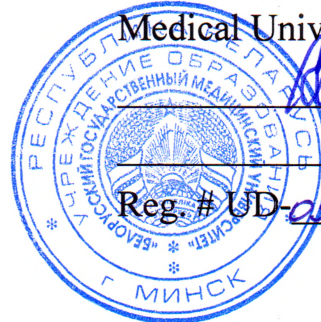


MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS
Educational Institution
«BELARUSIAN STATE MEDICAL UNIVERSITY»

Контрольный
экземпляр

APPROVED

by Rector of the Educational
Institution «Belarusian State
Medical University»



S.P.Rubnikovich

26.06.2025

Reg. # UD-0912-01-24/2524/edu.

PHARMACY TECHNOLOGY OF DRUGS

**Curriculum of the educational institution
in the academic discipline for the specialty**

7-07-0912-01 «Pharmacy»

Curriculum is based on the educational program «Pharmacy Technology of Drugs», approved 26.06.2025, registration # УД-0912-01-24/2425/уч.; on the educational plan in the specialty 7-07-0912-01 «Pharmacy», approved 16.04.2025, registration # №7-07-0912-01/2526/mf.

COMPILER:

N.S.Goliak, Head of the Pharmaceutical Technology Department with a course for advanced training and retraining of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor;

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RECOMMENDED FOR APPROVAL:

by the Pharmaceutical Technology Department with a course for advanced training and retraining of the Educational Institution «Belarusian State Medical University» (protocol # 14 dated 14.06.2025);

by the Scientific and Methodological Council of the Educational Institution «Belarusian State Medical University» (protocol # 10 dated 26.06.2025)

EXPLANATORY NOTE

«Pharmacy Technology of Drugs» – academic discipline of the Pharmaceutical Technology Module, containing systematic scientific knowledge about pharmaceutical manufacture medicines on the prescription of a doctor and the requirements of organizations of health care.

The aim of the academic discipline «Pharmacy Technology of Drugs» is to develop scientific knowledge and practical skills in the pharmaceutical manufacture of high-quality, safe and effective medicines.

The objectives of the academic discipline «Pharmacy Technology of Drugs» are to provide students with knowledge about:

- the range of pharmaceutical substances and excipients for pharmaceutical manufacturing of drugs, their physical, chemical and pharmacological properties;
- technological methods of pharmaceutical manufacturing of various dosage forms;
- effective use of technological equipment and low-mechanization means in pharmacies;

- promising auxiliary materials and packaging;

- methods for assessing the quality of manufactured drugs according to pharmacopeial quality indicators;

- skills for independent knowledge search and work with educational and methodological literature.

Relations to other educational disciplines

The knowledge, skills and abilities acquired in the study of the academic discipline «Pharmacy Technology of Drugs» are necessary for the successful study of the following academic disciplines: «Industrial Technology of Drugs», «Pharmaceutical Development with the Fundamentals of Biopharmaceutics», «Pharmaceutical Biotechnology».

A student who has mastered the content of the educational material of the academic discipline should have the following specialized competence: make medicines at the pharmacy.

As a result of studying the academic discipline «Pharmacy Technology of Drugs», the student should

know:

- the basic concepts in the field of manufacturing drugs;

- regulatory legal acts governing pharmacy manufacturing and quality requirements for drugs;

- the nomenclature and properties of drugs and auxiliary substances used in pharmacy technology;

- the main stages, operations and techniques used in the manufacture of drugs in various dosage forms;

- the design and operating principle of low-mechanization equipment used in the pharmacy manufacture of drugs;

- the characteristics of containers, auxiliary and sealing materials used in pharmacy organizations;

be able to:

dose substances by weight, volume, drops;

conduct a pharmaceutical examination of doctors' prescriptions and the requirements of healthcare organizations for extemporaneous manufactured medicines;

manufacture drugs taking into account the compatibility of components in the doctor's prescription;

find rational ways to overcome the incompatibility of pharmaceutical ingredients;

select and use excipients, packaging and closure materials for pharmaceuticals manufactured in pharmacies as intended;

carry out stage-by-stage quality control of pharmaceuticals manufactured in pharmacies;

issue pharmaceuticals manufactured in pharmacies for dispensing;

master:

theoretical foundations of manufacturing processes based on a scientific approach to the manufacture of pharmaceuticals;

practical skills of extemporaneous manufacturing.

Total number of hours for the study of the academic discipline is 310 academic hours, of which 163 classroom hours and 147 hours of student independent work. Classroom hours according to the types of studies: lectures – 30 hours (including 3 hours of supervised student independent work (SSIW)), laboratory classes – 136 hours.

Form of higher education – full-time.

Intermediate assessment is carried out according to the syllabus of the specialty in the form of a credit (5 semester) and examination (6 semester).

