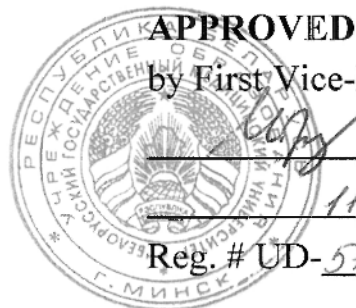


MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS
EDUCATIONAL INSTITUTION
BELARUSIAN STATE MEDICAL UNIVERSITY

Контрольный
экземпляр



APPROVED

by First Vice-Rector

I.N. Moroz

11.06.2019

Reg. # UD-574/1920 /edu.

PHARMACEUTICAL ECOLOGY

**Curriculum of the higher educational institution
in the educational discipline for the specialty:**

1-79 01 08 «Pharmacy»

Minsk, 2019

Curriculum is based on the educational program «Pharmaceutical Ecology», approved on August 31, 2016, registration # УД-Л.574/1617/уч.

COMPILERS:

N.D.Yarantseva, Head of the Pharmaceutical Chemistry Department of the Educational Institution «Belarusian State Medical University», PhD, Associate professor;

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RECOMMENDED FOR APPROVAL:

Pharmaceutical Chemistry Department of the Educational Institution «Belarusian State Medical University»
(protocol # 12 of May 17, 2019);

Methodological commission of pharmaceutical disciplines of the Educational Institution «Belarusian State Medical University»
(protocol # 9 of May 23, 2019)

EXPLANATORY NOTE

«Pharmaceutical Ecology» – academic discipline, containing systematized scientific research knowledge, which ensure the safety and security of medicines, medicinal plant raw materials, medical products, pharmaceutical products.

The purpose of teaching and studying the discipline «Pharmaceutical Ecology» is to form and acquire in students scientific knowledge on the reduction of the pharmaceutical companies and pharmacy organizations adverse effects on the environment, human health and the environmental measures organization.

The tasks of teaching and studying academic disciplines consist in the formation and acquisition by students of academic, social, personal and professional competencies, the basis of which lies in the knowledge and application of:

- the basic laws and principles of modern ecology;
- the national strategy for sustainable development, the legal and institutional basis for state regulation in the field of environmental safety;
- the main environmental pollutants and their sources, the types of the pharmaceutical production and pharmacy organizations effects on the environment and human health;
- methods of the medical and pharmaceutical waste management;
- fundamentals of environmental management and marketing in pharmacy.

Teaching and successful study of the academic discipline «Pharmaceutical Ecology» is carried out on the basis of the knowledge and skills acquired by the student in the sections of the following academic disciplines:

Biology. Population, its ecological characteristics. Population humankind structure. The main biological systems of the biosphere-biogeocenotic level of the living organization. Human ecology, its tasks. Levels of the human environmental links.

Pharmaceutical hygiene. The environmental factors influence on human health. Hygienic requirements for the medicines pharmacy manufacturing and industrial production, working conditions for the pharmacy organizations and pharmaceutical enterprises employees. Effect of air pollutants, water, soil and the internal dwelling environment on human health. Requirements for radiation safety. Prevention of the environmental factors and pollutants adverse effects on human health. Hygienic characteristics of physical (microclimate, noise, vibration, ultraviolet, infrared, laser, ionizing radiation), chemical (industrial poisons), biological (microorganisms, protein-vitamin and enzyme means, antibiotics) factors, dust.

Pharmaceutical botany. Plant geography and ecology basics. Elements of geobotany. Stocks rational exploitation and wild medicinal plants protection.

Microbiology. Ecology of microorganisms.

Pharmacognosy. Raw material base of medicinal plants in the Republic of Belarus. Resource science of medicinal plants. Proper practice of cultivation, collection, storage of medicinal plant materials. Standardization system and requirements for the medicinal plant materials quality. The influence of various

environmental factors on the accumulation of biologically active substances by the plant.

As a result of studying the academic discipline «Pharmaceutical Ecology» the student should

know:

- the current state of the environment and the instruments of the Republic of Belarus state environmental policy;
- directions of environmental activities and modern environmental protection measures of pharmaceutical enterprises;
- methodology of environmental management and marketing;

be able to:

- use the regulatory legal acts on environmental issues in their professional activities;
- apply environmental principles to ensure the safety of raw materials used for medicines pharmaceutical manufacturing and industrial production;
- make a conclusion on the environmental well-being and the possibility of medicinal plant materials procurement in the particular area;
- take part in the environmental policy development and the environmental management system implementation in pharmaceutical enterprises;

master:

- skills of the air, soil, water sampling acts drawing up and their assessment according to laboratory analysis;
- skills of the pollutants effects minimizing on the human body;
- ability to manage medical waste.

