs work with literature, electronic databases and computer learning programs, prepares and presents information in various forms (drawings, graphs, diagrams, tables) and on various media (paper, electronic version), including in the form of presentations in classes, scientific clubs, seminars.
LO3	Conducts the selection of explosives in the production of FDF, the calculation of the initial components for the preparation of tableted, ampouled and other FDF, the choice of technological equipment for the production of a particular type of FDF, the choice of machines and apparatus for their filling and packaging.
LO4	Able to collect and interpret information on the substantiation of the nature and quantity of excipients in the production of FDF and arrange it in the form of a technological and instrumental scheme and present it at laboratory classes, conferences, seminars, etc.
LO5	Assesses the ability to work in small groups, jointly solve tasks.
LO6	Able to transfer to students / teachers / examiners and other interested parties own knowledge and skills in planning and conducting laboratory work, explain the observed facts and phenomena, their cause-and-effect relationships, methods of conducting scientific research in the field of pharmaceutical production

12. Prerequisites:: "processes and devices of chemical and pharmaceutical production 1-2", "technology of extraction preparations", Production practice

13. Postrequisites: Special drug technology and pharmacology basics, Filling and packaging machines for dosage forms, Good manufacturing practice and zero waste principles. Pre-graduate practice, writing and defending a thesis

14. Literature:

1. Gavrilov, A. S. Pharmaceutical technology. Manufacturing of drugs [Text]: textbook / A. S. Gavrilov. - 2nd ed., revised. ; Ministry of Education and Science of the Russian Federation. Rec. GBOU VPO "First Moscow State Medical University named after I.M. Sechenov". - M. : GEOTAR - Media, 2016. - 760 p.
2. Kazakhstan Republic synnyn memlekettik pharmacopeias. T. 3: monograph / ҚR densaulyқ saktau ministerligi. - 1-bass; ҚR Densaulyk saktau ministerinin buyrygymen bekit. - Almaty: Zhibek Zholy, 2014. - 864 bet. WITH
3. State Pharmacopoeia of the Republic of Kazakhstan. V. 3 [Text]: monograph / Ministry of Health of the Republic of Kazakhstan. - 3rd ed. ; Approved by order of the Ministry of Health of the Republic of Kazakhstan. - Almaty: Ed. house "Zhibek Zholy", 2014. - 872 p.
4. Sagyndykova B.A. Darilerdin andiristik tekhnologiyasy. - Almaty. - 2011. - 346 b.
5. Torlanova B.O. Machines and automatic machines for filling and packaging dosage forms. - Shymkent. - 2013-166 p.
6. Pharmaceutical technology. Technology of dosage forms: Textbook. / I.I. Krasnyuk, G.V. Mikhailova, T.V. Denisova, V.I. Sklyarenko. - M.: GEOTAR-Media, 2015. - 656 c. http://rmebrk.kz/
7. Technology of finished dosage forms and biopharmacy: Educational and methodological complex for the specialty 5B074800 "Technology of pharmaceutical production". / Comp. E.V. Minaev. - Karaganda: Publishing house of KarSU, 2013. - 86 c http://rmebrk.kz/
8. Kistaubayeva, Aida Serikkyzy Ondiristik biotechnology Negizderi [Matin]: oқu құraly / [ed. Sh. Biekeyeva]; Al-Farabi atyn. KazU. - Almaty: Kazakh un-ti, 2013. - 161, [3] b http://elib.kaznu.kz

1. Department: Engineering disciplines
2. level of education: bachelor's degree
3. Name of the educational program 6B07201-Technology of Pharmaceutical production
4. Course: 4
5. Name of the elective discipline «Labor protection and safety regulation»
6. Number of credits: 5
7. Purpose: Formation of knowledge requirements and regulations "Labor protection and safety regulation" for the preservation of life and health in the process of implementation of training work activities.
8. The content of the discipline:
Normative-legal documents of labor protection and safety. Requirements of safety and labor protection in the design and construction of pharmaceutical enterprises, industrial buildings, industrial, warehouse, ancillary facilities, laboratory control areas, corridors, etc. in accordance with the requirements of the standard GMP. The safety of pharmaceutical process equipment
9. Tasks:
In the conditions of pharmaceutical production, prevention of potential harmful and dangerous effects on employees.
10. Justification of the choice of discipline:
Conducting preventive measures at a pharmaceutical enterprise to protect against potential health and life-threatening factors for employees.