ALLOCATION OF ACADEMIC TIME ACCORDING TO SEMESTERS OF STUDY

Code, name of the specialty	Semester	Total number of academic hours	Number of classroom hours				Out-of-class self-studies	Form of intermediate assessment
			Number of classroom hours	including				
				class lectures	SSIW	laboratory studies		
7-07-0912-01 «Pharmacy»	5	190	89	21	3	68	101	Credit
	6	120	74	6	-	68	46	Examination
		310	163	27	3	136	147	

THEMATIC PLAN

Section (topic) name	Number of class hours	
	lectures (incl. SSIW)	laboratory
1. General technology of medicines, produced at chemist's shop	3	20
1.1. Introduction to the academic discipline «Pharmacy Technology of Drugs»	1,5	4
1.2. State regulation of the manufacturing of medicines at chemist's shop	1,5	4
1.3. Dosing in pharmacy technology of drugs	-	12
2. Special technology of pharmaceutical dosage forms, which produced at chemist's shop	27	116
2.1. Solid dosage forms	1,5	16
2.2. Liquid dosage forms	6	36
2.3. Heterogeneous dispersed systems	6	12
2.4. Water extracts from medicinal plants raw materials	1,5	8
2.5. Dosage forms with elastic-ductile-viscous dispersion medium	3	16
2.6. Sterile dosage forms	6	20
2.7. Pharmaceutical incompatibilities	3	8
Total hours	30	136

CONTENT OF THE EDUCATIONAL DISCIPLINE

1. General technology of medicines, produced at chemist's shop

1.1. Introduction to the academic discipline «Pharmacy Technology of Drugs»

Pharmacy technology of drugs: the objective, tasks, history of development, present state and development prospects. Basic terms and notions. Components of medicinal products: pharmaceutical substances, excipients, auxiliary materials, containers and closures, quality requirements. Classification of dosage forms by method of administration, aggregate state, dosage, biopharmaceutical classification, dispersological classification.

1.2. State regulation of the manufacturing of medicines at chemist's shops

The concept of regulatory legal acts and technical regulatory legal acts. Right to pharmaceutical practice, the concept of licensing. Regulation of the composition of prescriptions: standard and non-standard prescriptions; main sections and functions of the recipe, rules for prescribing extemporaneous medications, the concept of examination of the recipe. Rationing of the quality of raw materials and materials for the production of medicines. Rationing of the technological process and manufacturing conditions; sanitary conditions at chemist's shop. Normalization of the procedure and conditions for quality assurance of medicines manufactured at chemist's shop: types of control. Standardization of storage, packaging and registration of medicines manufactured at chemist's shop.

1.3. Dosing in pharmacy technology of drugs

The concept of doses. Dosing methods used in the manufacturing of medicines at chemist's shops.

Dosage by mass. Scales used at chemist's shops for dispensing pharmaceutical substances, their metrological characteristics. Rules for dosing medicines by mass. Weight sets. Verification of measuring instruments. Factors affecting the accuracy of dosing by mass.

Dosing by volume and by drops. Characteristics of measuring instruments for dosing by volume and by drops. Instruments graduated «for filling» and «for pouring». Rules for dosing by volume and by drops. Factors influencing the accuracy of dosing by volume.

2. Special technology of pharmaceutical dosage forms, which produced at chemist's shop

2.1. Solid dosage forms

Powders as a dosage form. General and private powder technology. Classification and characteristics of powders as a dosage form and dispersion system. Methods of prescription. Basic calculations in the manufacture of powders. Rules for the manufacture of simple and complex powders. Rules for dosing, packaging, storage. Quality requirements. Improvement of powder technology.

Technology of powders with pharmaceutical substances having different structure and particle size. Pharmaceutical substances large and small crystalline, amorphous. Features of manufacturing powders with difficult-to-grind and lightweight substances. Use of auxiliary liquids for grinding pharmaceutical substances, their mechanism of action.

Technology of powders with substances of the list «A». List of narcotic, toxic, psychotropic drugs, rules for their storage, accounting and dispensing. Pharmaceutical examination of prescriptions: checking the correctness of the prescribed dose of a substance, the compliance of the amount of a substance with the established norm of sale under one doctor's prescription. Features of dosing toxic substances. Rules for the manufacture of powders with toxic substances, the use of triturations. Quality assessment, features of packaging and registration for sale.

Technology of powders with coloring, odorous and volatile pharmaceutical substances. List of coloring, odorous and volatile pharmaceutical substances, storage at chemist's shop. Rules for working with coloring, odorous and volatile pharmaceutical substances. Features of the technology of powders. Powders with hygroscopic and weathering substances, liquids and semi-finished products. Manufacturing, quality assessment, packaging and formalization for sale, storage conditions of powders.

2.2. Liquid dosage forms

General characteristics and classification of liquid dosage forms. Methods designations of concentration. The concept of the volume increase coefficient and the norms of permissible deviations in total volume and in total mass.

Dispersion media. Non-aqueous dispersion media: classification, physicochemical and technological properties, characteristics, area of application. Purified water: methods of obtaining at chemist's shop, requirements to quality and

requirements to storage. The structure, principles of working and operation rules for the aqua-distiller. Obtaining the water: purpose, main processes and devices.

