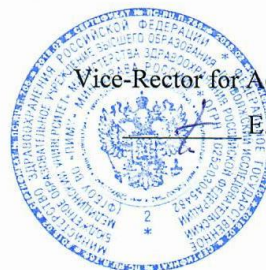


Federal State Budgetary Educational Institution of Higher Education
"Privolzhsky Research Medical University"
Ministry of Health of the Russian Federation



APPROVED

Vice-Rector for Academic Affairs

E.S. Bogomolova

31 August 2021

WORKING PROGRAM

Name of the academic discipline: **MICROBIOLOGY**

Specialty: **PHARMACY 05.33.01**

Qualification: **PHARMACIST**

Department: **EPIDEMIOLOGY, MICROBIOLOGY AND EVIDENCE-
BASED MEDICINE**

Mode of study: **FULL-TIME**

Labor intensity of the academic discipline: **216 academic hours**

Nizhny Novgorod
2021

The working program has been developed in accordance with the Federal State Educational Standard for the specialty Pharmacy – 05.33.01 approved by order of the Ministry of Science and Higher Education of the Russian Federation No. 219 of 27.03.2018

Developers of the working program:

Makhrova Tatyana Vladimirovna Ph.D. of Medical Sciences, Docent, Associate Professor at the Department of Epidemiology, Microbiology and EBM of FSBEI HE PRMU MOH Russia

The program was reviewed and approved at the department meeting (protocol No. 12, date 15.04.2021)

Head of the Department of Epidemiology,
microbiology and evidence-based medicine,
DSci. of Medical Sciences, Associate Professor



(Kovalishena O.V.)

(signature)

15.04.2021

AGREED

Head of the EMA



O. M. Moskovtseva

(signature)

15.04.2021

1. The purpose and objectives of mastering the academic discipline "Microbiology" (hereinafter – the discipline):

1.1. The purpose of mastering the discipline: participation in forming the relevant competencies UC-1, 6, 8, GPC-1, 2.

1.2. Tasks of the discipline:

- obtaining students' knowledge about the structure and the most important biological properties of pathogenic microbes, their relationship with the human body in certain environmental conditions.
- students' study of the etiology and pathogenesis of the most urgent infectious diseases;
- teaching students the principles and methods of laboratory diagnostics and prevention of infectious diseases;
- knowledge of the most effective and widely used diagnostic, preventive and therapeutic drugs.
- teaching students methods of sanitary microbiological control of environmental objects, water and food;
- teaching students the principles and methods of disinfection and sterilization, basic disinfectants and the rules of their use;
- study of sanitary microbiology and ecology of microorganisms in terms of storage and control of medicinal raw materials and finished medicines.

1.3. Requirements to the deliverables of mastering the discipline

As a result of completing the discipline, the student should

Know:

- the device of the microbiological laboratory and the rules;
- principles of classification of microorganisms, features of structure and vital activity; methods of isolation of pure cultures of aerobic and anaerobic bacteria and methods of virus cultivation;
- fundamentals of microbial genetics;
- the essence of biotechnology, concepts and principles of genetic engineering, preparations obtained by genetic engineering methods; the composition of the microflora of the human body and its significance;
- sanitary-indicative microorganisms of water, air, soil and their significance for assessing the sanitary state of the environment;
- phytopathogenic microflora and its role in the spoilage of medicinal plant raw materials;
- the concept of parenchymal and vascular lesions of plants, tumor processes of plants.
- sources of contamination of medicines.
- microflora of pharmacies.
- microbiological methods for assessing the quality of medicines in accordance with the requirements of regulatory documents;
- influence of environmental factors on microorganisms, purposes and methods of asepsis, antiseptics, preservation, sterilization, disinfection;
- equipment and quality control of sterilization;
- the concept of chemotherapy and antibiotics; classification of antibiotics by source, methods of preparation, chemical structure, spectrum, mechanism and type of action; methods for determining the activity of antibiotics and the sensitivity of microbes to antibiotics;
- fundamentals of the doctrine of "infection", "infectious disease"; types of infection;
- the role of microbes in the development of the infectious process; mechanisms and ways of transmission of the pathogen;
- the concept of "immunity" as immunity to infectious diseases;
- types of infectious immunity;
- nonspecific and specific protection factors in bacterial and viral infections;
- allergies and allergens;
- the mechanism of the main immune reactions used for the diagnosis of infectious diseases;
- diagnostic preparations;

- immunobiological preparations for the prevention and treatment of infectious diseases and their classification, including vaccines, therapeutic and prophylactic serums, immunoglobulins;
- taxonomy, morphological and biological properties of infectious agents;
- epidemiology, mechanisms and ways of transmission of pathogens, pathogenesis, the main clinical manifestations of diseases.

Be able to:

- work with a microscope and binoculars, prepare micro-preparations;
- to use humanitarian knowledge in professional activity, in individual and social life;
- work in aseptic conditions, disinfect and sterilize pharmacy utensils, tools, workplace, etc.;
- prepare and color micropreparations using simple methods and the Gram method;
- perform microscopy of preparations using an immersion system;
- isolate a pure culture of microorganisms (make crops, identify a pure culture);
- analyze medicines, medicinal raw materials, environmental objects, hand washes and dishes according to indicators of microbiological purity; when conducting a sanitary and microbiological study of pharmacies
- give explanations on the use of immunobiological drugs;
- determine the sensitivity of bacteria to antibiotics;
- evaluate the results of some immune reactions.

