ONTUSTIK QAZAQSTAN MEDISINA AKADEMIASY
«Оңтүстік Қазақстан медицина академиясы» АҚ

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

"APPROVED"
Rector
JSC "SKMA"
Doctor of Medical Sciences.,
Professor M.M. Rysbekov
«08» 08 2022 y.

EDUCATIONAL PROGRAM

The code of the educational program:	7M10143
Name of the educational program:	Pharmaceutical ecology
The level of the educational program:	Magistracy

Shymkent, 2022 y.

The educational program was developed by the members of the CEP:

Head of the Department of Medicine Technology, Doctor of Pharmacy, Professor — Sagyndykova B. A.

Head of the Department «Organization and Management of Pharmaceutical business», Doctor of Pharmacy, Professor — Shertaeva K. D.

Head of the Department of Pharmaceutical and Toxicological Chemistry, Doctor of Pharmacy, Professor — Ordabaeva S. K.

Head of the Department of Pharmacognosy, Ph.D. in Pharmacy, Acting Professor — Orynbasarova K. K.

Agreed with the employer:

Director of the Association of Pharmaceutical and Medical Organizations «Damu» — Alzhanova Kh. D.

Director of «Recipe» LLP — Baimbetov E. A.

Advisor to the Director of Pharmaceutical Activities of «Ecopharm International» LLP — Kenzhebaev Zh. D.

Head of the Production Department of «Zerde-Phyto» LLP — Zhumataev M. Zh.

Chairman of the CEP «Pharmacy»
Protocol № 12 05 08 20 22 y. Toksanbayeva Zh.S.

Approved by the Scientific Council
Vice-Rector by SCW Nurmashev B.K.
Protocol № 5a 08 08 20 22 y.

Approved by the Academic Council
Protocol № 15 08 08 20 22 y.

Passport of the educational program

1. **Mission of the educational program:** To train highly qualified scientific and pedagogical personnel with research skills in pharmacy
2. **Purpose of the educational program:** Training of qualified competitive personnel to solve issues in the field of rational use of natural resources and minimize the impact of environmental pollution factors in the organization of the work of pharmaceutical institutions and chemical and pharmaceutical enterprises.
3. **Rationale for the educational program:** On the basis of the integration of education and science, to create an effective system for training scientific personnel capable of effectively solving pharmaceutical and managerial problems in healthcare, providing education, modernizing science, and developing innovative technologies in pharmacy.
4. **Профессиональный стандарт, на основе которого разработана образовательная программа:**

Regulatory documents for the development of an educational program

- Order of the Minister of Science and Higher Education of the Republic of Kazakhstan «On Approval of State Compulsory Standards of Higher and Postgraduate Education» dated July 20, 2022 No. 2.
- Order of the Minister of Health of the Republic of Kazakhstan «On Approval of State Compulsory Standards for the Levels of Education in the Field of Healthcare» dated July 4, 2022 No. KR DSM-63.
- Order of the Minister of Education and Science of the Republic of Kazakhstan «On Approval of the Rules for the Organization of the Educational Process on Credit Technology of Training in Higher and (or) Postgraduate Education Organizations» dated April 20, 2011 No. 152.
- Law of the Republic of Kazakhstan «On Education» dated July 27, 2007 No. 319-III (as amended on 04.07.2022)
- Order of the Minister of Education and Science of the Republic of Kazakhstan «On Approval of the Model Rules for the Activities of Higher and Postgraduate Education Organizations» dated October 30, 2018 No. 595 (as amended on 29.12.2021)
- «Regulations on the Procedure and Procedures for the Development of Educational Programs» of JSC «SKMA» dated 29.05.2019.
- Internal regulatory documents of JSC «SKMA»»

5. Field of professional activity: Heads of pharmaceutical enterprises, quality management managers in pharmacy. Research activities in universities.

6. Objects of professional activity: Healthcare management organizations, pharmaceutical organizations and manufacturing.

Types of professional activity:

- organizational and managerial;
- scientific and research activities.

