The catalog of elective disciplines

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	- 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.	- 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;

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.	- 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.	- 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: 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.

9. 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.

10.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)

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

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

13.**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. 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 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: technology of extraction preparations
14. Literature

The main:

1. Табиғи дәрілік заттардың химиясы : оқулық / Ә. Қ. Патсаев. –Шымкент :Әлем, 2016. – 188 бет с.
2. Патсаев, А. К. Химия природных лекарственных веществ : учебник / А. К. Патсаев, Г. А. Туребекова, К. Дж. Кучербаев. –Шымкент :Әлем, 2016. – 192 с. -
3. Дәрілік өсімдік шикізаттарын фармакогностикалық талдау. Оқу құралы/ Орынбасарова К.К.-Шымкент, 2016
4. Орынбасарова К. К.Дәрілік өсімдік шикізаттарын фармакогностикалық талдау : оқукұралы. –Алматы : ЭСПИ, 2021. – 308 бет.
5. Тоқсанбаева Ж. С. Фармакогнозия. Т.1 : оқулық / Ж. С. Тоқсанбаева, Т. С. Серікбаева, К. К. Патсаева. –Алматы : ЭСПИ, 2021. – 252 бет.

6. Тоқсанбаева Ж. С. Фармакогнозия. Т.2 : оқулық / Ж. С. Тоқсанбаева, Т. С. Серікбаева, К. К. Патсаева. –Алматы : ЭСПИ, 2021. – 264 бет
7. Табиғи дәрілік қосылыстардың химиясы пәнінің зертханалық сабақтарына арналған қолданба : оқу құралы / К. К. Орынбасарова, Г. С. Рахманова. – Алматы : New book, 2022.- 300 б.

Additional:

1. Айдарбаева, Д. Қ. Қазақстанның пайдалы өсімдіктері: монография / Д. Қ. Айдарбаева ; ҚР Білім және ғылым Министірлігі. Абай атындағы ҚҰПУ. –Караганды : АҚНҰР, 2014. – 290 б.
2. Айдарбаева**,** Д. К. Растительные ресурсы Казахстана и их рациональное использование: учебное пособие. – 2-е изд. –Караганда : АҚНҰР, 2019. – 194 с
3. Фармакогнозия пәнінің зертханалық-тәжірибелік сабақтарына арналған қолданба: оқу құралы / Б. Қ. Махатов [ж. б.] ; ҚР ДСМ; ОҚМФА. –Шымкент : Б. ж., 2013. – 328 бет.
Фармакогнозия. Рабочая тетрадь к практическим занятиям:И. В. Гравель [и др.]; под ред. И. А. Самылиной ; М-во образования и науки РФ. – 2-е изд., испр. Идоп ; Рек. ГОУ ВПО Московская мед. Акад. Им. И. М. Сеченова. –М. : ГЭОТАР – Медиа, 2013. – 264 с

Electronic resources:

1. Табиғи дәрілік заттардың химиясы мен технологиясы : Оқу-әдістемелік кешен 5В074800 – фармацевтикалық өндіріс технологиясы мамандығы үшін. / Құраст. С.О. Кенжетаева, Л. Ж. Жапарова. –Қарағанды: ҚарМУбаспасы, 2013. – 60 б. РМЭБ http://rmebrk.kz/
2. Махатов Б.Қ.Фармакогнозия: оқулық/Махатов Б.Қ., Патсаев Ә.Қ., ОрынбасароваК.К., Қадишаева Ж.А. – Алматы Эверо, 2020.https://www.elib.kz/ru/search/read_book/795/
3. Махатов Б.Қ., Патсаев Ә.Қ., Қадишаева Ж.А., Т.С. Серікбаева.,Е.К. Оразбеков Фармакогнозия пәніненоқуқолданбасы. Оқу-әдістемеліккұрал — Алматы, ЖШС «Эверо», 2020,https://www.elib.kz/ru/search/read_book/807/
4. Джангозина Д.М., Лосева И.В., Ивлева Л.П., Дербуш С.Н.Лекарственные растения, лекарственное растительное сырье и некоторыепродукты переработки сырья животного происхождения.Учебное пособие по фармакогнозии. Издание второе, доп. Часть I: Лекарственные растения и лекарственное растительное сырье, содержащие углеводы,жиры и жироподобные вещества, витамины, терпеноиды. – Алматы: издатель-ство «Эверо», 2018. – 206 с.https://www.elib.kz/ru/search/read_book/744/
5. Джангозина Д.М., Лосева И.В., Ивлева Л.П., Дербуш С.Н.Лекарственные растения, лекарственное растительное сырье и некоторыепродукты переработки сырья животного происхождения.Учебное пособие по фармакогнозии. Издание второе, доп. Часть II: Лекарственные растения и лекарственное растительное сырье, содержащие сердечные гликозиды, сапонины, алкалоиды. – Алматы: издательство «Эверо», 2020. – 194 с.https://www.elib.kz/ru/search/read_book/746/
6. Джангозина Д.М., Лосева И.В., Ивлева Л.П., Дербуш С.Н.Лекарственные растения, лекарственное растительное сырье и некоторыепродукты переработки сырья животного происхождения.Учебное пособие по фармакогнозии. Издание второе, доп. Часть III: Лекарственные растения и лекарственное растительное сырье, содержащие фенольные соединения и их гликозиды; кумарины, хромоны, лигнаны, антраценпроизводные, флавоноиды, дубильные вещества, биологически активные веществамалоизученного состава и лекарственное сырье животного происхождения. –Алматы: издательство «Эверо», 2020. – 220 с.https://www.elib.kz/ru/search/read_book/748/
7. ДжангозинаД.М. м.ғ.д. Дәрілікөсімдіктержәнедәрілікөсімдікшикізаты: оқуқұралы – Алматы: «Эверо»баспасы, 2020. – 240б.https://www.elib.kz/ru/search/read_book/742/