Possess:

- medical-anatomical conceptual apparatus;
- information on the principles of sterilization, disinfection and antiseptic treatment of instruments;
- the method of immersion microscopy of micro-preparations, the ability to analyze microbiological purity and give explanations on the use of immunobiological preparations;
- skills of sanitary and educational work

2. Position of the academic discipline in the structure of the General Educational Program of Higher Education (GEP HE) of the organization.

2.1. The discipline "**Microbiology**" refers to the core part of Block 1 of GEP HE ((B1.O.18)). The discipline is taught in 2 and 3 semester/ I and II year of study.

2.2. The following knowledge, skills and abilities formed by previous academic disciplines are required for mastering the discipline:

philosophy, Latin; foreign language, physics, mathematics, computer science, general and inorganic chemistry, biology, physcolloid chemistry, human anatomy, biological chemistry, physiology.

2.3. Mastering the discipline is required for forming the following knowledge, skills and abilities for subsequent academic disciplines:

pathology, life safety (emergency medicine), first aid, pharmacology, biophysics, bioethics, biological chemistry, general hygiene, biotechnology.

3. Deliverables of mastering the academic discipline and metrics of competence acquisition

Mastering the discipline aims at acquiring the following universal (UC) or/and general professional (GPC) or/and professional (PC) competencies

n/a	Competence code	The content of the competence (or its part)	Code and name of the competence acquisition metric	As a result of mastering the discipline, the students should:		
				know	be able to	possess
1.	UC-1	UK-1. Able to realize critical analysis of problem situations based on a systematic approach, develop strategy actions	UC-1.1. Analyzes the problem situation as a system identifying its components and connections between them UC-1.2. Identifies gaps in the information needed to solve a problem situation, and designs processes for their elimination UC-1.3. Critically assesses reliability of information sources, works with conflicting information from different sources UC-1.4. Develops and meaningfully argues the strategy of solving the problem situations based on the system and interdisciplinary approaches UC-1.5. Uses logical and methodological tools for critical evaluation of modern concepts of philosophical and social nature in its subject areas	Safety regulations and work in biological laboratories, with reagents, devices, animals; Principles of sterilization, disinfection and antiseptic treatment of tools and equipment Types of infection; the role of microbes in the development of the infectious process; mechanisms and pathways of pathogen transmission	Apply safety and work regulations in biological laboratories, with reagents, devices, animals and principles of sterilization, disinfection and antiseptic treatment of instruments and equipment for the analysis of a problem situation	Rules of safety and work in biological laboratories and principles of sterilization, disinfection and antiseptic treatment of instruments and equipment for the development of measures to prevent infection
2.	UC-6	Able to determine and implement the priorities of own activities and ways to improve it on the basis of self-assessment and lifelong education	UC-6.1. Evaluates its resources and their limits (personal, situational, temporary), optimally uses them for successful execution of the assigned task UC-6.2. Determines the priorities of professional growth and ways to improve their own activities based on self-assessment according to the	The influence of microorganisms on human health, mechanisms and ways of transmission of pathogens, pathogenesis, the main clinical manifestations of diseases. The main immunological methods for assessing the impact of the environment	Apply basic immunological methods for assessing the impact of the environment on human health to analyze the problem situa-	Skills of self-preparation for classes, search for additional information on behalf of the teacher, use self-control methods.

			<p>selected criteria</p> <p>UC-6.3. Builds a flexible professional trajectory using the tools of continuing education, taking into account the accumulated experience of professional activity and dynamically changing labor market requirements</p>	on human health	tion	
3.	UK-8	<p>UC-8. Able to create and support in everyday life and in professional activity, safe living conditions for the preservation of the natural environment, ensuring the sustainable development of society, including in case of threat and occurrence of emergency situations and military conflicts</p>	<p>UC-8.1. Analyzes the factors of harmful influence on the vital activity of the elements of the habitat (technical means, technological processes, materials, buildings and structures, natural and social phenomena)</p> <p>UC-8.2. Identifies dangerous and harmful factors within the framework of the activity</p> <p>UC-8.3. Solves problems related to safety violations and participates in prevention activities of emergencies in the workplace</p> <p>UC-8.4. Observes and explains rules of conduct in the event of emergencies of natural and man-made origin, provides first aid</p>	<p>Methods of microbiological diagnostics of human infectious diseases.</p> <p>The main groups of antimicrobial chemotherapeutic and immunobiological drugs.</p> <p>Sanitary microbiology.</p> <p>The concept of "biological safety".</p> <p>Methods for assessing the biological safety of environmental objects and industrial products.</p>	<p>To carry out sampling, labeling and arrange for the direction of biological material from the patient and habitat objects for microbiological examination.</p> <p>Evaluate and interpret research results in order to create and maintain safe living conditions</p>	<p>Skills of sanitary and educational work.</p> <p>Skills of making a preliminary diagnosis based on the results of laboratory and instrumental examination in order to recognize and assess dangerous situations, environmental risk factors affecting the health of a population or individual groups of the population</p>
4.	GPC-1	<p>GPC-1. Able to use basic biological, physical-chemical, chemical, mathematical methods for the development, research and examination of medi-</p>	<p>GPC-1.1. Applies basic biological methods of analysis for the development, research and examination of pharmaceuticals and medicinal plant raw materials</p> <p>GPC-1.2. Applies basic physical-chemical and chemical analysis methods for the development, research and examination of medi-</p>	<p>Classification, morphology and physiology of microbes, their indication and identification.</p> <p>The concept of "immunity" as immunity to infectious diseases;</p> <p>Types of infectious immuni-</p>	<p>To carry out a microscopic examination of the material, its sowing on nutrient media, to determine morphological, tinctori-</p>	<p>Skills in choosing specialized equipment, technology, drugs and products, disinfectants, medicines, other substances and their combinations based</p>