True solutions of low-molecular drugs. Solubility of drugs. Application of the provisions of dissolution theory to optimize the technology of drug solutions. Manufacturing methods: by mass, volume and mass-volume.

Technology of non-aqueous solutions of medicinal substances. Features of dosing non-aqueous solvents. Technology of non-aqueous solutions, quality assessment, packaging and registration for sale, storage conditions.

Technology of ethyl alcohol solutions. Determination of concentration, dilution, fortification and accounting of ethyl alcohol at chemist's shop.

Standard pharmacopoeial solutions. Classification and characteristics. Rules for diluting aqueous standard pharmacopoeial solutions. Rules for the manufacturing of alcohol standard solutions at chemist's shop. Quality assessment, packaging and registration for sale, storage conditions.

Technology of aqueous solutions of medicinal substances. General rules and special cases of manufacturing of aqueous solutions. Solutions of slowly, moderately and poorly soluble medicinal substances. Technology of solutions of sodium bicarbonate, furacilin, riboflavin, iodine, potassium permanganate, phenobarbital, sodium thiosulfate according to the prescription of Demyanovich. Quality assessment, packaging and formalization for sale, storage conditions of aqueous solutions. Manufacturing of solutions using combined solvents.

Concentrated solutions of medicinal substances in the technology of liquid dosage forms. Purpose, conditions and rules for the manufacturing of concentrated solutions at chemist's shop. Quality control, calculations for adjusting concentration, dilution and fortification rules. Conditions and periods of storage of concentrated solutions at chemist's shop.

Technology of mixtures. Technological scheme for the manufacturing of mixtures, quality assessment, packaging and registration for sale, storage conditions. Technology of mixtures using concentrated solutions in combination with the dissolution of solid medicinal substances.

Technology of drops for internal and external use. Drops as a dosage form: characteristics and classification. Checking the doses of toxic and strong-effective substances in drops for internal use. Technology of drops, quality assessment, packaging and formalization for sale, storage conditions.

Technology of high-molecular compounds (HMC) solutions. Characteristics, classification and properties of HMC used at chemist's shop. The influence of the size and structure of substance molecules on the dissolution process. Technology of solutions of unlimited and limited swelling HMC. Quality assessment, packaging and formalization for sale, storage conditions. Phenomena observed when the rules and terms of storage of solutions of HMC are violated.

2.3. Heterogeneous dispersed systems

Technology of protected colloid solutions. Physicochemical properties of colloidal solutions, thermodynamic, electrostatic, aggregative and kinetic lability. Phenomenon of coagulation, factors influencing coagulation. Mechanism and significance of colloidal protection. Technology of protected colloid solutions.

Colloidal electrolyte solutions. Quality assessment, packaging and formalization for sale, storage conditions.

Technology of medicinal suspensions. Characteristics of suspensions as a dosage form, cases of their formation. Dispersion and condensation methods for obtaining suspensions. Hydrophilic and hydrophobic pharmaceutical substances. Causes of instability and methods of stabilizing suspensions. Stokes' law. Technology of manufacturing suspensions, quality assessment, packaging and formalization for sale, storage conditions.

Technology of medical emulsions. Types of emulsions. Characteristics of emulsions as a dosage form. Causes of instability and methods of stabilizing emulsions. Surfactants. Rules for the manufacture of oil emulsions, quality assessment, packaging and formalization for sale, storage conditions. Features of the manufacture of seed emulsions.

2.4. Water extracts from medicinal plants raw materials

Theoretical bases of extraction of biologically active substances from medicinal plants raw materials (MPRM). Technology of aqueous extractions from MPRM containing various groups of biologically active substances. Equipment for manufacturing of aqueous extractions. Technological modes and features of manufacturing of infusions, decoctions, mucus, teas. Features of introduction of pharmaceutical substances into aqueous extractions. Quality assessment, packaging and formalization for sale, storage conditions.

2.5. Dosage forms with elastic-ductile-viscous dispersion medium

Technology of ointments. Ointments as a dosage form and dispersion system. Classification of ointments. Excipients in ointment technology. Classification of ointment bases. Technology of homogeneous, heterogeneous and combined ointments. Features of manufacturing pastes, liniments, creams, gels. Quality assessment, packaging and formalization for sale, storage conditions.

Technology of suppositories. Characteristics of suppositories as a dosage form, classification. Excipients in suppository technology. Classification of suppository bases. Obtaining suppositories by the rolling method. Quality assessment, packaging and formalization for sale, storage conditions.

2.6. Sterile dosage forms

Organization of aseptic conditions at chemist's shop. Sources of microbial contamination of drugs. Microbiological purity and sterility. Sterilization methods used at chemist's shop: thermal, sterilizing filtration. Concept of the level of sterility guarantee. Classification and characteristics of sterile dosage forms.

Ophthalmic dosage forms: characteristics, classification, quality requirements. Determination of isotonic concentration of ophthalmic solutions using isotonic equivalent. Technology of eye drops at chemist's shop, quality assessment, packaging and formalization for sale, storage conditions. Characteristics and technology of eye ointments; eye ointment bases, quality requirements.