General information

№	Characteristics of the EP	Data
1	Registration Number	7M10100159
2	Code and classification of the field of education	7M10 Health care
3	Code and classification of the field of study	7M101 Health care
4	Group of Educational Programs	M142 Pharmacy
5	Code, name of the educational program	7M10143 Pharmaceutical Ecology
6	Type of EP	New EP
7	ISCED level	7
8	NQF level	7
9	IQF Level	7
10	Distinctive features of the EP	Double-Degree Bachelor's Degree
	Partner University (JEP)	-
	Partner University (DDEP)	I.M. Sechenov First Moscow Medical University
11	List of competencies	Key competencies of the graduate of the program: **KC1** Able to effectively and successfully carry out research activities in the field

		of quality and safety of medicines and medicinal plant raw materials. **KC2** Able to organize and manage the production process of the faraceutic product in accordance with GMP and GPP standards, relevant pharmaceutical practice. **KC3** Has the skills to validate analytical methods, statistical processing of test results, and compile a report on the validation of methods in accordance with international requirements. **KC4** Able to plan, organize and manage pharmaceutical activities for the storage, transportation and quality control of medicines and medical devices in accordance with the requirements of the standards of relevant pharmaceutical practices. **KC5** Competent in the field of pharmaceutical development according to the principles of relevant practices, capable of professional growth and self-analysis.
12	Learning Outcomes	**LO1** Organize the work of pharmaceutical ecology in accordance with regulatory legal acts, rules and standards of safety, labor protection, environment and rational use of natural resources. **LO2** Apply the laws and principles of fundamental disciplines to research activities in the field of study in the planning and development of environmental monitoring, validation of test processes and analytical methods. **LO3** Apply the basic laws and principles of modern ecology in scientific activities, taking into account the national strategy for sustainable development, the legal and organizational foundations of state regulation in the field of environmental safety. **LO4** Develop a team strategy to achieve the goal, on the basis of which plans, organizes, corrects and manages the work of the team, taking into account the peculiarities of the behavior of its members, resolves conflicts and contradictions. **LO5** To carry out an examination of the main environmental pollutants and their

		sources, the types of impact of pharmaceutical production and pharmacy organizations on the environment and human health, methods of medical and pharmaceutical waste management, taking into account the basics of environmental management and marketing in pharmacy. **LO6** Prepare premises, technological equipment and employees for pharmacy manufacture and industrial production of medicines and participate in the development of technological documentation for the industrial production of medicines. **LO7** To organize the cultivation and harvesting of medicinal plant raw materials, taking into account the rational use of medicinal plant resources, to predict and substantiate ways to solve the problem of protecting the thickets of medicinal plants and the preservation of their gene pool. **LO8** Apply advanced innovations in research and development activities in quality control and standardization, assessment of biological safety of medicinal plant raw materials and medicines. **LO9** Develop a strategy for solving the problems of pharmaceutical ecology, plan and independently carry out scientific experiments in accordance with ethical standards, summarize and justify the results obtained and make innovative decisions based on them in the preparation of projects in the field of biotechnology. **LO10** Demonstrate the skills of systematizing scientific knowledge to ensure the environmental safety of the circulation of medicines, medicinal plant raw materials, medical devices and pharmacy products. **LO11** To carry out research and experimental work aimed at the implementation of the environmental policy of pharmaceutical enterprises on the basis of state programs for environmental protection and international GxP standards.

		LO12 Develop scientifically based projects and business plans for the improvement of biotechnological processes to solve problems of health care, environmental protection, industrial production of medicines and medical equipment and argue (written and oral reports, presentations, articles) the introduction of innovative technologies into production.
13	Form of study	In-person
14	Language of instruction	Kazakh, Russian
15	Amount of loans	120
16	Degree Awarded	Master of Medical Sciences in 7M10143 «Pharmaceutical ecology»
17	Duration of training	2 years
18	Availability of an appendix to the license for the direction of personnel training	KZ36LAA00011387 (018)
19	Availability of EP accreditation	No
	Name of accreditation body	-
	Accreditation Certificate No., Accreditation Validity Period	-
20	Information about disciplines	Annex 1.2

Annex 1

Matrix of correlation of learning outcomes in the educational program as a whole with the competencies being formed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12
KC1	■					■						
KC2		■										
KC3			■									
KC4				■	■							
KC5							■	■	■	■	■	■