		cines, the manufacture of medicinal products	<p>nal products and medicinal plant raw materials</p> <p>GPC-1.3. Applies the basic methods of physical-chemical analysis in the manufacture of medicinal products</p> <p>GPC-1.4. Applies mathematical methods and performs mathematical processing of data obtained during the development of medicines, as well as research and examination of medicines and medicinal plant raw materials</p>	ty; nonspecific and specific protection factors in bacterial and viral infections;	al, cultural, anti-genic, genetic and biochemical properties, to carry out serological and genetic diagnostics.	on the set professional task
5.	GPC-2	GPC-2. Able to apply knowledge about morphofunctional features, physiological conditions and pathological processes in the human body to solve professional tasks	<p>GPC-2.1. Analyzes the pharmacokinetics and pharmacodynamics of medicines based on knowledge about morphofunctional features, physiological conditions and pathological processes in the human body</p> <p>GPC-2.2. Explains the main and side effects of drugs, the effects of their combined use and interaction with food, taking into account morphofunctional features, physiological conditions and pathological processes in the human body</p> <p>GPC-2.3. Takes into account morphofunctional features, physiological conditions and pathological processes in the human body when choosing non-prescription medicinal products and other pharmacy products</p>	<p>Classification of antibiotics by chemical structure, producers, mechanism of action, spectrum of action.</p> <p>The principle of inhibition of bacterial growth, the most important targets for antibacterial drugs.</p> <p>Pharmacokinetics and pharmacodynamics of the drug in the human body, possible consequences and side effects of antibiotics.</p> <p>The mechanism of the main immune reactions used for the diagnosis of infectious diseases; diagnostic drugs; immunobiological drugs for prevention</p>	<p>To analyze the effectiveness of antibiotics by the disco-diffusion method.</p> <p>Determine the minimum inhibitory and bactericidal concentrations of the antibiotic.</p> <p>Keep records of the antibiogram.</p>	<p>Skills of independent work with educational and scientific literature, the Internet for solving professional tasks</p> <p>Skills interpretation of these basic concepts and methods in solving a professional problem</p>

4. Sections of the academic discipline and competencies that are formed when mastering them

№	Competence code	Section name of the discipline	The content of the section in teaching units
1.	UC-1, 6, 8, GPC-1, 2	Morphology and metabolism of bacteria	<p>The subject and tasks of medical microbiology, virology. Discoveries of A. Leeuwenhoek, L.Pasteur, R. Koch. The relationship of microbiology with other disciplines. The importance of microbiology, virology in the preparation of a doctor. Systematics of microbes. The concepts of species, strain, culture, clone, population.</p> <p>Morphology of microbes. The main signs of a prokaryotic cell. Ultrastructure and chemical composition of bacteria. Differences in the structure of gram-positive and gram-negative bacteria. Chemical composition, structure and role of capsules and spores. Protoplasts, spheroplasts, L-forms of bacteria and mycoplasma.</p> <p>Various methods and techniques of microscopic examination of bacteria. Simple and complex ways of painting strokes. Gram staining of bacteria, mechanism and practical significance. Detection of spores and capsules in bacteria. The importance of the microscopic method in the diagnosis of diseases.</p> <p>The physiology of microbes. Constitutive and inducible bacterial enzymes. Mechanisms of nutrient intake into the prokaryotic cell. Catabolism and anabolism in aerobic and anaerobic bacteria.</p> <p>Characteristics of the growth and reproduction processes in bacteria.</p> <p>Characteristics of the bacteriological research method. Nutrient media. Pure cultures and their production. Stages of the bacteriological research method. Methods of identification of the isolated culture, determination of its sensitivity to antibiotics. Methods of cultivation of aerobic and anaerobic bacteria.</p>
2.	UC-1, 6, 8, GPC-1, 2	Antibiotics	<p>Symbiosis and antibiosis. Antibiotics. The history of discovery. Classification by origin, chemical composition. Narrow and wide spectrum, bacteriostatic and bactericidal action. The mechanism of action of antibiotics on prokaryotic cells. Bacteriocins.</p>
3.	UC-1, 6, 8, GPC-1, 2	General virology	<p>Viruses. Basics of classification. History of virology development. Hypotheses about the origin and nature of viruses. The fundamental differences between viruses and prokaryotic cells. Modern principles of classification and nomenclature of viruses. Features of the structural organization of viruses. Ecology of viruses. The concept of a virus and a virion. Viroids and prions, their role in pathology. Stages of virus-cell interaction. Methods of virus cultivation.</p> <p>Molecular bases of virus reproduction. Features of reproduction of RNA viruses (plus-RNA viruses, minus-RNA viruses), DNA viruses, retroviruses. Outcomes of virus-cell interaction. Productive, abortive and integrative infections. Persistence of viruses. Mechanisms and types of persistence. Virogenia. Methods of studying viruses. Bacteriophages. Classification, mechanisms of interaction of a bacteriophage with a cell. Lysogeny. Concepts of profage. Practical significance of phages in biology and medicine.</p>
4.	UC-1, 6, 8,	Ecology	<p>The spread of microbes in the environment. The role of microbes in the circulation of substances in nature.</p>