Isotonization of solutions for parenteral administration. Physiological solutions: characteristics, classification, osmolarity and osmolality. Calculation of theoretical osmolarity and isotonic concentrations of solutions based on the laws of Vant-Hoff, Raoult and the Mendeleev-Clapeyron equation. Ensuring isohydricity,

isoionicity, isoviscosity of infusion solutions – regulators of water-salt metabolism and acid-base balance.

Technology of solutions for parenteral administration. Features of parenteral administration of drugs into the body. Characteristics and classification of injections and infusions. Pyrogenic substances: nature and sources of origin, physicochemical properties, detection methods. The concept of bacterial endotoxins. Water for injection: characteristics, production, storage at chemist's shop. Features of water distillers intended for obtaining water for injection. Requirements for pharmaceutical substances for the manufacture of parenteral solutions. Technology of parenteral solutions; stage-by-stage control and quality assessment; packaging and formalization for sale, storage conditions.

Stabilization of solutions subjected to thermal sterilization. Causes of destruction of drugs in solutions during thermal sterilization. Use of the basic provisions of the theory of hydrolytic and oxidation-reduction processes to ensure the stability of solutions subjected to heat sterilization. Characteristics of stabilizers, mechanisms of action and theoretical basis for their selection. Stabilization of solutions of drugs subject to hydrolysis and oxidation. Containers for injection solutions.

Dosage forms for newborns and children the first year of life. Anatomical and physiological characteristics of the body of newborns and children the first year of life. Selection and purpose of dosage forms, features of dosing of drugs. Requirements for the composition of excipients and manufacturing conditions. Quality assessment, rules for dispensing and storage.

2.7. Pharmaceutical incompatibilities

Difficult cases and cases of incompatible combinations in multicomponent compositions of various dosage forms. Characteristics of physical, physico-chemical and chemical incompatibilities. Ways to prevent incompatibilities in dosage forms.

EDUCATIONAL DISCIPLINE «PHARMACY TECHNOLOGY OF DRUGS» CURRICULAR CHART

Section, topic #	Section (topic) name	Number of class hours		Supervised student independent work	Literature	Practical skill	Forms of control	
		lectures	laboratory				practical skill	current / intermediate certification
5 semester								
	Lectures	21	-	3	-			
1.	General technology of medicines, produced at chemist's shop	3	-	-	-			
1.1	Introduction to the academic discipline «Pharmacy Technology of Drugs». Basic terms and notions. History and development prospects. Classification of dosage forms	1,5	-	-	1, 3			
1.2	State regulation of the manufacturing of medicines at chemist's shop	1,5	-	-	1, 3			
2.	Special technology of pharmaceutical dosage forms, which produced at chemist's shop	18	-	-	-			
2.1	Powders as a dosage form. General powder technology	1,5	-		1-3			
2.2	General characteristics of liquid dosage forms. Dispersion media.	1,5	-	1,5	1, 3			Electronic testing
2.2	Technology of concentrated solutions of medicinal substances, their using in the technology of liquid dosage forms. Technology of mixtures	1,5	-	-	1, 3			
2.2	Technology of drops for internal and external use (except ophthalmological). Technology of solutions of high-molecular compounds	1,5	-	-	1, 3			

2.3	Heterogeneous dispersed systems. Technology of suspensions	1,5	-	1,5	1, 3			Electronic testing
2.3	True solutions of medicinal substances. Application of the provisions of dissolution theory to optimize the technology of drug solutions	1,5	-	-	1, 3			
2.3	Technology of colloid solutions	1,5	-	-	1, 3			
2.4	Technology of non-aqueous solutions of medicinal substances	1,5	-	-	1, 3			
2.5	Dosage forms with elastic-ductile-viscous dispersion medium	1,5	-	-	1, 3			
2.5	Aqueous and alcohol standard pharmacopoeial solutions, rules for the manufacturing and diluting	1,5	-	-	1, 3			
2.6	Sterile dosage forms	1,5	-	-	1, 3			
2.6	Stabilization of solutions subjected to thermal sterilization	1,5	-	-	1, 3			
	Laboratory lessons	-	68	-	-			
1.	General technology of medicines, produced at chemist's shop	-	20	-	-			
1.1	Introduction to the academic discipline «Pharmacy Technology of Drugs». Classification of dosage forms. Special terms	-	4	-	1, 3			Interview
1.2	State regulation of the manufacturing of medicines	-	4	-	1, 3			Interview, testing
1.3	Dosing by mass. Laboratory work: dosing of medicinal substances using manual, tare and electronic scales; checking the sensitivity of manual scales	-	4	-	1, 3	Dosing by mass	Laboratory work report	Interview, solving the tasks
	Dosing by volume. Laboratory work: calibration of a non-standard empirical droplet meter	-	4	-	1, 3	Dosing by volume	Laboratory work report	Interview, solving the tasks
	Final lesson on the topic «General technology of medicines, produced at chemist's shop»	-	4	-	1, 3			Colloquium*