Curriculum structure: the training material included in the curriculum consists of two sections. The first section is «Introduction to the academic discipline «Pharmaceutical Ecology». Legal regulation in the field of environmental protection and environmental management- is the basis for the subsequent topics study. The second section «Environmental management and environmental protection activities in pharmacy» contains applied information necessary for pharmacists in their professional activities.

Total number of hours for the study of the discipline is 80 academic hours. Classroom hours according to the types of studies: lectures - 18 hours, laboratory studies (practical) classes - 27 hours, student independent work (self-study) - 35 hours.

Current assessment is carried out according to the syllabus of the specialty in the form of a credit (7 semester).

Form of higher education – full-time.

**ALLOCATION OF ACADEMIC TIME
ACCORDING TO SEMESTERS OF STUDY**

Code, name of the specialty	semester	Number of academic hours					out-of-class self-studies	Form of current assessment
		total	in-class	Including				
				lectures	laboratory			
1-79 01 08 «Pharmacy»	7	80	45	18	27	35	credit	

THEMATIC PLAN

Section (topic) name	Number of class hours	
	lectures	laboratory
1. Introduction to the academic discipline «Pharmaceutical Ecology». Legal regulation in the field of environmental protection and environmental management	6	9
2. Nature management and environmental activities in pharmacy	12	18
2.1. Environmental aspects of the pharmaceutical and biotechnological industries	4	3
2.2. Environmental aspects of pharmacies, pharmacy warehouses, control and analytical (testing) laboratories	2	3
2.3. Medical and pharmaceutical waste management	2	6
2.4. Fundamentals of environmental management and marketing in pharmacy	4	6
Total hours	18	27

CONTENT OF THE EDUCATIONAL MATERIAL

1. Introduction to the academic discipline «Pharmaceutical Ecology».

Legal regulation in the field of environmental protection and environmental management

Aims and objectives of the discipline «Pharmaceutical Ecology», integration with other academic disciplines in the system of training a pharmacist.

Environmental problems of modernity. Model of sustainable development of civilization. National strategy for sustainable socio-economic development of the Republic of Belarus.

Resources and current state of the environment of the Republic of Belarus. Consequences of the Chernobyl disaster for the population of the republic. Features of the current environmental situation in the Republic of Belarus and its major industrial centers.

The main directions of the state policy of the Republic of Belarus in the field of environmental protection. Legislation of the Republic of Belarus on environmental protection. Constitution of the Republic of Belarus. Law of the Republic of Belarus «On Environmental Protection». Basic principles of environmental protection. Law of the Republic of Belarus «On Ecological Expertise». Technical normative legal acts in the field of environmental protection.

Responsibility for violation of the legislation of the Republic of Belarus on environmental protection.

2. Nature management and environmental activities in pharmacy

2.1. Environmental aspects of the pharmaceutical and biotechnological industries

Environmental problems in the manufacture of medicines, including biotechnology products. Pharmaceutical enterprises as sources of environmental pollution. Requirements in the field of environmental protection during the placement of pharmaceutical enterprises and biotechnological industries.

Accounting at pharmaceutical enterprises of emissions (discharges) of pollutants, the procedure for filling and application of the accounting documentation forms in the environmental protection field. Material Safety Data Sheet.

Wastewater from pharmaceutical production, organoleptic, chemical and microbiological analysis. Conditions for receiving wastewater from pharmaceutical enterprises and pharmacies into the drainage network. Methods of cleaning and neutralization of industrial wastewater, sewage treatment plants.

Definition of the hazard category of pharmaceutical enterprises depending on the mass, type and composition of pollutants emitted into the atmosphere. Rules of the movement and documents accounting in the implementation of activities for issuing permits for the pollutants emission into the air. Measures aimed at the reduction and elimination of air pollution by industrial emissions. Air purification methods.

Sanitary protection zone. The procedure for accounting and handling plant world objects located on the lands of pharmaceutical enterprises.

The influence of the production environment factors on the workers' health in pharmaceutical enterprises.