	GPC-1, 2	microorganisms. Sanitary microbiology	<p>The purpose and objectives of sanitary microbiology, the objects to be studied. The main regulatory documents of sanitary and bacteriological studies are the microflora of the environment (water, soil, air) and its role in the development of human diseases. Sanitary-indicative microorganisms, methods of their determination. Standards for the evaluation of distilled water (for the preparation of medicines, injection solutions), drinking water, open reservoirs, underground sources, wastewater. Criteria for assessing microbial contamination of pharmacy air.</p> <p>Sanitary-bacteriological examination of dishes and equipment of pharmacies. Basic documents on microbiological control of pharmacies. The importance of sanitary and microbiological research in assessing the state of pharmacies.</p> <p>The microflora of the human body (skin, mucous membranes of the gastrointestinal tract, respiratory and genitourinary systems), its role in norm and pathology. Autochthonous and allochthonous microflora. Dysbiosis. Factors affecting the composition of microflora. Preparations for the restoration of intestinal microflora (eubiotics). Sanitary and bacteriological examination of hand washes.</p> <p>Plant microflora, phytopathogenic microorganisms. Epiphytic microflora. Diseases of medicinal plants caused by phytopathogenic bacteria, viruses, fungi. The role of microflora in the spoilage of herbal medicinal raw materials and medicines (solid, liquid, soft). Sources and ways of microbial contamination and ways to prevent them.</p> <p>Microbiological examination of medicinal raw materials and finished medicines. Methods of microbiological control of medicines in pharmacies.</p> <p>Destruction of microbes in the environment. Disinfection. The principle of decontamination.</p> <p>The concepts of disinfection and sterilization. Aseptics and antiseptics. Physical and chemical factors of decontamination. The concept of antiseptics, disinfectants. Methods for monitoring the effectiveness of sterilization and disinfection.</p>
5.	UC-1, 6, 8, GPC-1, 2	Infectious process. Pathogenicity and virulence. Bacteria genetics	<p>Characteristics of pathogenicity factors. Factors determining adhesion, colonization, invasion, the doctrine of biofilms. Biofilms and mechanisms of their formation. Comparative characteristics of exo- and endotoxins of bacteria. Genetic control of pathogenicity factors in microbes. The role of plasmids.</p> <p>The doctrine of the infectious process. Stages of the infectious process. Exogenous and endogenous, primary and secondary infection. Bacteriocarriage.</p> <p>The role of the external environment in the infectious process. Ways of transmission of infectious diseases. Pathogenicity factors of microorganisms.</p> <p>The structure of the bacterial genome. Genotype and phenotype in prokaryotes. Modern ideas about the mechanisms of replication of chromosomal DNA in bacteria. The role of plasmids and other mobile genetic elements in the vital activity of bacteria. Characteristics of the main forms of variability.</p> <p>Phenotypic and genotypic variability. Modifications and mutations.</p> <p>Types of recombinant variability in bacteria. Characterization of the processes of transformation, conjugation, transduction and lysogenic conversion.</p> <p>The role of different types of variability in the evolution of bacteria. Mechanisms of the emergence and spread of</p>

			drug resistance at the cell and population level. R-plasmids and their role in stability. Practical significance of phages in biology and medicine. Genetic engineering and biotechnology.
6.	UC-1, 6, 8, GPC-1, 2	General immunology	<ol style="list-style-type: none"> 1. Introduction to immunology. Subject, tasks, methods of immunology. Historical information. The structure of the immune system. Types of immunity. 2. Antigens. Structure and functions of antigens. Bacterial and viral antigens. 3. Antibodies. Structure and functions of antibodies. Classes of immunoglobulins. 4. Antigen-recognizing T- and B-lymphocyte receptors. Building. Functions. Natural killers. 5. Antigens of the main histocompatibility complex. Presentation of antigens. Regulation of T- and B-cell immunity. 6. Induction of the immune response. Cytokines. 7. Implementation of the immune response. Cooperation of factors of specific and nonspecific immunity. 8. Anti-infectious immunity. Levels of protection against infection. 9. Vaccines and serums. Serological reactions. The immune status of the organism and methods of its assessment.
7.	UC-1, 6, 8, GPC-1, 2	Special medical microbiology	<ol style="list-style-type: none"> 1. Methods of laboratory diagnostics of infectious diseases of microbiological research (express diagnostics, microbiological and immunological). 2. Pyogenic cocci. Staphylococci. Streptococci. Meningococci. Gonococci. Classification. Characteristic. Role in pathology. Immunity. Laboratory diagnostics. Treatment and prevention. 3. <i>Enterobacteriaceae</i> family. Escherichia. Shigella. Salmonella. Taxonomy and classification. Morphology and other biological properties. Pathogenesis and clinic of the diseases caused. Immunity. Prevention. Nosocomial infections caused by enterobacteria. 4. Causative agents of diphtheria. Biological properties. Pathogenesis and clinic of the diseases caused. Immunity. Specific prevention. 5. Mycobacterium tuberculosis. Characteristic. Pathogenesis and clinic of tuberculosis. Immunity. Specific prevention. 6. The causative agent of anthrax. Pathogenesis and clinic of the diseases caused. Ecology of pathogens. Specific prevention. 7. Pathogenic clostridia. Pathogens of tetanus, anaerobic wound infection, botulism. Ecology of pathogens. Pathogenesis and clinic of the diseases caused. Specific therapy and prevention of clostridiosis. 8. Mycoplasma. Chlamydia. Features of morphology, physiology. Pathogenesis and clinic of the diseases caused. Prevention.
8.	UC-1, 6, 8, GPC-1, 2	Special medical virology	<ol style="list-style-type: none"> 1. Orthomyxoviruses. The flu virus. Structure and other biological properties. The pathogenesis of influenza. Immunity. Diagnostics. Specific prevention. 2. The concept of ARVI. Paramyxoviruses. Adenoviruses. Characteristic. Prevention. 3. Rhabdoviruses. Rabies virus. Biological properties and ecology. Role in human pathology. Prevention. 5. Picornaviruses. Polio virus. Pathogenesis and clinic of polio. Specific prevention. Coxsackie viruses, ESCO – patho-