11. Learning outcomes (competencies):

LO1	Demonstrates knowledge of the purpose, scope of application, classification of the main regulatory and technical and legal documents on labor protection, rules of labor protection and technical safety. Conducts risk assessment of production processes and makes independent decisions on choosing

	optimal options for their safety. Able to develop local normative acts related to labor organizations (internal labor regulations, provisions on vacations, provisions on business trips, etc.). Implementation of state policy in the field of labor protection.
LO2	Monitors the implementation of the norms of the Labor Code of the Republic of Kazakhstan, regulatory legal acts and requirements of international standards GMP and ISO for management systems of hygiene and occupational safety. Uses methods of analysis and prevention of traumatism and occupational diseases. Analyzes the impact of harmful substances on the human body. Defines a group of production processes by characterizing the impact. Determines the necessary ventilation for harmful substances in the production premises.
LO3	Normalizes the production microclimate. It sets the basic parameters of the microclimate in the production premises. Provides the required lighting in the production room. Conducts measures to establish the required noise level in the production premises. Provides means of individual protection.
LO4	Organizes measures to ensure electrical safety, fire and explosion safety at chemical and pharmaceutical enterprises. Controls the burning process and implements measures to prevent fires and explosions in production.
LO5	Provides the necessary amount of fire extinguishers. Identifies vessels working under pressure. Updates regulatory and technical documentation regulating the operation of vessels working under pressure.
LO6	Provides security of lifting and transport equipment. It evaluates the degree of radiation impact on the human body. Organizes a complex of actions to protect personnel from exposure.

12. Prerequisites: Technology of extraction preparations, Pharmaceutical biotechnology the basics of Microbiology
13. Postrequisites: Undergraduate practice, graduation project
14. Reference:
1. Panasenko A.I., Buryak V. P., Kremzer A. A. Labor protection in the pharmaceutical industry. - Zaporozhe: ZSMU, 2015. - 102 p.
2. Belyakov G. I. Work safety and safety technology: textbook for applied bachelor's degree. - 3rd ed. - M.: Publishing house Yurayt, 2016. - 404 p.

1. Department: Pharmaceutical Production Technologies
2. Level of training: Bachelor's degree
3. Specialty: 6B07201-Pharmaceutical production technology
4. Course: 4
5. Name of the elective discipline: "Machines and automatic machines for filling and packaging of dosage forms»
6. Number of credits: 6
7. Purpose: to train students in the field of pharmaceutical production technology, to acquaint students with the device and basic principles of operation of machines and automatic machines for packaging dosage forms and medical (and sanitary) products.
8. The content of the discipline: Basic concepts of containers and packaging. Basic requirements Standard requirements for packaging and containers for FDF, special requirements for packaging. Requirements for the external design of the packaging. Special types of packaging. The main machines and automatic machines for filling and packing DF. Ways to solve the problem of complex mechanization and automation of the processes of packaging and packaging of DF.
9. Tasks:
–mastering theoretical and practical issues related to packaging and packaging for medicinal products and

medical devices;
−study of the device and principle of operation, rules of operation of machines and automatic machines for packaging and packaging of finished dosage forms and semi-finished products;
−study of the characteristics of electrical circuits and electrical equipment;
10. Justification of the choice of discipline: Bachelors in the specialty 6B07201-Technology of pharmaceutical production trajectories "Maintenance of technological equipment" must perform the following types of professional activities •
* manufacture of finished medicines in accordance with the requirements of regulatory documents and GMP standards;
* implementation of step-by-step quality control of pharmaceutical products;
* organization of the technological process of production of finished medicines;
• control of the technological process of production of pharmaceutical products;
* implementation of technical control of the production process;
* conducting technical and economic analysis of chemical and pharmaceutical production;
• quality control and standardization of finished medicines;
* organization and provision of input control of raw materials and materials in accordance with the requirements of regulatory documentation.

11. Learning outcomes (competencies):

LO 1	Knows the organization of the technological process of packaging, packaging and labeling of medicines; general and standard requirements for containers and packaging, as well as special (special) requirements for packaging for medicinal products
LO 2	Knows how to choose packaging materials, types of containers, packaging and closures, dosing nozzles, etc., depending on the type of drug being produced. Selection of filling and packaging technological equipment and production conditions
LO 3	Evaluates and interprets the results of studies conducted to improve the technology for the production of dosage forms and their evaluation in a scientific circle, presents the results of the study in the form of an article, reports at scientific conferences
LO 4	Able to transfer to students, interested parties own knowledge and skills in working with information (educational, reference, scientific literature) in the field of production, packaging and packaging of pharmaceutical and medical products

12. Prerequisites: "Processes and devices of chemical and pharmaceutical production 1-2", "Fundamentals of pharmaceutical technology", "Technology of extraction preparations", "Pharmaceutical biotechnology".
13. Postrequisites: "Special technology of medicines and principles of waste-free production", "Control systems of chemical and technological processes", "Labor Protection and Safety", "Fundamentals of design and equipment of production", pre-graduate practice.
14. Literature

1. Baubekov S.Zh. Elektlik mashinalar men apparatus: okulyk.-Evero.2013
2. Gavrilov, A. S. Pharmaceutical technology. Manufacturing of medicines: textbook / - M.: GEOTAR - Media, 2016. - 760 p.
3. Surashov N. T. Koteru-tasymaldau machinalary [Electronic resource]: okulyk/-Electron text data. (7.34Mb).-Almaty: [b.i.], 2016
4. Torlanova B.O. Machines and automatic machines for filling and packaging dosage forms. - Shymkent. - 2003 -166 p.