Annex 1.2

Matrix of achievability of competencies/learning outcomes

№	Name of the discipline	A brief description of the discipline	Cycle (BD, PD)	Component (UC, OC)	Number of credits	Generated LO (codes)
The cycle of basic disciplines					**35**	
Mandatory / University component					**20**	
1	History and philosophy of science	Philosophy and methodology of science as branch of philosophical knowledge. Structure of scientific knowledge. Scientific rationality. Features of the present stage of science development. Science as social institute. Natural sciences in structure of modern scientific knowledge. The history of formation of sciences about society, culture, history and person. Actual philosophical problems of specific sciences	BD	UC	4	LO3 LO11 LO12
2	Foreign language (professional)	Extension and development of skills for practical usage proficiency language of specialty, for active application of a foreign language both in daily, and in professional communication: lexicon, grammar, possession of oral speech, written skills, audition, translation.	BD	UC	4	LO2 LO3
3	Pedagogics of the higher school	Pedagogics of the higher education. The main directions and trends of development of the higher education in the modern world. New paradigm of education. The higher	BD	UC	3	LO1 LO4

		education in the Republic of Kazakhstan. The essence and structure of pedagogical activity. The theory of training at the higher school (didactics). Modern educational technologies. The organization of educational process on the basis of the credit system of training. Education quality management system.				
4	Psychology of management	The essence of administrative processes. Object of psychology management. Psychology of activity of the organization head and of his personality psychology. Functional and structural analysis of administrative activity. The psychological problems arising between the head and the staff of the organization. A clear idea of distribution on responsibility levels of the manager.	BD	UC	3	LO4 LO8 LO12
5	Teaching practice	Formation of practical skills in teaching and learning methodology. Involvement of undergraduates in conducting undergraduate classes.	BD	UC	8	LO4
Optional component					**15**	
6	Physico-chemical methods of analysis	Physico-chemical methods of analysis based on modern theoretical, methodological and technological achievements of science and practice. Complex specific methods for determining pollutants and industrial emissions of chemical and pharmaceutical enterprises by instrumental (spectral, chromatographic, electro-chemical, etc.) analysis methods	BD	OC	3	LO2 LO8
7	Bioethics	The discipline «Bioethics» is an integrated study of various problems discovered as a result of the	BD	OC	3	LO1 LO9

		development of new biomedical technologies (transplantation, genetic, bioengineering research, reproduction). The most important are moral, social, gender, and legal problems that arise during scientific research. The center of bioethical norms becomes the autonomy of a person and his legal right to make independent decisions concerning his own health				
8	Modern problems of biotechnology in solving global problems of society	Trends in the development of biotechnology and their importance in the world economy. Biomedical developments for healthcare. Application of biotechnology achievements in the field of environmental protection (solving environmental problems). Achievements of genetic engineering to solve problems in agriculture and in the field of providing the population with food. Biotechnology and the search for new energy sources. Chemical synthesis and bioconversion. The contribution of biotechnology to the development of nanotechnology. Ethical aspects of some advances in biotechnology.	BD	OC	3	LO4 LO11 LO12
9	Scientific project management	Theoretical and methodological foundations of project management of various types. Project management tools at various stages of the project life cycle, qualitative and quantitative assessment of project risks, pro-ject effectiveness, development of a project business plan. Preparation of project documentation, work in the MS Project program, work with national and international	BD	OC	3	LO4 LO11 LO12

		standards in the field of project management.				
10	Pharmaceutical chemistry	Investigation of the methods of preparation, structure, physical and chemical properties, the relationship of the chemical structure with the pharmacological activity of biologically active compounds. Development of chemical, physico-chemical methods of quality control and determination of the chemical structure of medicines. Pharmaceutical analysis of medicines at the stages of creation, production, use and storage in accordance with the requirements of regulatory documents and international quality standards.	BD	OC	3	LO8 LO10
11	Development of medicines	State rationing of the creation of new medicines. The concept of Proper Practices in Pharmacy (GxP). International requirements for Pharmaceutical Development (CHQD), (ICHQ8). The main stages of pharmaceutical development. Elements of pharmaceutical development. Molecule design, drug design, quality design. Preclinical studies of medicinal products. Clinical studies of medicines. State registration of medicines.	BD	OC	3	LO8 LO10
12	Practical biostatistics	Biostatistics: tasks, methods, applications. Basic concepts. Statistical estimates, their properties. Hypothesis testing. Formulation of clinical research objectives, terminology, types of clinical research, preclinical research. Power analysis and estimation of sample size. Descriptive analysis. Data visualization. Comparison of averages in two samples. Analysis of variance. Conjugacy tables.	BD	OC	3	LO2 LO11