			<p>gens of polio-like diseases.</p> <p>6. Human immunodeficiency virus (HIV). Pathogenesis and clinic of the disease. Diagnostics. Prevention.</p> <p>7. Human herpesviruses. Herpes simplex virus. Primary and recurrent herpes. Chickenpox virus – shingles. Cytomegalovirus. Pathogenesis and clinic of the diseases caused. Diagnostics. Prevention.</p> <p>8. Hepatitis viruses. Hepatitis A virus. Hepatitis B virus. Pathogenesis and clinic of viral hepatitis. Immunity. Prevention.</p> <p>9. Arboviruses. Tick-borne encephalitis virus. 10. Rotaviruses.</p>
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5. Volume of the academic discipline and types of academic work

Type of educational work	Labor intensity		Labor intensity by semester (AH)	
	volume in credit units (CU)	volume in academic hours (AH)	2	3
Classroom work, including	3,05	110	66	44
Lectures (L)		32	18	14
Laboratory practicum (LP)*		78	48	30
Practicals (P)	are not provided			
Seminars (S)	are not provided			
Student's individual work (SIW)	1,95	70	42	28
Mid-term assessment				
exam	1	36	-	36
TOTAL LABOR INTENSITY	6	216	108	108

6. Content of the academic discipline

6.1. Sections of the discipline and types of academic work

№	Semester (L/P)	Name of the section of the academic discipline	Types of academic work* (in AH)					total
			L	P	LP	S	SIW	
1.	2/-	General microbiology	-	-	20	-	14	34
2.	2/-	General virology	-	-	7	-	6	13
3.	2/-	Variability of Microorganisms	-	-	-	-	4	4
4.	2/3	Microbiota of the human body Sanitary microbiology	2	-	1 1	-	6	10
5.	2/3	General immunology Infectious process	18	-	21 3	-	12	54
6.	3/3	Special medical microbiology	4	-	18	-	12	34
7.	3/3	Special medical virology	6	-	6	-	14	26
8.	3/3	Plant microflora Introduction in medical mycology	2	-	1	-	2	5
		total	32	-	78	-	70	180

* - L – lectures; LP – laboratory practicum; P – practicals; S – seminars; SIW – student's individual work.

6.2. Thematic schedule of educational work types:

6.2.1 Thematic schedule of lectures

№	Name of lecture topics	Volume in AH	
		2nd semester	3rd semester
1.	Introduction to immunology.	2	
2.	Antigens	2	
3.	Immunoglobulins (antibodies)	2	
4.	The main histocompatibility complex (MHC/HLA). Antigen-recognizing receptors of B- and T-lymphocytes.	2	
5.	Induction of the immune response. Cytokines	2	
6.	Realization of the immune response Immune response effectors.	2	
7.	Realization of the immune response Immune response effectors (continued)	2	
8.	Infection immunity	2	
9.	Principles of specific prevention and immunotherapy of infectious diseases. Vaccines	2	
10.	General characteristics of enterobacteria. Shigella		2
11.	Mycobacterium tuberculosis		2
12.	Paramyxoviruses, adenoviruses.		2
13.	Human immunodeficiency viruses (HIV)		2
14.	Hepatitis. General characteristics. Hepatitis A and B viruses		2
15.	General characteristics of enterobacteria. Shigella		2
16.	Introduction to sanitary microbiology. Microbiological examination of pharmacies		1
17.	Microflora of medicinal plants and medicinal raw materials. Phytopathogenic microorganisms.		1
	TOTAL (total - 32 AH)	18	14
	Pseudomonas aeruginosa		2
	Microflora of plants. Phytopathogenic microorganisms. Microflora of medicinal raw materials. Sanitary and bacteriological examination of medicinal products		2