1. Department: Pharmaceutical Production Technologies
2. Training level: Bachelor's degree

3. Specialty: 6B07201-pharmaceutical production Technology
4. Course: 4
5. Name of elective discipline: "Good manufacturing practices and principles of waste-free production"
6. Number of credits: 6
7. Purpose: "Good manufacturing practices" is to teach students the basic provisions of good practices(GxP), regulatory documents and methodological materials for ensuring the quality of pharmaceutical and medical products.
8. The content of the discipline Good manufacturing practices and principles of waste-free production The concept of good practices in pharmacy. Life cycle of medicinal products (drugs). Methodology of the quality assurance system for medicinal and medical products. Good manufacturing practice (GMP) basic principles. Methodological principles of non-waste/low-waste production. Classification of pharmaceutical industries by type and amount of waste generated. Ways to minimize waste generation, air emissions, hazardous sewers.
9. Tasks:
– mastering the basic concepts and theoretical foundations of the subject methodology;
– history of development of quality systems (quality control, management and quality assurance), the concept of " quality»;
– state regulation in the sphere of circulation of medicinal products (medicines);
– good practices of GCP: GMP, GLP, GPP, GDP;
- validation and certification in the production of pharmaceutical and medical products;
- modern system of registration of medicines.
10. Justification of the choice of discipline:
Bachelors in the specialty 6B07201-technology of pharmaceutical production trajectories "maintenance of technological equipment" must perform the following professional activities:
• manufacturing of finished medicines in accordance with the requirements of regulatory documents and GMP standards;
• implementation of stage-by-stage quality control of pharmaceutical products;
* organization of the technological process of production of finished medicines;
• control of technological process of production of pharmaceutical products;
• implementation of technical control of the production process;
• conducting technical and economic analysis of chemical and pharmaceutical production;
• quality control and standardization of finished medicines;
• organization and provision of input control
11. Learning outcomes (competencies):

LO1	General technological concepts and terms in the field of pharmaceutical technology of drugs, technology of extractive preparations, special drug technology, pharmacology, pharmaceutical biotechnology with the basics of microbiology, good manufacturing practice (GMP) with the principles of waste-free technologies and pharmaceutical analysis of raw materials and materials, intermediates and finished products.
LO2	Theoretical foundations of general pharmacology, drug transport in the body and factors affecting its speed and completeness
LO3	Theoretical foundations (principles, methods, technological methods) for the creation of drugs with prolonged action, drugs with targeted delivery to the target organ and controlled release of the drug
LO4	Theoretical foundations of the biotechnological production of medicinal substances with the participation of microorganisms, tissue culture and working proteins (enzymes), features of the technology, equipment used and methods for isolating target products
LO5	Features of technology and design of age-related (children's and geriatric) dosage forms

LO6	Theoretical foundations (principles, tasks) in the field of creating waste-free production technologies in the pharmaceutical industry and the use of secondary raw materials
LO7	Basic terms and concepts in the field of QA quality assurance, QC quality control, TQM quality management
LO8	GxP - the main provisions of good practices, including GMP - the basic principles of good manufacturing practice
LO9	Rules of labor protection, industrial sanitation and safety.

12. Prerequisites: Industrial technology of medicines, technology of extraction preparations
13. Postrequisites: pre-graduate practice, writing and defense of diploma projects/works**.**
14. Literature