2.	Special technology of pharmaceutical dosage forms, which produced at chemist's shop	-	-	-	-			
2.1	Solid dosage forms	-	16	-	-			
	Technology of powders with difficult-to-grind medicines. Laboratory work: manufacturing of complex powder according to an individual recipe	-	4	-	1-3	Manufacturing of simple and complex powders with pharmaceutical substances from the general list	Laboratory work report	Interview
	Technology of powders with narcotic and toxic medicines Laboratory work: manufacturing of complex powder with using toxic or narcotic pharmaceutical substances according to an individual recipe	-	4	-	1-3	Manufacturing of simple and complex powders with strong-effective, poisonous, narcotic and psychotropic pharmaceutical substances	Laboratory work report with registration of written control passport	Interview
	Technology of powders with coloring, odorous and volatile medicines Laboratory work: manufacturing of complex powder with coloring, odorous or volatile pharmaceutical substances	-	4	-	1-3	Manufacturing of simple and complex powders with pharmaceutical substances from the general list	Laboratory work report with registration of written control passport*	Interview
	Final lesson on the topic «Solid dosage forms»	-	4	-	1-3			Colloquium*
2.2	Liquid dosage forms	-	32	-				
	Technology of non-aqueous solutions of medicinal substances. Laboratory work: manufacturing by mass of a solution using a viscous or volatile solvent according to an individual recipe	-	4	-	1, 3	Manufacturing of solutions by mass and mass-volume methods using various types of solvents	Laboratory work report with registration of written control passport	Interview
	Technology of ethyl alcohol solutions. Laboratory work: dilution of ethyl alcohol to the specified concentration	-	4	-	1, 3	Determination of the concentration of ethyl alcohol, dilution and strengthening of ethyl alcohol solutions	Laboratory work report with registration of written control passport	Interview
	Technology of standard pharmacopoeial solutions. Laboratory work: manufacturing of an alcohol solution or dilution of a standard pharmacopoeial liquid	-	4	-	1, 3	Dilution of standard pharmacopoeial liquids	Laboratory work report with registration of written control passport	Interview

	Technology of aqueous solutions of medicinal substances. Special cases of dissolution. Laboratory work: manufacturing of a solution of a low-molecular substance according to an individual prescription	-	4	-	1, 3	Manufacturing of solutions by mass-volume methods	Laboratory work report with registration of written control passport*	Interview
	Technology of concentrated solutions. Laboratory work: manufacturing of a concentrated solution as a pharmaceutical preparation and determination of its concentration by the refractometric method	-	4	-	1, 3	Manufacturing of concentrated solutions of salts as a pharmaceutical preparation and control of their concentration by the refractometric method	Laboratory work report with registration of written control passport	Interview
	Technology of mixtures. Laboratory work: manufacturing of a mixture according to an individual prescription	-	4	-	1, 3	Manufacturing of mixtures using individual medicinal substances and concentrated solutions	Laboratory work report with registration of written control passport	Interview
	Final lesson on the topic «Liquid dosage forms».	-	4	-	1, 3			Colloquium*
	Final lesson on the topic «Manufacturing of solid and liquid dosage forms»	-	4	-	1, 3	Manufacturing of solid and liquid dosage forms	Laboratory work report with registration of written control passport*	Credit*

6 semester

	Lectures	6	-	-	1, 3			
2.6	Sterile dosage forms	1,5	-	-	1, 3			
2.6	Organization of aseptic conditions at chemist's shop. Sterilization methods, concept of the level of sterility guarantee	1,5	-	-	1, 3			
2.7	Pharmaceutical incompatibilities	1,5	-	-	1, 3			
2.7	Pharmaceutical incompatibilities and difficult cases in the process of manufacturing	1,5	-	-	1, 3			

	Laboratory lessons	-	24	-	-			
2.2	Technology of solutions of high-molecular compounds and protected colloids. Laboratory work: manufacturing of solutions of high-molecular compounds and protected colloids according to an individual prescription	-	4	-	1, 3	Manufacturing of solutions of high-molecular substances and solutions of protected colloids	Laboratory work report with registration of written control passport	Interview
2.3	Technology of suspensions from hydrophilic substances. Laboratory work: manufacturing of the suspension of hydrophilic substances according to an individual recipe	-	4	-	1, 3	Manufacturing of suspensions for internal and external use	Laboratory work report with registration of written control passport	Interview
	Technology of suspensions from hydrophobic substances. Laboratory work: manufacturing of the suspension of hydrophobic substances according to an individual recipe	-	4	-	1, 3	Manufacturing of suspensions for internal and external use	Laboratory work report with registration of written control passport	Interview
	Technology of emulsions. Laboratory work: manufacturing of the emulsion according to an individual recipe	-	4	-	1, 3	Manufacturing of emulsions	Laboratory work report with registration of written control passport*	Interview
2.4	Water extracts from medicinal plants raw materials. Laboratory work: manufacturing of aqueous extractions (infusion, decoction, mucus) from medicinal plants raw materials	-	4	-	1, 3	Manufacturing of aqueous extracts from medicinal plant raw materials	Laboratory work report with registration of written control passport	Interview
	Final lesson on the topic «Heterogeneous and combined liquid dosage forms»	-	4	-	1, 3			Colloquium*
2.5	Dosage forms with elastic-ductile-viscous dispersion medium	-	16	-				
	Technology of ointments, pastes, liniments. Laboratory work: manufacturing of the homogeneous ointments according to individual prescription	-	4	-	1, 3	Manufacturing of soft dosage forms (ointments, liniments, gels) using bases of various chemical nature	Laboratory work report with registration of written control passport	Interview