		Correlation analysis. Dependency and relationship analysis.				
13	Leadership	Interpretation of structural theories of leadership. Analysis of approaches to leadership. Motivational program-target management in the activities of the head. Assessment of the social influence and psychological ways of the leader's influence on the group. Application of situational approach to leadership. Choosing an effective leadership style. Formation of autogenic management. Creating an image of a leader. Justification of the use of psychological personality traits in working with staff.	BD	OC	3	LO1 LO4
14	Pharmaceutical Microbiology	The global importance of microorganisms as processors of life and the environment. Microorganisms are the potential and tools for developing new innovations in the pharmaceutical industry. Principles of functioning of microbial cells and communities, methods of research in microbiology and the solution of microbiological problems.	BD	OC	3	LO1 LO2
15	Physico-chemical biology	The role of physico-chemical biology in the development of modern natural science and the applied value of the discipline. In-depth study of the chemical structure and properties of enzymes, features of enzymatic catalysis, regulation of enzymatic reactions in the cell and the use of enzymes in practice. Physico-chemical features of the molecular organization of biological membranes and physico-chemical bases of energy conversion and	BD	OC	3	LO1 LO2

		accumulation in biological systems.				
Cycle of profile disciplines					**49**	
University component (General professional module)					**22**	
16	Environmental monitoring at pharmaceutical enterprises	The study of methods and devices of environmental control and monitoring, the organization of public services for monitoring the state of the environment and metrological support of the means of the control system within the pharmaceutical production. Validation of clean rooms. Monitoring and analysis of air and water for compliance with regulatory documents.	PD	UC	4	LO1 LO3 LO11
17	Ecology and nature management	The study of the content and structure of nature use, the peculiarities of the development of nature use as a system of human activity and science, the basic concepts, laws, principles and general problems of nature use, as well as the principles of rational nature use, sectoral and territorial nature use. Results of technogenic impact on the environment, assessment of their nature and direction of influence. A system of environmental protection measures.	PD	UC	3	LO1 LO7
18	Modern methods of biotechnology	The place and role of biotechnology (BT) in the modern economy, including in the pharmaceutical industry. The main directions of BT development and applied methods. Cellular BT: hybridomic technology, directed mutagenesis and screening. Genetic engineering: genetic restructuring in «in vivo» and «in vivo» experiments. Industrial enzymology: methods of bioconversion of chemical	PD	UC	6	LO9 LO12

		synthesis products. Methods of tissue and cell culture.				
19	Good manufacturing practice and environmental management system at pharmaceutical enterprises	The concept of good practices in Rcc pharmacy and the place of PMR in it. Environmental management of pharmaceutical enterprises: environmental policy of the enterprise, environmental protection programs and principles of their implementation. Environmental, technological, organizational and managerial aspects of creating waste-free/lowwaste pharmaceutical industries.	PD	UC	6	LO5 LO6 LO11
20	Ecological analysis of medicinal plant raw materials	Technogenic pollution of the natural environment. The main pollutants of the environment. Study of sources of contamination of medicinal plant raw materials. The strategy of the main directions for reducing radiological contamination of plants and pollution with heavy metals, pesticides and farther ecotoxicants. Investigation of the growing trend towards anthropogenic pol-lution of the areas of harvesting medicinal plants.	PD	UC	3	LO5 LO7 LO10
21	Research Practice	Familiarization with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data and their application.	PD	UC	12	LO2 LO11
Optional component					**15**	
22	Pharmaceutical production processes and	The main regularities of mechanical, hydromechanical and hydrodynamic processes in pharmaceutical production: the choice of optimal device designs. The main	PD	OC	6	LO6 LO11

	devices	regularities of heat exchange, mass transfer and biochemical processes occurring in the farm. production. Design features of devices, fundamentals of kinetic and constructive calculation of devices, determination of their overall dimensions.				
23	Modeling of chemical and technological processes	Mathematical methods of modeling the chemical-technological process. Tasks of optimal process management. Determining the parameters of the regression model. Building models of object statics. Identification of the dynamic characteristics of the object. Basic techniques for working with the ChemCad program. Construction of a model of the kinetics of a chemical reaction using experimental data.	PD	OC	6	LO6 LO11
24	Good practice of cultivation and collection (GACP) of medicinal plants	Regulatory documents. Formation of the concept and strategy. Implementation of HACCP principles. Research methods in crop production. Buildings and production area. Equipment. Documentation. Seeds and seedlings. Cultivation. Ecological aspects of the cultivation of medicinal plants. Collecting. Harvesting. Drying and primary processing of raw materials. Package. Storage and distribution.	PD	OC	3	LO7 LO10
25	Medicinal resource studies	Methods of resource research to determine the natural reserves of medicinal plant raw materials of various morphological groups. Mapping. Compilation of the floral composition of the phytocenosis. Stages of the expedition resource survey. Selection of objects of resource survey.	PD	OC	3	LO7 LO10