1. Pharmaceutical technology. Macromolecular compounds in pharmacy and medicine: textbook / ed. I. I. Krasnyuk. - M. : GEOTAR - Media, 2016. - 560 p.
2. State Pharmacopoeia of the Republic of Kazakhstan. Vol. 3. – Almaty: Zhibekzholy Publishing House, 2014–872 p.
3. Kazakhstan Republic synnyn memlekettik pharmacopeias. T. 3: monograph / ҚR densaulyқ saktau ministerligi. - 1-bass; ҚR Densaulyk saktau ministerinin buyrygymen bekit. - Almaty: Zhibek Zholy, 2014. - 864 bet. WITH
4. Dzhumabekova, M. S. Organization of the technological process for the production of dosage forms according to the requirements of GPP [Text]: dis. ... for the academic degree of Master of Health / M. S. Dzhumabekova. - Shymkent, 2018. - 77 p. + el.opt.disk (CD-ROM)
5. Pharmaceutical technology. Manufacture of medicinal preparations: textbook / Loyd V. Allen, A.S. Gavrilov. – M.: GEOTAR – Media, 2014. – 512 p
6. Orekhov S.N. Pharmaceutical biotechnology. Guide to practical exercises: study guide. / Ed. V.A. Bykov, A.V. Katlinsky.-2013. -384s.:ill. -ISBN978-5-9704-2499-5.
7. Orekhov S.N. Pharmaceutical biotechnology. [Electronic resource] - M.: GEOTAR-Media, 2013. - 384 p. - ISBN 978-5-9704-2499-5 - Access mode: http://www.studentlibrary.ru/book/ISBN9785970424995.html
8. Pharmaceutical chemistry [Electronic resource]: textbook / ed. T. V. Pletneva. - Electron. text data. (). - M. : GEOTAR - Media, 2017.
9. Intykov, T.S., Pak, I.A. Organization of production and enterprise management: Electronic textbook. . - Karaganda: KSTU, 2013. http://rmebrk.kz/
10. Chausova, T.A. and others. Technology of modern production: Electronic textbook. / T.A. Chausova, Yu.A. Bakina, O.A. Dick. - Karaganda: KSTU, 2017. http://rmebrk.kz/
11. Taikulakova, G.S. Economics and organization of production: Textbook. / Association of universities of the Republic of Kazakhstan. - Almaty: Print-S, 2012. - 477c.http://rmebrk.kz/

1. Department: Pharmaceutical Production Technologies
2. Training level: Bachelor's degree
3. Specialty: 6B07201-pharmaceutical production Technology
4. Course: 4
5. Name of elective discipline: "The special technology of drugs and the basics of pharmacology»
6. Number of credits: 5
7. Purpose: to study the theoretical foundations and acquire professional skills and skills for the preparation of age-related dosage forms, long-acting drugs in the factory, with directed delivery of the drug to the target organ, with a controlled release rate, to improve known and create new dosage forms with high effective therapeutic activity and safety, taking into account intersubject links with specialized and General engineering disciplines.

8. The content of the discipline Achievements of modern pharmaceutical science in the field of creating separate groups of drugs - pediatric, geriatric, with prolonged action, with targeted delivery of drugs to the target organ, with controlled release of drugs in the body. Fundamentals of pharmacology. The value of pharmacology in the process of creating new drugs. Principles of drug classification. The concept of pharmacokinetic and pharmacodynamics of drugs. Applied value of pharmacokinetic research for the industrial production of drugs.

9. Tasks:

- get acquainted with General technological concepts and terms in the field of special medicine technology;
- master the theoretical foundations (principles, methods, technological techniques) of creating long-acting drugs;
- master the basic principles, methods and technological techniques for ensuring the stability of medicines and substances;
- to study modern achievements in the field of creating medicines with targeted delivery of a medicinal substance,
- to study modern achievements in the field of creating medicines with controlled release of a medicinal product;
- to master the features of technology and design of age-related (children's and geriatric) forms;
- to master the theoretical foundations (principles, tasks) in the field of creating waste-free production technologies in the national economy, including in the pharmaceutical industry in the production of extraction preparations, adhesive plaster, packaging materials, etc.;
- principles of using secondary raw materials;
- to master the maximum permissible concentrations of harmful emissions into the atmosphere, harmful waste and solid waste;
- to develop technological equipment to collect the dust fraction in the pharmaceutical industry, etc.

10. Justification of the choice of discipline: Bachelor's degree in 6b07201-pharmaceutical production technology trajectory "design of pharmaceutical production" must perform the following professional activities:

• development of technical specifications for the design of new and modernization of existing technologies, technological processes, technological lines or technological equipment;

* development of technological regulations for the production of ready-made medicines (laboratory, experimental, industrial, standard);

• development of design and estimate documentation in the production of pharmaceutical and medical products;

* analysis and evaluation of alternative versions of the technological process and individual stages using mathematical models;

* provision and participation in commissioning.

11. Learning outcomes (competencies):

LO1	Demonstrates knowledge of the principles of prolongation, technology and features of the preparation of drugs of prolonged action, principles, chemical physico-chemical and technological methods for ensuring the stability of drugs and medicinal substances.
LO2	Performs technological methods of prolonging the action and ensuring the stability of drugs.
LO3	He owns the basic principles of methods and technological methods for ensuring the stability of medicines and substances, modern achievements in the field of creating medicines with targeted delivery of a medicinal substance.
LO4	Conducts analysis, collection and interpretation of information on the justification of technological methods and methods used in the production of age-related dosage forms, long-acting drugs, to ensure the stability of drugs and their substances, etc.