	Technology of ointments, pastes, liniments. Laboratory work: manufacturing of the heterogeneous ointment or liniment according to individual prescription	-	4	-	1, 3	Manufacturing of soft dosage forms (ointments, liniments, gels) using bases of various chemical nature	Laboratory work with report registration of written control passport*	Interview
	Technology of suppositories. Laboratory work: manufacturing of the suppositories by rolling method according to individual prescription	-	4	-	1, 3	Manufacturing of suppositories for rectal and vaginal use by the method rolling out	Laboratory work with report registration of written control passport	Interview
	Final lesson on the topic «Medicinal forms with elastic-ductile-viscous dispersion medium»	-	4	-	1, 3			Colloquium*
2.6	Sterile dosage forms	-	20	-				
	Organization of aseptic conditions in chemist's shop	-	4	-	1, 3			Interview, testing
	Ophthalmic dosage forms. Laboratory work: manufacturing of the eye drops according to an individual prescription	-	4	-	1, 3	Manufacturing of eye drops using concentrated ophthalmic solutions and individual medicinal substances	Laboratory work with report registration of written control passport*	Interview
	Isotonization of injection solutions. Technology of solutions for parenteral administration	-	4	-	1, 3			Interview, solving the tasks
	Stabilization of injection solutions. Dosage forms for newborns and children the first year of life, dosage forms with antibiotics	-	4	-	1, 3			Interview, solving the tasks
	Final lesson on the topic «Sterile dosage forms»	-	4	-	1, 3			Colloquium*
2.7	Pharmaceutical incompatibilities and difficult cases of manufacturing	-	4	-	1, 3			Interview, solving the tasks
	Final lesson on the topic «Manufacturing of dosage forms» according to an individual recipe	-	4	-	1, 3			Credit*
	Total hours	6	68	-				Examination

*This is a mandatory form of current certification.

INFORMATION AND INSTRUCTIONAL UNIT

LITERATURE

Basic:

1. Pharmaceutical compounding and dispensing / J. F. Mariott, K. A. Wilson, C. A. Langley, D. Belcher. – Great Britain, 2023. – 305 p.

Additional:

2. Pharmacy Technology of Medicines: Dosing, Technology of Powders : manual / N. S. Golyak, O. G. Sechko. – Minsk : BSMU, 2022. – 50 p.

Electronic courseware for the educational discipline «Pharmacy Technology of Drugs»:

3. etest.bsmu.by/course/view.php?id=177.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

The time allocated for independent work can be used by students for:

- preparing for lectures and laboratory classes;
- preparing for colloquiums, credit and exam;
- studying questions submitted for independent study;
- solving tasks;
- preparing thematic reports, papers and presentations;
- completing practical assignments;
- taking notes on educational literature;
- preparing laboratory reports;
- compiling a review of scientific literature on a given topic;
- compiling a thematic selection of literary sources and online sources.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF SUPERVISED STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

APPROXIMATE LIST OF TASKS FOR SUPERVISED STUDENT INDEPENDENT WORK:

- writing and presenting an essay;
- delivering a report;
- studying topics and issues not covered in lectures;
- taking notes from primary sources (sections of documents, monographs, textbooks);
- electronic testing.

FORMS OF CONTROL OF SUPERVISED STUDENT INDEPENDENT WORK:

- electronic testing.

LIST OF AVAILABLE DIAGNOSTIC TOOLS

The following forms are used for competence assessment:

- interview;
- testing;
- colloquium;

solving the tasks;
report on laboratory work.

LIST OF AVAILABLE TEACHING METHODS

Traditional method;
active (interactive) methods:
 Problem-Based Learning (PBL);
 Team-Based Learning (TBL);
 Research-Based Learning (RBL).