		Good GCP practices (collection, drying, storage, cultivation). The influence of external factors on the dynamics of the accumulation of BAS in the medicinal plant. Calculation of the annual volume (operational reserve) of raw material procurement.				
26	Standardization of medicinal plant materials	The general importance of medicinal plants and medicinal plant raw materials as a source of biologically active compounds used in standardization in modern phytotherapy. Technology of isolation and research of substances and phytopreparations from medicinal raw materials of plant origin. The relationship between the chemical structure of plant substances and their pharmacological activity.	PD	OC	3	LO7 LO8 LO10
27	Standardization of medicines of natural origin	Standardization and quality control of medicinal plant raw materials. Tasks and procedure for standardization of medicinal plant raw materials. Standardization and category of regulatory documents regulating the quality of medicinal plant raw materials. The procedure for approving regulatory documentation for medicinal plants and products of their processing. Improvement of methods for establishing the authenticity and quality of raw materials. The range of modern herbal complex preparations.	PD	OC	3	LO7 LO8 LO10
28	Boianalytical chemistry and toxicology	Fundamentals of analytical and biochemical toxicology. Methodology of chemical and toxicological analysis. Modern methods of analysis used in chemical and	PD	OC	3	LO5 LO10

		toxicological studies. Preliminary and confirmatory methods for the determination of toxicologically important substances.				
29	Toxicology	Fundamentals, principles and methods of toxicology. parameters and basic patterns of toxicometry, determination of toxicological characteristics. Mechanisms and toxic effects on organs and tissues caused by chemicals (medicines, pesticides, food additives, industrial and household chemicals, environmental pollutants, etc.). Indepth study of the assessment of health risks associated with chemicals.	PD	OC	3	LO5 LO10
Research work					**24**	
30	Research work, including a master's thesis	Research Planning in Pharmacy. Literature review. Research in Pharmacy ecology. Data collection and analysis. Methods of Scientific Research in Pharmacy ecology. Evaluation of the results of the study.			24	LO1 LO2 LO3 LO4 LO5 LO6 LO7 LO8 LO9 LO10 LO11 LO12
Final examination					**12**	
31	Preparation and defense of a master's thesis	Assessment of core competencies and learning outcomes achieved after completion of the Master's degree program.			12	LO1 LO2 LO3 LO4 LO5 LO6 LO7 LO8 LO9 LO10 LO11 LO12
TOTAL					**120**	

Annex 1.3

A matrix for achieving LO using various learning methods

LO	Teaching and learning methods	
LO1 To organize the work of pharmaceutical ecology in accordance with regulatory legal acts, rules and regulations of safety, labor protection, environment and environmental management.	Lectures, seminars, analysis of pharmaceutical activities	Discussion of the results of the analysis, work in groups
LO2 Apply the laws and principles of fundamental disciplines to research activities in the field under study when planning and developing environmental monitoring, validation of testing processes and analytical techniques.	Develop strategies and make decisions, work in small groups	Application of fundamental disciplines
LO3 Apply the basic laws and principles of modern ecology in scientific activity, taking into account the national strategy of sustainable development, legal and organizational foundations of state regulation in the field of environmental safety.	Case Study, Material Analysis, feedback from a graduate student	Analysis of cases of pharmacotherapy and clinical testing of products, work in small groups
LO4 Develop a team strategy to achieve the goal, on the basis of which he plans, organizes, corrects and directs the work of the team, taking into account the peculiarities of the behavior of its members, resolves conflicts and contradictions.	Practical modeling	Using interactive teaching methods
LO5 To carry out an examination of the main environmental pollutants and their sources, the types of impact of pharmaceutical industries and pharmacy organizations on the environment and human health, methods of management of medical and pharmaceutical waste, taking into account the basics of environmental management and marketing in pharmacy.	Material analysis, pharmaceutical activity analysis	Analyze data, develop strategies and make decisions, work in small groups
LO6 To prepare premises, technological equipment and employees for pharmacy manufacturing and industrial production of medicines and participate in the development of technological documentation for the industrial production of medicines.	The use of interdisciplinary cases	Discussion, group tasks