LO5	Able to prepare and present information in various forms (drawings, graphs, diagrams, tables) and on various media (paper, electronic version), including in the form of presentations in classes, scientific circles, seminars.
LO6	Assesses the ability to work in small groups, jointly solve tasks.
LO7	Able to transfer to students / teachers / examiners own knowledge and skills in planning and conducting laboratory work, explain the observed facts and phenomena, their cause-and-effect relationships. To other interested parties, knowledge on the development and implementation of innovative technologies in the field of pharmaceutical production.

12. Prerequisites:: "Processes and devices of chemical and pharmaceutical production", "Fundamentals of pharmaceutical technology", "technology of extraction preparations", "Pharmaceutical biotechnology", "Technology of finished dosage forms and biopharmaceutical".

13. Postrequisites: pre-graduate practice, master's degree courses in the specialty "Technology of pharmaceutical production".

14. Literature:

1. Gavrilov, A. S. Pharmaceutical technology. Manufacturing of drugs [Text]: textbook / A. S. Gavrilov. - 2nd ed., revised. ; Ministry of Education and Science of the Russian Federation. Rec. GBOU VPO "First Moscow State Medical University named after I.M. Sechenov". - M. : GEOTAR - Media, 2016. - 760 p.
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3. State Pharmacopoeia of the Republic of Kazakhstan. V. 3 [Text]: monograph / Ministry of Health of the Republic of Kazakhstan. - 3rd ed. ; Approved by order of the Ministry of Health of the Republic of Kazakhstan. - Almaty: Ed. house "Zhibek Zholy", 2014. - 872 p.
4. Sagyndykova B.A. Darilerdin andiristik tekhnologiyasy. - Almaty. - 2011. - 346 b.
5. Torlanova B.O. Machines and automatic machines for filling and packaging dosage forms. - Shymkent - 2013 -166 p.
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7. Technology of finished dosage forms and biopharmacy: Educational and methodological complex for the specialty 5B074800 "Technology of pharmaceutical production". / Comp. E.V. Minaev. - Karaganda: Publishing house of KarSU, 2013. - 86 c http://rmebrk.kz/
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10. State Pharmacopoeia of the Republic of Kazakhstan. V. 3 [Text]: monograph / Ministry of Health of the Republic of Kazakhstan. - 3rd ed. ; Approved by order of the Ministry of Health of the Republic of Kazakhstan. - Almaty: Ed. house "Zhibek Zholy", 2014. - 872 p.
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15. Stickieeva R.K. Pharmacology-1. Textbook, Karaganda.-АҚҢҰР.-2014.-132 p. https://aknurpress.kz/login

1. Department: Pharmaceutical Production Technologies
2. Training level: Bachelor's degree
3. Specialty: 6B07201-pharmaceutical production Technology
4. Course: 4
5. Name of the elective discipline: "Chemical and pharmaceutical process control systems (automation)"
6. Number of credits: 6
7. Purpose: the Main Purpose of the course "chemical and technological process control System" is to teach students the skills and methods of building modern automated chemical and technological process control systems for the production of ready-made medicines.
8. The content of the discipline Structure and functioning of software and hardware complex of automation system. Automatic measuring systems. Types of automatic control systems. General information on industrial automatic control systems in the field of manufacturing technology of fishing lines. Modern software of APCS of chemical and pharmaceutical industries.
9. Tasks:
- improving the technology of medicines with the use of modern automated control systems for technological processes and devices;
- construction of automated control systems for chemical and pharmaceutical productions.
10. Justification of the choice of discipline: Bachelor's degree in 6b07201-pharmaceutical production technology trajectory "design of pharmaceutical production" must perform the following professional activities:
• development of technical specifications for the design of new and modernization of existing technologies, technological processes, technological lines or technological equipment;
* development of technological regulations for the production of ready-made medicines (laboratory, experimental, industrial, standard);
• development of design and estimate documentation in the production of pharmaceutical and medical products;
* analysis and evaluation of alternative versions of the technological process and individual stages using mathematical models;
* provision and participation in commissioning.
11. Learning outcomes (competencies):

PO1	Demonstrates the knowledge required for automated systems of pharmaceutical production, the basic principles for the selection and justification of technical means of automation.
PO2	Performs the simplest operations in the LabVIEW environment, modern software for ACS XTP and industrial controllers.
PO3	Owns the basic principles of control and modeling of chemical-technological processes, selects a mathematical model for individual devices of chemical production.
PO4	Conducts analysis of transient processes, searches, collects, stores and processes information, including computer information, in the field of professional activity.
PO5	Able to present personal judgments on the automated control system of the chemical-technological process, issue it in the form of an abstract, presentation and present it at laboratory classes, student scientific circles, conferences, etc.
PO6	Assesses the ability to work in small groups, jointly solve tasks.