6.2.2. The thematic plan of laboratory practicums

№	Name of the topics of laboratory practicums	Volume in AH	
		Term	
		2	3
1.	<p>Topic 1 Morphology of bacteria and methods of its study</p> <p>Introduction to medical microbiology.</p> <p><u>Rules for working in a microbiological laboratory</u></p> <p><u>Subject: Morphological classification of bacteria and microscopic examination. Morphology of bacteria.</u></p> <p>1. Introduction in medical microbiology.</p> <p>2. Prokaryotes and their properties. Morphological classification of bacteria.</p> <p>3. Gram stain.</p>	4	

	<p>1. Structure of bacterial cell.</p> <p>2. The methods of bacteria staining. Special staining procedures for studying structure of bacteria.</p>		
2.	<p>Topic 2 Physiology of bacteria.</p> <p><u>Subject: Cultivation of bacteria</u></p> <p><u>Rules for working in a microbiological laboratory</u></p> <p>1. Culturing method in microbiology. Identification of bacteria.</p> <p>2. Culturing of bacteria. Types of media for bacteria growing. Methods of obtaining a pure culture.</p> <p>3. Principles of sterilization in microbiology.</p> <p>4. Bacteriological analysis. Culture method</p>	4	
3.	<p>Topic 2 Physiology of bacteria.</p> <p>Subject: Metabolism of bacteria.</p> <p>1. Bacterial metabolism. Anabolism. Bacterial growth and cell division. Phases of growth in a bacterial culture.</p> <p>2. Catabolism. Respiration and fermentation of bacteria.</p> <p>3. Principles of anaerobes culturing.</p>	4	
4.	<p>Topic 3 Chemotherapeutic drugs.</p> <p>1. The antagonism of microbes and the principles of its detection. Antibiotics. History of antibiotic discovery.</p> <p>2. Classification of antibiotics. The modes of action of antimicrobial agents on bacterial cells.</p> <p>3. Resistance of bacteria. Mechanisms of resistance.</p> <p>4. Determination of microbial sensitivities to antimicrobial agents.</p>	4	
5.	<p>Topic 4 Atypical bacteria.</p> <p>Structure and general properties of mycoplasmas, rickettsia, chlamydia, mycobacteria, spirochaetes, and actinomyces</p>	4	
6.	<p>Topic 5 General virology</p> <p>Methods of sterilization and disinfection in microbiology.</p> <p>Viruses, basics of classification. Ecology of viruses.</p> <p>1. General characteristics and classification of viruses.</p> <p>2. Components of virion. Viroids and prions.</p> <p>3. Culturing of viruses.</p> <p>4. Viral replication. Stages of viral replication.</p> <p>5. Mechanism of viral replication. Functions of virion proteins.</p>	4	
7.	<p>Topic 5 General virology</p> <p>Mechanisms of viral reproduction.</p> <p>1. The results of virus-cell interaction.</p> <p>2. Types of viral infections: productive, abortive and persistent infections. Mechanism of viral persistence.</p> <p>3. Detection of viruses in infected objects.</p> <p>4. Bacteriophages.</p> <p>5. Principles of antiviral therapy.</p>	3	
8.	<p>Topic 7 General immunology</p> <p>1. Antigens. Immunochemical analysis. Basic concepts of immunology. Specific and non-specific immune response. Organs of the immune system.</p> <p>2. Antigens.</p> <p>3. Immunochemical analysis (definition, tasks, main phenomena and methods).</p> <p>4. The phenomenon of agglutination. Methods of direct and indirect agglutination.</p>	3	

	5. Reactions based on the phenomenon of precipitation.		
9.	Topic 7 General immunology 1. Antibodies. Immunochemical analysis. Antibodies. 2. Immunochemical analysis (continued). Monoclonal antibodies and their use in immunochemical analysis. 3. The concept of labeled antibodies and their main markers. Immunochemical methods based on the use of labeled antibodies (immunofluorescence, enzyme immunoassay). 4. Biological neutralization reactions.	3	
10.	Topic 7 General immunology Molecules of the main histocompatibility complex. CD-antigens T- and B-lymphocyte receptors.	3	
11.	Topic 7 General immunology 1. The general concept of the immune response. 2. Cytokines. The phase of induction of a specific immune response.	3	
12.	Topic 7 General immunology 1. Realization of the immune response. The main effectors. 2. The complement system. Principles of activation. Functions. 3. Direct and immune phagocytosis. 2. The role of antibodies in the realization of the immune response.	3	
13.	Topic 7 General immunology 1. The role of T-lymphocytes and natural killers in the realization of the immune response. Cooperation T-lymphocytes with effectors of nonspecific immunity at the stage of realization. 2. Mechanisms of antiviral immunity. Interferons. 3. Infection immunity. Levels of protection against infection.	3	
14.	Topic 8 General immunology 1. Specific prevention of infectious diseases. Vaccines. 2. Immunoglobulins and immune serums. 3. Rules of transportation and storage of immunological preparations.	3	
15.1	1. Infectious process. 2. Factors and mechanisms of pathogenicity of microorganisms. 3. Principles of immunoprophylaxis and immunotherapy of infectious diseases.		1
16.2	1. Plan for discussing the properties of microorganisms 2. Principles of laboratory diagnosis of bacterial infections. 3. Staphylococci.		2
17.3	1. Streptococci. <i>S.pyogenes</i> .		2
18.4	1. Pneumococci. 2. <i>Pseudomonas aeruginosa</i>		1
19.5	1. Neisseries. General characteristics. 2. <i>Neisseria gonorrhoeae</i> , <i>Neisseria meningitidis</i> .		2
20.6	General characteristics of Enterobacteria Escherichia..		2
21.7	1. Shigella. 2. Salmonella - pathogens of food toxicoinfections		2
22.8	Clostridia. General characteristics. <i>Cl. perfringens</i> , <i>Cl. tetani</i> , <i>Cl. botulinum</i> , <i>Cl. difficile</i> .		2
23.9	1. Corynebacteria. 2. Mycobacterium tuberculosis.		2
24.10	1. Principles and methods of diagnosis of viral infections. 2. Orthomyxoviruses.		2