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: technology of extraction preparations
15. Literature

The main:

8. Табиғи дәрілік заттардың химиясы : оқулық / Ә. Қ. Патсаев. –Шымкент :Әлем, 2016. – 188 бет с.
9. Патсаев, А. К. Химия природных лекарственных веществ : учебник / А. К. Патсаев, Г. А. Туребекова, К. Дж. Кучербаев. –Шымкент :Әлем, 2016. – 192 с. -
10. Дәрілік өсімдік шикізаттарын фармакогностикалық талдау. Оқу құралы/ Орынбасарова К.К.-Шымкент, 2016
11. Орынбасарова К. К.Дәрілік өсімдік шикізаттарын фармакогностикалық талдау : оқуқұралы. –Алматы : ЭСПИ, 2021. – 308 бет.
12. Тоқсанбаева Ж. С. Фармакогнозия. Т.1 : оқулық / Ж. С. Тоқсанбаева, Т. С. Серікбаева, К. К. Патсаева. –Алматы : ЭСПИ, 2021. – 252 бет.
13. Тоқсанбаева Ж. С. Фармакогнозия. Т.2 : оқулық / Ж. С. Тоқсанбаева, Т. С. Серікбаева, К. К. Патсаева. –Алматы : ЭСПИ, 2021. – 264 бет
14. Табиғи дәрілік қосылыстардың химиясы пәнінің зертханалық сабақтарына арналған қолданба : оқу құралы / К. К. Орынбасарова, Г. С. Рахманова. – Алматы : New book, 2022.- 300 б.

Additional:

4. Айдарбаева, Д. Қ. Қазақстанның пайдалы өсімдіктері: монография / Д. Қ. Айдарбаева ; ҚР Білім және ғылым Министірлігі. Абай атындағы ҚҰПУ. –Караганды : АҚНҰР, 2014. – 290 б.
5. Айдарбаева**,** Д. К. Растительные ресурсы Казахстана и их рациональное использование: учебное пособие. – 2-е изд. –Караганда : АҚНҰР, 2019. – 194 с
6. Фармакогнозия пәнінің зертханалық-тәжірибелік сабақтарына арналған қолданба: оқу

құралы / Б. Қ. Махатов [ж. б.] ; ҚР ДСМ; ОҚМФА. –Шымкент : Б. ж., 2013. – 328 бет.
Фармакогнозия. Рабочая тетрадь к практическим занятиям:И. В. Гравель [и др.]; под ред. И. А. Самылиной ; М-во образования и науки РФ. – 2-е изд., испр. Идоп ; Рек. ГОУ ВПО Московская мед. Акад. Им. И. М. Сеченова. –М. : ГЭОТАР – Медиа, 2013. – 264 с