PO7	Able to transfer to students / teachers / examiners own knowledge and skills in planning and conducting laboratory work, explain the observed facts and phenomena, their cause-and-effect relationships, methods for conducting scientific research in the field of automation and control of chemical and technological processes, knowledge on the development and implementation of innovative technologies in the field of automation and control.

12. Prerequisites:**:** Mathematics, Electrical engineering fundamentals of industrial electronics and electrical equipment, Modeling of chemical and technological processes.
Related disciplines: Machines and automatic machines for filling and packaging of dosage forms, The basics of designing and equipping production, Technology of finished dosage forms and biopharmacy
13. Postrequisites: Disciplines of the magistracy
14. Literature

1. Arystanbaev K.E., Mambaeva A.M. Chemistry and technology
2. Arystanbaev, K. E. Control systems for chemical and technological processes [Text]: textbook / K. E. Arystanbaev, A. B. Zhumabekova, A. A. Umarov. - Almaty : Evero, 2020. - 128
3. Krasnov, E. A. Pharmaceutical chemistry in questions and answers [Text]: textbook / E. A. Krasnov, R. A. Omarova, A. K. Boshkaeva. - ; Ministry of Education and Science of the Russian Federation. Rec. GBOU VPO "First Moscow State Medical University named after I.M. Sechenov". - M. : "Litterra", 2016. - 352 p.
4. Krasnov, E. A. Pharmaceutical chemistry surақtar men zhauaptar turinde [Matin]: oқu құraly = Pharmaceutical chemistry in questions and answers: textbook / E. A. Krasnov, R. A. Omarova, A. K. Boshkaeva ; kaz. tel. room J.K. Smailova. - M. : GEOTAR - Media, 2016. - 704 p.
5. Schwab, Klaus Tortinshi industrial revolution [Matin]: oқulyқ / Schwab Klaus; Kazakh.til.aud. N.B. Aқysh [zhane t.b.]. - Almaty: Ulttyk audarma bureaus, 2018. - 200 b. With. : (Rukhani zhangyru)
6. Battle, Francis Tutynushymen karym-katynas management: ұgymdar men tekhnologiyalar [Matin] = Custom-er Relationship Management. Concepts and technologies: okulyk / Francis Battle, Stan Maclan; ed. A. B. Isemberdiev; Kaz. TV room A. Mukhamedzhanova. - 4th bass. - Almaty: "Ulttyk audarma bureausy" kogamdyk kory, 2020. - 444 b. With
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8. Seitmagzimova, G. M. General chemical technology: textbook / G. M. Seitmagzimova. - Almaty : Association of hiighereducational institutions of Kazakhstan, 2016. - 292 p.
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11. Arystanbaev K.E., Mambaeva A.M. Chemistry-technologylyқ үderisterdi baskaru zhүyesi./oқy құraly [Electronic resource] .- Shymkent 2022
12. Control systems for chemical and pharmaceutical processes [Electronic resource]: a textbook for students in the specialty "Technology of pharmaceutical production" / K. E. Arystanbaev, A. B. Zhumabekova, A. A. Umarov. - Electron. text data. (6.85 MB). - Shymkent: OKMA, 2018. - 109 p. email opt. disc (CD-ROM).
13. Pharmaceutical chemistry [Electronic resource]: textbook / ed. T. V. Pletneva. - Electron. text data. (50.6Mb). - M. : GEOTAR - Media, 2017.
14. Omarova R.A. Processes and devices of chemical-pharmaceutical production. Textbook. 2020 https://aknurpress.kz/login

1. **Department:**“Medical Biophysics & Information Technology”
2. **Undergraduate**
3. **Specialty:**" Pharmaceutical production technology"
4. **Course**:1

5. **Number of credits 5**
6. **Discipline**: "Physics"
7. **Learning goal:** mastering the main laws of nature in the field of mechanics and molecular physics, electricity and magnetism, optics, as well as familiarity with their application in spectroscopy, physiology, medicine and technology (chemical technology).
8. **Learning objectives:**

• to acquaint students with the basic laws of physics and the conditions for their correct application, the main methods and instruments for measuring physical quantities, methods for processing and analyzing experimental results, methods for using information technology in processing experimental results;

• to acquaint students with the basic laws of physics and the conditions for their correct application, the main methods and instruments for measuring physical quantities, methods for processing and analyzing experimental results, methods for using information technology in processing experimental results;