2.2. Environmental aspects of pharmacies, pharmacy warehouses, control and analytical (testing) laboratories

Requirements in the field of environmental protection when placing pharmacy organizations and their structural divisions.

The influence of environmental factors on the quality of medicinal plant materials. Ecological and biological features of natural populations of medicinal plants as the basis of their rational exploitation. The conclusion about the ecological well-being and the possibility of medicinal plant materials preparation in a certain area.

Disposal of used reagents and reagents with the expired shelf life in the control and analytical laboratories.

Disposal of general reagents and alcohol-containing reagents. Recycling of silver-containing reagents, returned by pharmacies to the control and analytical laboratory.

Features recycling containing acetonitrile and methanol. Destruction of medicinal products rejected by the control-analytical laboratory during testing.

The influence of factors of the working environment on the health of workers in pharmacies, pharmacy warehouses, control and analytical (testing) laboratories.

2.3. Medical and pharmaceutical waste management

Pharmaceutical production and consumption waste. The basic principles of the state policy in the field of waste management. Environmental legislation on waste production and consumption of the Republic of Belarus. Law of the Republic of Belarus «On Waste Management». Waste classification. Hazard degree and hazard classes of waste. Classification of waste generated in the Republic of Belarus.

Medical waste. Regulations for the management of medical waste. License for hazardous waste management. Rules and methods for the medical waste disposal, medical devices and medical equipment.

Pharmaceutical waste. Classification, accounting of availability, education and placement, rules and methods of the drugs waste disposal in pharmacies.

Methods of expired drugs disposal by the population.

Wastes from the production and processing of pharmaceutical products. Waste generation guidelines. Passport hazard waste. Instructions for handling pharmaceutical production wastes, placement, storage, order and methods of the pharmaceutical companies disposal. Accounting and inventory of waste.

Permission and waste collection contract. Environmental requirements for the transport of pharmaceutical waste to landfills. Reception of waste to landfills, depending on the hazard class. Economic payments for the disposal of regulatory and excess waste (environmental tax).

The use of waste. Secondary material resources. Waste-free and low-waste production.

Responsibility for violation of environmental requirements when handling wastes.

2.5. Fundamentals of environmental management and marketing in pharmacy

Environmental management in the pharmaceutical enterprise. Environmental policy of the pharmaceutical company. Environmental Management System (ISO 14001: 2005). Ecological services at the pharmaceutical enterprise. Environmental certification, mandatory certification, objects, goals and objectives of products.

Environmental Impact Assessment System (EIA). Ecological expertise at pharmaceutical enterprises: basic concepts and objects subject to ecological expertise. Documenting the results of environmental expertise. Environmental certification of the pharmaceutical industry enterprises.

Ecological marketing at the pharmaceutical enterprise, goals and objectives. Standards governing the use of eco-labels for products: international, national, Customs Union. The environmental safety of the packaging of medicines, medical devices, pharmaceutical goods.

Environmental audit of pharmaceutical activities, responsibility for violation of the legislation of the Republic of Belarus on environmental protection.

The main types of environmental reporting. State environmental statistical reporting of pharmaceutical enterprises, common standard forms of statistical environmental reporting of pharmacy organizations. Forms of departmental reporting «Information about the local monitoring of the environment». Environmental check in the pharmacy.

EDUCATIONAL DISCIPLINE CURRICULAR CHART

Section, topic #	Section (topic) name	number of hours			Equipment	Form of control
		lectures	laboratory	Self-studies		
1	Introduction to the academic discipline «Pharmaceutical Ecology». Legal regulation in the field of environmental protection and environmental management	6	9	7	computer	interviews; situational tasks and tests; control questioning; electronic tests
2	Nature management and environmental activities in pharmacy	12	18	28	computer	interviews; seminar reports; situational tasks and tests; control questioning; written accounts of laboratory work; evaluation based on modular rating system; case based evaluation; evaluation based on cooperative teaching method;
2.1	Environmental aspects of the pharmaceutical	4	3	7	computer	evaluation based on the project method; accounts of laboratory work with oral defense; electronic tests; electronic workshops (practicals); situational tasks and control questioning;

	and biotechnological industries						written accounts of laboratory work; evaluation based on modular rating system; case based evaluation; portfolio based evaluation; evaluation based on cooperative teaching method; evaluation based on the project method; accounts of laboratory work with oral defense; electronic tests; interviews; seminar reports; evaluation based on modular rating system; case based evaluation; electronic tests;
2.2	Environmental aspects of pharmacies, pharmacy warehouses, control and analytical (testing) laboratories	2	3	7	computer		interviews; seminar reports; evaluation based on modular rating system; case based evaluation; electronic tests;
2.3	Medical and pharmaceutical waste management	2	6	7	computer		interviews; seminar reports; evaluation based on modular rating system; case based evaluation; electronic tests;
2.4	Fundamentals of environmental management and marketing in pharmacy	4	6	7	computer		final tests, credit
	Total	18	27	35			