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8. Табиғи дәрілік заттардың химиясы мен технологиясы : Оқу-әдістемелік кешен 5В074800 – фармацевтикалық өндіріс технологиясы мамандығы үшін. / Құраст. С.О. Кенжетаева, Л. Ж. Жапарова. –Қарағанды: ҚарМУбаспасы, 2013. – 60 б. РМЭБ http://rmebrk.kz/
9. Махатов Б.Қ.Фармакогнозия: оқулық/Махатов Б.Қ., Патсаев Ә.Қ., ОрынбасароваК.К., Қадишаева Ж.А. – Алматы Эверо, 2020.https://www.elib.kz/ru/search/read_book/795/
10. Махатов Б.Қ., Патсаев Ә.Қ., Қадишаева Ж.А., Т.С. Серікбаева.,Е.К. Оразбеков Фармакогнозия пәніненоқуқолданбасы. Оқу-әдістемеліккұрал — Алматы, ЖШС «Эверо», 2020,https://www.elib.kz/ru/search/read_book/807/
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12. Джангозина Д.М., Лосева И.В., Ивлева Л.П., Дербуш С.Н.Лекарственные растения, лекарственное растительное сырье и некоторыепродукты переработки сырья животного происхождения.Учебное пособие по фармакогнозии. Издание второе, доп. Часть II: Лекарственные растения и лекарственное растительное сырье, содержащие сердечные гликозиды, сапонины, алкалоиды. – Алматы: издательство «Эверо», 2020. – 194 с.https://www.elib.kz/ru/search/read_book/746/
13. Джангозина Д.М., Лосева И.В., Ивлева Л.П., Дербуш С.Н.Лекарственные растения, лекарственное растительное сырье и некоторыепродукты переработки сырья животного происхождения.Учебное пособие по фармакогнозии. Издание второе, доп. Часть III: Лекарственные растения и лекарственное растительное сырье, содержащие фенольные соединения и их гликозиды; кумарины, хромоны, лигнаны, антраценпроизводные, флавоноиды, дубильные вещества, биологически активные веществамалоизученного состава и лекарственное сырье животного происхождения. –Алматы: издательство «Эверо», 2020. – 220 с.https://www.elib.kz/ru/search/read_book/748/
14. ДжангозинаД.М. м.ғ.д. Дәрілікөсімдіктержәнедәрілікөсімдікшикізаты: оқуқұралы – Алматы: «Эверо»баспасы, 2020. – 240б.https://www.elib.kz/ru/search/read_book/742/

1. Department: "Hygiene and epidemiology"
2. Level of preparation (bachelor / internship / magistracy / residency)
3. Specialty: "Technology of pharmaceutical production"
4. Course: 1
5. The name of the elective discipline: "Ecology and sustainable development"
6. Number of credits - 5
7. Objective: to form an ecological outlook, to gain deep system knowledge and to have an idea about the basics of the sustainable development of society and nature, theoretical and practical knowledge on modern approaches to the rational use of natural resources and environmental protection.

8. Tasks:

- to acquaint students with the problems of modern civilization;
- to study the basic zakomernosti functioning of living organisms, ecosystems of various organizations, the biosphere as a whole and their sustainability;

- to generate knowledge about the environmental consequences of human activities in conditions of intensified environmental management;
- to form students' complex objective and creative approach to discussing the most acute and complex problems of environmental protection and sustainable development.

9. The rationale for the choice of discipline: modern civilization is under threat and requires the solution of a number of global environmental problems arising from anthropogenic influences. When using natural resources, a person has a certain negative impact on the environment. At the same time, not only the quality of environmental objects, but also the conditions of human life and his health change. In this regard, education in the field of environmental protection, ecology and sustainable development should be necessary in the development of the professional activity of a pharmaceutical production technologist.

10. Learning outcomes (competencies):

Knowledge (cognitive sphere)	**Skills and abilities (psychomotor sphere)**	**Personal and professional competencies (relationships)**
- knows the basic concepts and tasks of ecology and sustainable development; - knows the basic laws that determine the interaction of living organisms with the environment; -knows the distribution and dynamics of the number of organisms, the structure of communities and their dynamics; - knows the patterns of energy flow through living systems and the circulation of substances, the functioning of ecological systems and the biosphere as a whole; - knows the basic principles of nature conservation and rational nature management; - knows the social and environmental consequences of human activities; - knows the concept, strategies, problems of sustainable development and practical approaches to their solution at the global, regional and local levels.	- able to analyze natural and anthropogenic ecological processes and possible ways of their regulation; - able to understand modern concepts and strategies for the sustainable development of mankind, aimed at systematically changing the traditional forms of economic management and lifestyle of people in order to maintain the stability of the biosphere and the development of society without catastrophic crises; - knows how to use the knowledge gained about the patterns of interaction between living organisms and the environment in practical activities to maintain sustainable development; - has skills in analyzing environmental processes, setting specific tasks and priorities of sustainable development of nature and society and the use of the knowledge gained to solve environmental problems; - able to identify anthropogenic factors that may influence environmental objects; - apply this knowledge on the patterns of development of the biosphere and the conditions for maintaining its sustainability, as well as the implementation of ideas of sustainable development in different	- collects materials on environmental issues and sustainable development, rational use of natural resources; - presents the results of its own research on the assessment of environmental pollution; - knows the organizational and economic aspects of activities in the field of ecology and sustainable development; -Knows general environmental research methods; -predicts the quality of the state of environmental objects. - makes a conclusion on the results of its own research

	countries, including in the Republic of Kazakhstan;	