9. **Justification of the choice of discipline:**
The course of physics is the basic discipline necessary for the study of chemical and professional disciplines studied simultaneously with this discipline and in the following courses. The teaching of the discipline is closely related to such disciplines as mathematics, physical and colloidal chemistry, organic, inorganic, analytical, pharmaceutical chemistry, chemical technology, as well as physiology. Therefore, in the process of teaching the course "Physics" it is necessary to teach the fundamentals, as well as the current state of physical knowledge, accompanied by practical applications in the field of chemical technology, the application of the learned principles and tools in medicine and pharmacy based on them.
10. **Learning outcomes (competencies)**
Demonstrates knowledge of the terms and basic concepts of physics, physical phenomena
Understands the basic physical laws, physical processes and methods of analysis
Defines the basics of physical methods and the principles of operation of physical devices.
Applies the physical laws of physical processes and methods of analysis

11. **Pre-requisites:**school courses of physics, biology, chemistry.
12. **Post requisites:**physiology, molecular biology and genetics, biochemistry, physiology, pathological physiology, major disciplines.
13. **Bibliography:**

In English:

1. Gilmore R. S. Single particle detection and measurement: монография. -London: Taylor & Francis Ltd, 2015.
2. Edgcombe C. J. Cyrotron Oscillators: Their Principles and Practice. -Edited by. -London: Taylor & Francis Ltd, 2016.
3. Mydosh J. A. Spin glasses: an experimental introduction. -London: Taylor &Francis Ltd, 2015.
4. MyersH.P.IntroductorySolidState Physics: монография. -Francis: Taylor, 2017

In Kazakh language:

На казахском языке

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2. Крейн К.С. Заманауи физика. 2-бөлім: оқулық. Алматы 2015
3. Бижігітов Т. Жалпы физика курсы:оқулық-Алматы: Экономика 2016
4. Құдабаев Қ.Ж. Медициналық биофизика. Оқулық. – Алматы: Эверо, 2015 Биофизика.
5. Бижігітов Т. Статистикалық физика. Физикалық кинетика негіздері: оқулық. Алматы

На русском языке

- Основная:
1. Антонов В. Н. Физика и биофизика: учебник. - М.: ГЭОТАР - Медиа, 2015.-480с.
2. Феодорова В.Н.Физика. - М.: ГЭОТАР-Медиа, 2016.
3. Физика и биофизика: практикум: учеб. пособие / В. Ф. Антонов [и др.]. - М.: ГЭОТАР-Медиа, 2017.
4. Ремизов А.Н. Медицинская и биологическая физика: учеб. для вузов. -9-е изд., стереотип.. -М.: Дрофа, 2017.

Дополнительная:

1. Владимиров Ю. А. Физико-химические основы фотобиологических процессов: учебник. -2-е изд., перераб. и доп. -М.: Дрофа, 20014.
2. Ремизов А.Н. Медицинская и биологическая физика: учеб. для вузов. -9-е изд., стереотип.. -М.: Дрофа, 2017.
3. Тиманюк В. А. Биофизика: учебник для студентов фармацевтических и мед. вузов. -2-е изд. -К.: ИД "Профессионал", 2015.

Электронные ресурсы:

1. Антонов В. ф. биофизика и биофизика [электронный ресурс] : учебник . - электрон, текстовые дан. (98,1 6мб). - м.: гэотар - медиа, 2017. эл. опт. диск (cd-rom)
2. Устинов Г. г. медицинская физика. физические методы и приборы в диагностике и лечении [электронный ресурс]: учебное пособие . - электрон, текстовые дан. (10,6 мб). - Барнаул: алт. ун-т, 2014. - эл. опт. диск (cd-rom).
3. Биофизика [электронный ресурс]: учебник / в. ф. АНТОНОВ [И ДР.]. - ЭЛЕКТРОН, ТЕКСТОВЫЕ дан. (13,0 мб). - м.: б. и., 2016. - 1 эл. опт. диск.

1. **Department of Pharmacognosy**
2. **Level of training** (Bachelor's degree)
3. **Educational program**: 6B07201- " Technology of pharmaceutical production»
4. **Course**: 3
5. **Name of elective discipline**: "Chemistry of natural medicinal compounds»
6. **Number of credits**: 5 credits (150 hours)
7. **Purpose**: to form the necessary knowledge, skills and abilities of future specialists in the rational, scientifically-based procurement of medicinal plant raw materials, carrying out its standardization and quality control, as well as through the use and application in practice of medicinal products of plant origin
8. **Content of the discipline**: General laws and regularities of the chemistry of natural compounds. Classification of biological active substances, distribution and accumulation of biological active substances in plants. Methods for determining the structure, extraction of medicinal substances from plant sources, separation, purification and identification of biological active substances.
9. **Tasks**:

* to give students knowledge about the botanical, pharmacognostic characteristics, chemical composition of medicinal plants (LR) and medicinal plant raw materials(LRS), ways of its use by the phytoproduction industry;
* teach students to use the methods of pharmacognostic and commodity analysis of medicinal plant raw materials, standardization at various stages of procurement and use;

* teach students to determine the methods of rational harvesting of LRS, stocks of wild plants in connection with the ever-growing needs of the domestic pharmaceutical industry in high-quality medicinal plant raw materials.
* formation of students ' knowledge of phytochemistry of medicinal plants, physical and chemical properties of extractants and solvents, practical skills in the implementation of the technological process of preparation of extraction and complex pharmaceutical preparations with the use of modern equipment and new technologies.