LO7 To organize the cultivation and harvesting of medicinal plant raw materials taking into account the rational use of medicinal plant resources, to predict and justify ways to solve the problem of protecting medicinal plant thickets and preserving their gene pool.	Reflection and introspection	Analyze data, develop strategies and make decisions, work in small groups
LO8 Apply advanced innovations in research activities in quality control and standardization, assessment of biological safety of medicinal plant raw materials and medicines.	Material analysis, conducting research in pharmaceutical science	Discussion of the results of the analysis, work in groups
LO9 To develop a strategy for solving problems of pharmaceutical ecology, to plan and independently carry out scientific experiments in accordance with ethical standards, to summarize and justify the results obtained and on their basis to make innovative decisions in the preparation of projects in the field of biotechnology.	Develop strategies and make decisions, work in small groups	Development of strategies and execution of scientific experiments
LO10 Demonstrate the skills of systematization of scientific knowledge to ensure the environmental safety of the circulation of medicines, medicinal plant raw materials, medical products and pharmacy assortment goods.	Discussions and debates	Show skills
LO11 To carry out research and experimental work aimed at implementing the environmental policy of pharmaceutical enterprises on the basis of state environmental protection programs and international standards of GxP.	Data analysis, strategy development	Research activities in the direction of Environmental Policy
LO12 Develop science-based projects and business plans for the improvement of biotechnological processes to solve problems of healthcare, environmental protection, industrial production of medicinal products and medical equipment and to argue (in writing and orally-reports, presentations, articles) the introduction of innovative technologies into production.	Collection of material and data	Development of research projects and business plan

Annex 1.4

The matrix of compliance of LO with assessment methods

PO	Assessment methods	
LO1 To organize the work of pharmaceutical ecology in accordance with regulatory legal acts, rules and regulations of safety, labor protection, environment and environmental management.	Portfolio	Testing Oral survey
LO2 Apply the laws and principles of fundamental disciplines to research activities in the field under study when planning and developing environmental monitoring, validation of testing processes and analytical techniques.	Testing Oral survey	Preparation and provision of information at the appropriate level
LO3 Apply the basic laws and principles of modern ecology in scientific activity, taking into account the national strategy of sustainable development, legal and organizational foundations of state regulation in the field of environmental safety.	Presentation of the topic	Preparation and defense of the report
LO4 Develop a team strategy to achieve the goal, on the basis of which he plans, organizes, corrects and directs the work of the team, taking into account the peculiarities of the behavior of its members, resolves conflicts and contradictions.	Self-esteem	Publications
LO5 To carry out an examination of the main environmental pollutants and their sources, the types of impact of pharmaceutical industries and pharmacy organizations on the environment and human health, methods of management of medical and pharmaceutical waste, taking into account the basics of environmental management and marketing in pharmacy.	Oral response, oral survey	Essay (short and long)
LO6 To prepare premises, technological equipment and employees for pharmacy manufacturing and industrial production of medicines and participate in the development of technological documentation for the industrial production of medicines.	Drawing up test and situational tasks	Oral response, oral survey

LO7 To organize the cultivation and harvesting of medicinal plant raw materials taking into account the rational use of medicinal plant resources, to predict and justify ways to solve the problem of protecting medicinal plant thickets and preserving their gene pool.	Project activity: assessment of the quality of project execution	Publications, level of scientific proof and analysis
LO8 Apply advanced innovations in research activities in quality control and standardization, assessment of biological safety of medicinal plant raw materials and medicines.	Oral exams: conducting theoretical and practical exams	Oral response, oral survey
LO9 To develop a strategy for solving problems of pharmaceutical ecology, to plan and independently carry out scientific experiments in accordance with ethical standards, to summarize and justify the results obtained and on their basis to make innovative decisions in the preparation of projects in the field of biotechnology.	Essay (short and long)	Portfolio: creating a portfolio with the work and achievements of a graduate student to assess the overall level of training
LO10 Demonstrate the skills of systematization of scientific knowledge to ensure the environmental safety of the circulation of medicines, medicinal plant raw materials, medical products and pharmacy assortment goods.	Self-assessment and discussion of the results with the teacher	Abstract/presentation
LO11 To carry out research and experimental work aimed at implementing the environmental policy of pharmaceutical enterprises on the basis of state environmental protection programs and international standards of GxP.	Preparation and defense of the report	Testing Oral survey
LO12 Develop science-based projects and business plans for the improvement of biotechnological processes to solve problems of healthcare, environmental protection, industrial production of medicinal products and medical equipment and to argue (in writing and orally-reports, presentations, articles) the introduction of innovative technologies into production.	Project activity: assessment of the quality of project execution	Publications, level of scientific proof and analysis