25.11	Paramyxoviruses. Picornaviruses		1
26.12	1. HIV 2. Rhabdoviruses. Rabies virus.		2
27.13	Herpesviruses		1
23.14	Hepatitis viruses.		2
24.15	Pathogenic chlamydia, spirochetes, mycoplasmas		2
25.16	Introduction in medical mycology.		2
26.17	1. Microbiota of a human body. Mechanisms of formation. Classification. Function. 2. Microflora of the plants 3. Microbiological examination of pharmacies		2
TOTAL (total -78 AH)		48	30

***(full-time, with the use of EIOS and DOT)**

6.2.3. Thematic plan of practicals (are not provided).

6.2.4. Thematic plan of seminars (*if this type of classes is stipulated in the curriculum*)

6.2.5. Types and topics of student's individual work (SIW)

№	Chapter disciplines	Types and topics of SIW	Volume in AH	
			Semester	
			2	3
1.	General microbiology	Work with literature sources; preparation for classes in an interactive form; preparation for boundary control, including work with electronic educational resources (computer testing in on-line mode on the website of distance education of PIMU)	14	
2.	General virology	Work with literature sources, including lecture materials; preparation for classes in an interactive form; preparation for boundary control, including work with electronic educational resources (computer testing in on-line mode on the website of distance education of PIMU)	6	
3.	Variability of microorganisms	Independent work with educational literature to prepare for practical and test classes, exam; writing essays*	4	
4.	Microdiota of the human body Sanitary microbiology	Work with literature sources, including lecture materials; preparation for classes in an interactive form; preparation for boundary control, writing abstracts*	6	
5.	General immunology Infectious process	Work with literature sources, including lecture materials; preparation for classes in an interactive form; preparation for boundary control, including work with electronic educational resources (computer testing in on-line mode on the website of distance education of PIMU)	12	
6.	Special medical microbiology	Work with literature sources, including lecture materials; preparation for classes in an interactive form; preparation for boundary control, including work with electronic educational resources (computer testing in on-line mode on the website of distance education of PIMU)		12
7.	Special medical virology	Work with literature sources, including lecture materials; preparation for classes in an interactive form; preparation for boundary control, including work with electronic educational resources (computer testing in on-line mode on the website of distance education of PIMU)		14
8.	Plant microflora Introduction in	Work with literature sources, including lecture materials; preparation for classes in an interactive form; preparation		2

	medical mycology	for boundary control, writing abstracts*		
Total (total 70 AH):			42	28

6.3. Student's research work:

n/a	The name of the topics of the student's research work	Term
1.	Features of the microbiota species composition in various ecological niches	2,3
2.	Interaction of normal and pathogenic microflora in pathological processes	2,3
3.	Study of water, soil and other substrates.	2,3
4.	The place of microbiota in ecological systems	2,3

7. Types of assessment formats for ongoing monitoring and mid-term assessment

№	Se- mester No.	Types of control	Name of section of aca- demic discipline	Competence codes	Assessment formats		
					Types	number of test questions	number of test task options
1	2	3	4		5	6	7
1.	2	Control of the development of the topic, control of the student's in- dependent work	General microbiology	UC-1, 6, 8, GPC-1, 2	Security questions	2	6
					Test tasks	138	Unlimited
					Security questions Exam questions	1	12
2.	2	Control of the development of the topic, control of the student's in- dependent work	General virology	UC-1, 6, 8, GPC-1, 2	Test tasks	42	Unlimited
					Security questions	2	6
					Security questions Exam questions	1	7
3.	2	Control of the development of the topic, control of the student's in- dependent work	Variability of microor- ganisms	UC-1, 6, 8, GPC-1, 2	Test tasks	42	Unlimited
					Security questions Exam questions	1	7
4.	3	Control of the development of the topic, control of the student's in- dependent work	Microbiota of the human body Sanitary microbiology	UC-1, 6, 8, GPC-1, 2	Test tasks	25	Unlimited
					Report	1	10
					Security questions Exam questions	1	2
5.	2	Control of the development of the topic, control of the student's in- dependent work	General immunology Infectious process	UC-1, 6, 8, GPC-1, 2	Test tasks	308	Unlimited
					Security questions	2	6
					Report	1	2
					Control work: individual survey (border control)	7/2	5/66