11. Prerequisites: School program
12. Post requisites: epidemiology, infectious diseases, radiation hygiene and medical ecology
13. Literature
Primary:
1.Kenesariev U.I. Ecology and public health: studies. For medical schools and colleges.-Almaty: Evero, 2011
2. Ecology sustainable development: textbook / M.S.Tonkopy (i.dr.) - Almaty: Economy, 2011.
3. Guvernsky, Yu.D. Ecology and hygiene of the living environment for the specialists of Rospotrebnadzor: study guide. M: GEOTAR-Media, 2008.
4. Human ecology: textbook / ed. A.I. Grigorieva.-M: GEOTAR-Media, 2008.-240 + el.opt.disk (DVD-ROM).
5. Koshelev N.F. Hygiene of Water Supply for Troops: textbook.-2 nd ed.-SPb: Petroglyph, 2008.
6.Polyakova A.N. General hygiene, sanology and ecology: leaders for students of higher education nursing education of medical universities.-M: FGOU VUNMTS Roszdrava, 2008.
6. Ivanov, V.P. General and Medical Ecology: textbook.-Rostov n / D: Fenix, 2010.
7.Sukhanov B.P. Sanitary supervision of the safe use of pesticides and mineral fertilizers: study guide. M: GEOTAR-Media, 2006.
8.Novikov Yu.V. Ecology, environment and people: studies.book.-3rd ed., Corr. And add-M: FAIR-Press, 2005.
9. Lakshin AM. General hygiene with the basics of human ecology: textbook. -M., 2004.
10.Pivovarov Yu.P. Hygiene and fundamentals of human ecology: textbook.-M: Academy Publishing Center, 2004.
Additional:
1. Khandogina, E.K., Gerasimova, N.A., Khandogina, A.V. Ecological Basis of Nature Management, M., “Forum”, 2007.
2. Nikanorov A.M., Khorunzhaya T.A., Global Ecology, M., CJSC, Knigerservice, 2003.
3. Marfenin N.N. The concept of "sustainable development" in development / Russia in the outside world: 2002 (Analytical Yearbook) // Edited by: Danilova-Danilyana V.I., Stepanov S.A. -M.: Publishing house MNEPU, 2002.
4. Reports of the Ministry of Environmental Protection of the Republic of Kazakhstan “On the state of the environment of the Republic of Kazakhstan” 2000-2007

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 and understanding of occupational health and safety issues at pharmaceutical enterprises in accordance with the requirements of regulatory and technical documentation and international standards.
LO2	Demonstrates knowledge of the norms and rules of the Labor Code of the Republic of Kazakhstan, regulatory legal acts of the Republic of Kazakhstan and industry standards of the pharmaceutical industry in the field of occupational safety and health.
LO3	Applies the norms and rules to ensure occupational safety and health at a professional level for the organization of gasoline-hazardous technological processes at pharmaceutical enterprises.
LO4	Organizes and manages employees of a pharmaceutical enterprise for the safe implementation of technological processes and the use of equipment.
LO5	Ensures the organization and safety of technological processes and the use of equipment, monitors the working condition of premises and the production environment, monitors compliance with the requirements set out in the regulatory legal acts of the Republic of Kazakhstan and industry standards in the implementation of technological processes.
LO6	Identifies harmful and dangerous factors, potential risks affecting the life and health of a pharmaceutical production worker, identifies the causes of industrial accidents, suggests ways to solve occupational safety and health issues based on the use of industrial information in conditions of choice and diversity of possibilities, and assumes responsibility for them.
LO7	Carries out collection, processing and scientifically based analysis to carry out organizational and technical measures to create a safe environment during the technological processes of pharmaceutical production, assesses the safety of the production environment, demonstrates the ability to conduct research / experimental work on the introduction of new ways to prevent accidents at work.

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: 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 how to use technical regulations, standards and other regulatory documents
LO 3	He is able to use methods for constructing images (drawings) of spatial shapes on a plane
LO 4	Knows the methods of developing technical documentation on compliance with technological discipline in the conditions of existing production
LO 5	He is able to independently make sketches and carry out drawings of various technical details and structural elements of components of products of his future specialty
LO 6	He is able to work in small groups, solve tasks together.

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", "Machines and machines for packaging and packaging of dosage forms".