INFORMATION AND INSTRUCTIONAL UNIT

LITERATURE

Basic (relevant):

1. Chelnokov, A. A. Basics of Ecology: study guide / A.A.Chelnokov, L.F.Yushchenko, I.N.Oil cakes; under total ed. A.A.Chelnokova. – Minsk : Higher School, 2012. – 543 p. (and subsequent editions).
2. Patrick Jjemba, K. Pharma-Ecology. The Occurrence and Fate of Pharmaceuticals and Personal Care Products in the Environment – John Wiley & Sons Limited (USD), 2018. – 415 p.

Additional:

3. Juniper, Tony The Ecology Book: Big Ideas Simply Explained – John Wiley & Sons Limited (USD), 2019. – 352 p.

Normative regulatory acts:

4. <http://pravo.by>. – National legal Internet portal of the Republic of Belarus.

LIST OF AVAILABLE DIAGNOSTIC TOOLS

The following forms are used for competences assessment:

1. Oral form:
 - interviews;
 - seminar reports;
 - situational tasks and tests;
2. Written form:
 - control questioning;
 - final tests;
 - written accounts of laboratory work;
 - evaluation based on modular rating system;
 - case based evaluation;
 - portfolio based evaluation;
 - evaluation based on cooperative teaching method;
 - evaluation based on the project method;
3. Oral-written form:
 - accounts of laboratory work with oral defense;
4. Technical form:
 - electronic tests;
 - electronic workshops (practicals).

LIST OF PRACTICAL SKILLS

- Skills of drawing up acts of sampling air, soil, water and their assessment according to laboratory analysis;
- skills to minimize the effects of pollutants on the human body;
- ability to manage medical waste.

LIST OF LECTURES**7 semester**

1. Introduction to the academic discipline «Pharmaceutical Ecology».
2. Resources and current state of the environment of the Republic of Belarus.
3. Legal regulation in the field of environmental protection and environmental management.
4. Environmental aspects of the pharmaceutical and biotechnological industries.
5. Environmental aspects of pharmacies, pharmacy warehouses, control and analytical (testing) laboratories.
6. Medical and pharmaceutical waste management.
7. Fundamentals of environmental management and marketing in pharmacy.

LIST OF LABORATORY STUDIES**7 semester**

1. Introduction to academic discipline «Pharmaceutical Ecology».
2. Resources and current state of the environment of the Republic of Belarus.
3. Legal regulation in the field of environmental protection and environmental management.
4. Environmental aspects of the pharmaceutical and biotechnological industries.
5. Environmental aspects of pharmacies, pharmacy warehouses, control and analytical (testing) laboratories.
6. Medical and pharmaceutical waste management.
7. Fundamentals of environmental management and marketing in pharmacy.

**PROTOCOL OF THE CURRICULUM APPROVAL
BY OTHER DEPARTMENTS**

Title of the discipline requiring approval	Department	Amendments to the curriculum of the academic discipline	Decision of the department, which designed the curriculum (date, protocol No.)
1. Pharmacognosy	Department of the Pharmacy organization	no changes	protocol #. 12 of May 17, 2019
2. Pharmaceutical Hygiene	General Hygiene Department	no changes	protocol #. 12 of May 17, 2019

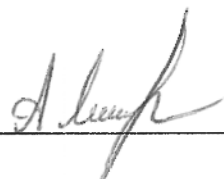
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N.V. Lishai

Curriculum content, composition and accompanying documents comply with
established requirements.

Dean of the Medical Faculty of
International Students of the
Educational Institution «Belarusian
State
Medical University»


10. 06. 2019



O.S. Ishutin

Methodologist of the Educational
Institution
«Belarusian State Medical University»

10. 06. 2019



S.V. Zaturanova



Head of the Foreign Languages
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10. 06. 2019



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