LIST OF PRACTICAL SKILLS

Name of the practical skill	Form of control of the practical skills
1. Dosing by mass	Laboratory work report
2. Dosing by volume	Laboratory work report
3. Manufacturing of simple and complex powders with pharmaceutical substances from the general list, strong-effective, poisonous, narcotic and psychotropic pharmaceutical substances	Laboratory work report
4. Manufacturing of solutions by mass and mass-volume methods using various types of solvents	Laboratory work report
5. Determination of the concentration of ethyl alcohol, dilution and strengthening of ethyl alcohol solutions	Laboratory work report
6. Dilution of standard pharmacopoeial liquids	Laboratory work report
7. Manufacturing of concentrated solutions of salts as a pharmaceutical preparation and control of their concentration by the refractometric method	Laboratory work report
8. Manufacturing of mixtures using individual medicinal substances and concentrated solutions	Laboratory work report with registration of written control passport
9. Manufacturing of solutions of high-molecular substances	Laboratory work report with registration of written control passport
10. Manufacturing of solutions of protected colloids	Laboratory work report with registration of written control passport
11. Manufacturing of suspensions for internal and external use	Laboratory work report with registration of written control passport
12. Manufacturing of emulsions for internal and external use	Laboratory work report with registration of written control passport
13. Manufacturing of aqueous extracts from	Laboratory work report with

Name of the practical skill	Form of control of the practical skills
medicinal plant raw materials	registration of written control passport
14. Manufacturing of soft dosage forms (ointments, liniments, gels) using bases of various chemical nature	Laboratory work report with registration of written control passport
15. Manufacturing of suppositories for rectal and vaginal use by the method rolling out	Laboratory work report with registration of written control passport
16. Manufacturing of eye drops using concentrated ophthalmic solutions and individual medicinal substances	Laboratory work report with registration of written control passport

LIST OF RECIPES FOR PRACTICAL SKILL

Solid dosage forms	
1	Rp.: Dimedroli 0,02 Sacchari 0,3 Misce ut fiat pulvis Da tales doses № 6 S.: 1 powder 1 time per day
2	Rp.: Natrii hydrocarbonatis 0,01 Natrii chloridi 0,2 Misce ut fiat pulvis Da tales doses № 10 S. for gargling
3	Rp.: Magnesii oxydi Bismuthi subnitratis ana 0,15 Calcii gluconatis 0,2 Misce ut fiat pulvis Da tales doses № 10 S.: 1 powder 2 times per day
4	Rp.: Camphorae Tinct. Leonuri gtts I Sacchari 0,2 Misce ut fiat pulvis Da tales doses № 6 S.: 1 powder 3 times per day
5	Rp.: Acidi borici Zinci oxydi ana 1,0 Talci 20,0 Misce ut fiat pulvis D.S.: powder
6	Rp.: Streptocidi 7,0 Xeroformii 3,0 Misce ut fiat pulvis D.S.: sprinkle on the affected areas

Liquid dosage forms	
7	Rp.: Acidi salicylici 1,0 Resorcini 0,2 Spiritus aethylici – 100 ml M.D.S.: tallow the affected areas of the skin 2 times a day
8	Rp.: Natrii hydrocarbonatis 0,5 Glycerini Aquae pur. ana 5 ml M.D.S.: 2 drops in both ears at night
9	Rp.: Acidi salicylici 0,2 Olei Helyanthi 50,0 M.D.S.: apply at night under a bandage
10	Rp.: Acidi borici 1,0 Glycerini 10 ml Spiritus aethylici 70% – 80 ml M.D.S.: tallow the affected areas of the skin 2 times a day
11	Rp.: Iodi 3,0 Kalii iodidi 6,0 Glycerini 100,0 M.D.S. For tallow tampons
12	Rp.: Resorcini Acidi salicylici ana 0,5 Sol. Acidi borici 3% 50 ml Spiritus aethylici 70% 50 ml M.D.S. Wipe your face in the morning and evening
13	Rp.: Solutionis Glucosi 10% – 200 ml Magnesii sulfatis 4,0 Natrii bromidi 2,0 Sirupi simplicis Tincturae Valerianae ana 10 ml M.D.S. 1 tablespoon 3 times a day
14	Rp.: Solutionis Laevomycetini spirituosae 5% - 100 ml Acidi borici Anaesthesini ana 3,0 D.S.: Tallow skin areas
15	Rp.: Sol. Furacillini 1: 5000 – 200 ml D.S. For gargling
16	Prepare a solution of 70% ethyl alcohol 100 ml from 96,4%.
17	Prepare a solution of 40% ethyl alcohol 100 ml from 96,4%.
18	Rp.: Sol. Perhydroli 10% – 200 ml D.S. For washing the wound
19	Rp.: Sol. Hydrogenii peroxydi 6% – 100 ml D.S. For disinfection
20	Rp.: Sol. Acidi acetici 10% – 100 ml D.S. For disinfection
21	Rp.: Zinci oxydi Talci ana 5,0 Glycerini 20,0 Spiritus aethylici 70% – 50 ml