14. Reference:

1. Hibbeler, R. Ch. Statics and mechanics of materials: Vol.1: textbook / R. Ch.Hibbeler; Kaz. language.AUD. E. B. Dauseitov, S. Zhunisbekov. - 4th edition. - Almaty: LLP Rpbk "Era", 2017. - 436 P.
2. Baidibekov, A. K. engineering graphics (in a projection with digital signs): textbook / - Almaty: Evero, 2011. - 140 P.
3. Mirzakulov M. E., Turdaly K. M. descriptive geometry./ educational and methodical manual .- Shymkent 2022.
4. Mirzakulov M. E., Turdaly K. M. basic geometry./ educational-methodical postobie.- Shymkent 2022 G.

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: Information and communication technology.

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», «The main processes and apparatus of chemical and pharmaceutical production – 1,2».
13. Post requisites: «Fundamentals of design and illumination of production».
14. Reference
1. Baidibekov, A. K. engineering graphics (in a projection with digital signs) [text]: textbook / Baidibekov A. K. - Almaty: ESPI, 2021. - 160 pages. S
2. Arystanbayev, K. E. chemical and technological process management system [text]: textbook / Arystanbayev K. E., Mambayeva A.M. - Shymkent: SKMA, 2022. - 104 P
3. Arystanbayev, K. E. system of management of chemical and technological processes [text]: educational post / K. E. Arystanbayev, A. B. Zhumabekova, A. A. Umarov. - Almaty: Evero, 2020. - 128 hours

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: "Basic processes and apparatus of Chemical and pharmaceutical production – 1,2", "Fundamentals of Electrical Engineering and industrial electronics".
Related disciplines: "Computer engineering in engineering and economic calculation".
13. Post-requisites: "Fundamentals of design and equipment of pharmaceutical production", "Chemical and technological process management system".
14. Reference
1.Arystanbayev, K. E. Chemical and technological process management system [text]: textbook / Arystanbayev K. E., Mambayeva A.M. - Shymkent: SKMA, 2022. - 104 P.
2.Arystanbayev, K. E. System of management of chemical and technological processes: educational process / K. E. Arystanbayev, A. B. Zhumabekova, A. A. Umarov. - Almaty: Evero, 2020 . - 128 P.
3.Mantler S. N. Process and apparatus of Chemical Technology: Teaching Post / S. N. Mantler,G. M. Zhu-manazarova. - Almaty: "Bastau", 2018. – 256
4.Mantler, S. N. Processes and apparatus of Chemical Technology [text]: textbook / S. N. Mantler, G. M. Zhumanazarova. - Recommended by the Ministry of education and science of the Republic of Kazakhstan. - Almaty: "Bastau", 2018. - 256 B. S.
5.Basic processes and apparatus of chemical production: laboratory workshop: manual / Sh. Sh.Nurseitov. - Almaty: Evero, 2014. - 140 pages
6.Zhakirova, N. K. General Chemical Technology:textbook / publishing house National Technical University named after K. I. Spataev. "no," he said. - Almaty: Evero, 2014. - 176 pages. S
7.Zhakirova, N. K. General Chemical Technology: учеb. "yes," he said. Учеb.- metodich. In the Soviet Union im. S. D. Asfendiyarova. - Almaty: Evero, 2013. - 119

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 and understanding of occupational health and safety issues at pharmaceutical enterprises in accordance with the requirements of regulatory and technical documentation and international standards.
LO2	Demonstrates knowledge of the norms and rules of the Labor Code of the Republic of Kazakhstan, regulatory legal acts of the Republic of Kazakhstan and industry standards of the pharmaceutical industry in the field of occupational safety and health.
LO3	Applies the norms and rules to ensure occupational safety and health at a professional level for the organization of gasoline-hazardous technological processes at pharmaceutical enterprises.
LO4	Organizes and manages employees of a pharmaceutical enterprise for the safe implementation of technological processes and the use of equipment.
LO5	Ensures the organization and safety of technological processes and the use of equipment, monitors the working condition of premises and the production environment, monitors compliance with the requirements set out in the regulatory legal acts of the Republic of Kazakhstan and industry standards in the implementation of technological processes.
LO6	Identifies harmful and dangerous factors, potential risks affecting the life and health of a pharmaceutical production worker, identifies the causes of industrial accidents, suggests ways to solve occupational safety and health issues based on the use of industrial information in conditions of choice and diversity of possibilities, and assumes responsibility for them.
LO7	Carries out collection, processing and scientifically based analysis to carry out organizational and technical measures to create a safe environment during the technological processes of pharmaceutical production, assesses the safety of the production environment, demonstrates the ability to conduct research / experimental work on the introduction of new ways to prevent accidents at work.

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.