Work plan for the entire period of study

The cycle of disciplines		Discipline code	Name of the discipline	Amount of credits	General hours	Practical lesson	MIC		1 year of study	2 year of study	Form of control
							MTIC	MIC			
1	2	3	4	5	6	7	8	9	10	11	13
BD	**UC/OC**	**BASIC DISCIPLINES**		**35**	**1050**	**350**	**210**	**490**	**35**		
BD	UC	**University component (General professional module)**		**20**	**600**	**200**	**120**	**280**	**20**		
		M-HPS	History and philosophy of science	4	120	40	24	56	4		Exam
		M-FL	Foreign language (professional)	4	120	40	24	56	4		Exam
		M-PHS	Pedagogics of the higher school	3	90	30	18	42	3		Exam
		M-PsM	Psychology of management	3	90	30	18	42	3		Exam
		TP	**Teaching practice**	**6**	**180**	**60**	**36**	**84**	**6**		**Report**
	OC	**Optional Component**		**15**	**450**	**150**	**90**	**210**	**6**		
		M-PhChMA	Physico-chemical methods of analysis	3	90	30	18	42	3		Exam
		M-BioET	Bioethics	3	90	30	18	42	3		Exam
		M-MPBSGPS	Modern problems of biotechnology in solving global problems of society	3	90	30	18	42		3	Exam
		M-SPM	Scientific project management	3	90	30	18	42		3	Exam
		M-PhC	Pharmaceutical chemistry	3	90	30	18	42		3	Exam
		M-DM	Development of medicines	3	90	30	18	42		3	Exam
		M-PBio	Practical biostatistics	3	90	30	18	42	3		Exam
		M-LD	Leadership	3	90	30	18	42	3		Exam
		M-PhMb	Pharmaceutical Microbiology	3	90	30	18	42	3		Exam
		M-PhChB	Physico-chemical biology	3	90	30	18	42	3		Exam

PD	UC/OC	PROFILE DISCIPLINES		49	1470	490	294	686	21	28	
PD	UC	**University component (General professional module)**		**22**	**660**	**220**	**132**	**308**	**9**	**13**	
		M-EMPhE	Environmental monitoring at pharmaceutical enterprises	4	120	40	24	56		4	Exam
		M-ENM	Ecology and nature management	3	90	30	18	42	3		Exam
		M-MMB	Modern methods of biotechnology	6	180	60	36	84	6		Exam
		M-GMPEMSPhE	Good manufacturing practice and environmental management system at pharmaceutical enterprises	6	180	60	36	84		6	Exam
		M-EAMPRM	Ecological analysis of medicinal plant raw materials	3	90	30	18	42		3	Exam
		RP	**Research practice**	**12**	**360**	**120**	**72**	**168**		**12**	**Report**
	OC	**Optional Component**		**15**	**450**	**150**	**90**	**210**	**12**	**3**	
		M-PhPPD	Pharmaceutical production processes and devices	6	180	60	36	84	6		Exam
		M-MChTP	Modeling of chemical and technological processes	6	180	60	36	84	6		Exam
		M-GPCCMP	Good practice of cultivation and collection (GACP) of medicinal plants	3	90	30	18	42		3	Exam
		M-MRS	Medicinal resource studies	3	90	30	18	42		3	Exam
		M-SMPM	Standardization of medicinal plant materials	3	90	30	18	42	3		Exam
		M-SMNO	Standardization of medicines of natural origin	3	90	30	18	42	3		Exam
		M-BChT	Boianalytical chemistry and toxicology	3	90	30	18	42	3		Exam
		M-Tox	Toxicology	3	90	30	18	42	3		Exam
RW		**RESEARCH WORK**		**24**	**720**	**240**	**480**		**10**	**14**	
	MRWI	Master's research work, including internship and master's thesis		4	120	40	80		4		Report
				6	180	60	120		6		
				8	270	80	160			8	

			6	180	60	120		6	
FE		**FINAL EXAMINATION**	**12**	**360**	**120**	**240**		**12**	
FE	DDMT	Design and defense of a master's thesis	12	360	120	240		12	
		TOTAL	**120**	**3600**	**1200**	**2400**	**60**	**60**	