	Aquae pur. 50 ml Misce. Da. Signa. Wipe wet areas.
22	Rp.: Kalii iodidi Natrii bromidi ana 5,0 Glucosi 10,0 Aquae purificatae 180 ml Misce. Da. Signa: 10 ml 3 times per day
23	Rp.: Solutionis Collargoli 1 % – 150 ml Da. Signa. For douching
24	Rp.: Solutionis Protargoli 1 % – 20 ml Da. Signa. 2 drops 3 times a day in both nostrils
25	Rp.: Ichthyoli 4,0 Zinci sulfatis 0,5 Aquae purificatae 200 ml Misce. Da. Signa. For lotions
26	Rp.: Gelatinae 3,0 Aquae purificatae 150 ml Glycerini 10,0 Misce. Da. Signa. 1 tablespoon 2 times a day
27	Rp.: Solutionis Amyli 50,0 Natrii bromidi 2,0 Misce. Da. tales doses № 4 Signa. 1 enema at night
28	Rp.: Amyli Bismuthi subnitratis ana 3,0 Aquae purificatae 200 ml Misce. Da. Signa. Wipe away the wetness
29	Rp.: Sol. Formalini 40% – 200 ml D.S. For shoe
30	Rp.: Sulfuris 6,0 Spiritus camphorati 6 ml Solutionis Acidi borici 2% Spiritus aethylici ana 40 ml Misce. Da. Signa. Wipe face
31	Rp.: Emulsi olei Helianthi 150,0 Camphorae 2,0 Misce. Da. Signa: 1 tablespoon 3 times a day
Soft dosage forms	
32	Rp.: Anaesthesini 0,5 Streptocidi 1,5 Lanolini 20,0 Vaselini 20,0 Misce, fiat unguentum Da. Signa: tallow the affected areas of the skin
33	Rp.: Sulfuris dep. 2,5 Acidi salicylici 0,5 Vaselini 20,0 Misce, fiat unguentum Da. Signa: tallow the affected areas of the skin
34	Rp.: Mentholi 0,1 Acidi borici 0,5

	Lanolini 10,0 Vaselini 10,0 Misce, fiat unguentum Da. Signa: put in nose 2 times a day
35	Rp.: Tannini Aquae purificatae Lanoloni ana 5,0 Vaselini 50,0 Misce, fiat unguentum Da. Signa: lubricate burns 2 times a day
36	Rp.: Sulfuris dep. Acidi salicylici ana 2,0 Lanoloni 5,0 Vaselini 20,0 Misce, fiat unguentum Da. Signa: apply to affected areas in the evening for 5 days
37	Rp.: Ichthyoli 0,2 Olei Cacao quantum satis Misce, fiat suppositorium Da tales doses № 6 Signa: 1 suppository in the morning and evening
38	Rp.: Tannini 0,2 Olei Cacao 2,0 Misce, fiat suppositorium Da tales doses № 10 Signa: 1 suppository 2 times a day
39	Rp.: Unguenti Camphorae 20,0 Mentholi 1,0 Misce, fiat unguentum Da. Signa: rub a sore joint
40	Rp.: Zinci oxydi 3,0 Acidi borici 2,0 Oxyli 2,5 Olei Helianthi 20,0 Misce, fiat linimentum Da. Signa: apply to affected areas of skin

LIST OF USED EQUIPMENT

1. Presentation equipment (multimedia projector, screen, computer for control);
2. Computer lab with internet access;
3. Laboratory scales BK-1500;
4. Electronic laboratory scales WLC 0.6/B1 type;
5. Electronic scales Scout Pro SPU 601;
6. Electronic medical scales БЭМ-150;
7. Scales for bulk materials – BCM-1, 5, 20, 100;
8. Abbe refractometer model NAR-1T;
9. General-purpose weights of the 4th accuracy class from 10 mg to 500 g;
10. Infusion apparatus with electric heating АИ-3;
11. Laboratory glass thermometer;

12. Electric stove ЭПН1-1,0/220;
13. Water bath БВ-04;
14. Alcoholmeters Type A;
15. Hydrometers АУ;
16. Measured glass laboratory Glassware;
17. Mortars and pestles.

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

Title of the discipline requiring approval	Department	Amendments to the curriculum in the academic discipline	Decision of the department, which designed the curriculum (date, protocol #)
Industrial Technology of Drugs	Pharmaceutical Technology with a course for advanced training and retraining	No additions or comments	Protocol #14 16.05.2025
Pharmaceutical development with biopharmaceutical fundamentals	Pharmaceutical Technology with a course for advanced training and retraining	No additions or comments	Protocol #14 16.05.2025
Pharmaceutical Biotechnology	Pharmaceutical Chemistry with a course for advanced training and retraining	No additions or comments	Protocol #14 16.05.2025

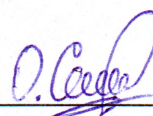
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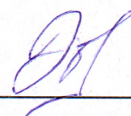
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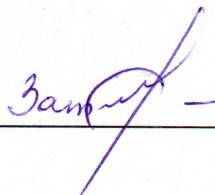
Curriculum content, composition and the accompanying documents comply with the established requirements.

Head of the Office of Educational Activities of the Educational Institution «Belarusian State Medical University»



I.L.Kotovich

Methodologist of the Educational and Methodological Department of the Office of Educational Activities of the educational institution «Belarusian State Medical University»



S.V.Zaturanova