10. **Justification of the choice of discipline:**

Taking into account the increased requirements of practical pharmacy and medicine for the use of medicinal raw materials of plant, animal and mineral origin, the subject "Chemistry of natural medicinal compounds" considers a range of issues related to the effectiveness of quality control at all stages of drug development. Ensuring the proper quality of medicinal plant raw materials largely depends on the proper organization of control, its effectiveness and efficiency, as well as on the level of requirements laid down in regulatory documents (GF, RD, VARD) and the methods of analysis used. The study of the system of quality standards of medicinal raw materials, their products, testing methods, etc., established in the national order and mandatory for manufacturers and consumers is currently an urgent problem in the Republic of Kazakhstan.

11. Learning outcomes (competencies):

Knowledge (cognitive sphere)	Skills and abilities (psychomotor sphere)	Personal and professional competencies (relationships)
- general laws and regularities of the chemistry of a natural compound; - classification of biological active substances, distribution and accumulation of biological active substances in plants; - apply methods of separation, purification and identification of natural medicinal compounds, formalize the results of laboratory work and draw appropriate conclusions based on them;	- the results of educational experiments, observed facts and phenomena, their causal relationships from a scientific point of view and the maximum yield of biologically active substances from natural sources; - collects information, evaluates and interprets the results of educational experiments, explains the accumulation of biological active substances in medicinal plants; works in a group and solves assigned tasks; - organize production areas and storage areas, maintain documentation in accordance with the RD, GF specifications for raw materials and monitor the quality of plant raw materials, depending on the nature of the PRM;	- Collects information, evaluates and interprets the results of educational and scientific experiments in the field of chemistry of medicinal natural compounds; - evaluates modern achievements of science and the field of pharmacy, compiles reviews and reports, prepares scientific publications - Capable of analyzing medicinal compounds in medicinal plant raw materials - Adheres to the principles of academic integrity and learning behavior in the performance of written works, answers to exams

12. Prerequisites: Processes and devices of chemical and pharmaceutical production

13. Post-requirements:: Industrial drug technology

14.

Basic literature:

Basic

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1. Табиғи дәрілік заттардың химиясы [: оқулық / Ә. Қ. Патсаев.-Шымкент: Әлем,2016.-188 бет

2. Г.Ш. Бурашева и др. Табиғи қосылыстар химиясының негіздері.Оқу құралы. – Алматы, 2013

на русском языке

1. Патсаев, А. К. Химия природных лекарственных веществ : учебник /. - Шымкент : Әлем, 2016. - 192 с.

2. Лекарственное сырье растительного и животного происхождения. Фармакогнозия / Под. ред. Г.П. Яковлева. – СПб.: СпецЛит, 2006. – 845 с.: ил.

3. В.В.Племенков. Введение в химию природных соединений, Казань, 2002.

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соединений. Учебник.- Алматы, 2010, 566с.

5. Г.Д.Бердимуратова, Р.А.Музычкина, Д.Ю.Корулькин и др. Биологически активные вещества растений. Выделение, разделение, анализ, Алматы: Атамура, 2006.

6.Государственная фармакопея СССР. XI издание, вып. 1 - МЗ СССР. М.: Медицина, 1987.

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8.Кузнецова В.А. Лекарственное растительное сырье и препараты. М.: Высшая школа, 1987.

Additional

на русском языке

1. Р.А.Музычкина, Д.Ю.Корулькин, Ж.А.Абилов. Качественный и количественный анализ основных групп БАВ в лекарственном растительном сырье ифито-препаратах, Алматы, 2004, 287с.

2. С.А.Минина, И.Е.Каухова Химия и технология фитопрепаратов, М,- ГЭОТАР-МЕД. -2004, 555с.

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6. Государственная Фармакопея Республики Казахстан. – том 1 – Алматы. – Издательский дом: «Жибек жолы».– 2008.– 592 с.

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2009. – 792 с.

8. ГФ СССР X издания М., Медицина.– 1968.

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10. Правила сбора и сушки лекарственных растений (сборник инструкций). М.: Медицина, 1985. – 328 с., ил.

11. Машковский М.Д. Лекарственные средства. – 15-е изд., перераб., испр. и доп. – М.: РИА “Новая волна”: 2008. – 1206 с.: ил.
12. Головкин Б.Н., Руденская Р.Н., Трофимова И.А., Шретер А.И. Биологически активные вещества растительного происхождения. – М.: Наука, 2001. – 240 с.
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