					Security questions Exam questions	1	14
6.	3	Control of the development of the topic, control of the student's independent work	Special medical microbiology	UC-1, 6, 8, GPC-1, 2	Tests (the variant is formed by random sampling)	275	Unlimited
					Security questions	2	6
					Control work: written control work on the section "Private microbiology"; individual survey (boundary control)	7/2	5/34
					Security questions Exam questions	1	15
7.	3	Control of the development of the topic, control of the student's independent work	Special medical virology	UC-1, 6, 8, GPC-1, 2	Tests (the variant is formed by random sampling)	153	Unlimited
					Security questions	2	6
					Control work: written control work on the section "Private virology"; individual survey (boundary control)	7/2	5/8
					Security questions Exam questions	1	8
8.	3	Control of the development of the topic, control of the student's independent work	Plant microflora Introduction in medical mycology	UC-1, 6, 8, GPC-1, 2	Tests (the variant is formed by random sampling)	25	Unlimited
					Report	1	10
					Security questions Exam questions	1	10
					Security questions	4	40
	3	Exam <i>at the end of the 3rd semester</i>	All sections of the discipline				

8. Educational, methodological and informational support for mastering the academic discipline (printed, electronic publications, the Internet and other network resources)

8.1. Key literature references

p/no.	Name according to bibliographic requirements	Number of instances	
		in the library	at the department
1	2	3	4
1	Zverev, V.V. Medical Microbiology, Virology, Immunology: textbook. Vol. 1: textbook / V. V. Zverev, M. N. Boichenko; Zverev V. V.; Boichenko M. N. - Moscow: GEOTAR-Media, 2020. - 384 p. – ISBN 978-5-9704-5607-		
2	1 Zverev, V.V. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. : textbook / V. V. Zverev, M. N. Boichenko; Zverev V. V.; Boichenko M. N. - Moscow: GEOTAR-Media, 2020. - 392 p. – ISBN 978-5-9704-5719-1.		
3	Medical Microbiology, Virology and Immunology. Lecture Notes: textbook / M. N. Artamonova, N. I. Potaturkina-Nesterova, N. A. Ilyina, I. S. Nemova; Artamonova M. N.; Potaturkina-Nesterova N.I.; Ilyina N. A.; Nemova I. S. - Moscow: GEOTAR-Media, 2021. - 352 p. – ISBN 978-5-9704-6043-6.		
4	Maianskii, A.N. Lectures in immunology / A. N. Maianskii, S. M. Belotsky; Maianskii A.N.; Belotsky S. M. - N. Novgorod : NSMA , 2004.		

8.2. Further reading

p/no.	Name according to bibliographic requirements	Number of instances	
		in the library	at the department
1	2	3	4
1.	General microbiology and microflora of plants : textbook / M. I. Zaslavskaya, T. V. Makhrova, N. I. Ignatova [et al.] ; FSBEI HE PRMU MOH Russia. – N. Novgorod : Publishing House of Privolzhskiy Research Medical University, 2021.		
2.	General microbiology: bacteriology, virology, mycology : textbook / M. I. Zaslavskaya, T. V. Makhrova, N. I. Ignatova [et al.] ; FSBEI HE PRMU MOH Russia. – N. Novgorod : Publishing House of Privolzhskiy Research Medical University, 2021.		
3.	Immunology = Tests in general immunology: tests / A. N. Maianskii, M. I. Zaslavskaya; Maianskii, A.N.; Zaslavskaya, M. I. - N. Novgorod : NSMA , 2005.		

8.3. Electronic educational resources for teaching academic subjects

8.3.1. Internal Electronic Library System of the University (IELSU)

Name of the electronic Resource	Brief description (content)	Access conditions	Number of users
Internal Electronic Library System (ELS) http://nbk.pimunn.n	The works of the teaching staff of the University: textbooks, textbooks, collections of tasks, methodological manuals, laboratory work, monographs, collections	From any computer and mobile device using an individual login and	Not limited

et/MegaPro/Web	of scientific papers, scientific articles, dissertations, abstracts of dissertations, patents	password. Access mode: http://nbk.pimunn.net/MegaPro/Web	
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8.3.2. Electronic educational resources acquired by the University

No	Name electronic resource	Brief description (content)	Access conditions	Quantity Users
1.	The digital library system " Student's Consultant "	contains full-text versions of digital textbooks and study guides in all areas and disciplines of medical education in accordance with the curricula and requirements of the Federal State Educational Standard. There is an English interface.	<p>on the platform of the PRMU Digital Library through the appropriate banner or directly through the e-book found in the catalog. To access the full text, you need to log in to the reader's Personal Account (login – the number of the campus card (eleven numerals), password – date of birth without spaces (for example – 05022002)</p> <p>directly on the platform of DLS "Student's Consultant". To access the resource, it is necessary to pass a personal registration from the computers of the Scientific Library or University.</p> <p>In the future, you can work from any computer or mobile device.</p> <p>Users who have not worked with the database for more than a year need to confirm their registration: log in to the database with their user name and password from the computers of the Scientific Library or University or through the Personal Account of the user of the PRMU Digital Library.</p>	Not limited until 31.12.2022
2.	The digital library " Doctor's Consultant " i	<p>includes:</p> <ul style="list-style-type: none"> • national guidelines for all areas of medicine • clinical recommendations • training manuals • monographs • atlases • pharmaceutical reference books 	<p>on the platform of the PRMU Digital Library using the appropriate banner or directly through the e-book found in the catalog. To access the full text, you need to log into the Reader's Personal Account (login – the number of the campus card (eleven numerals), password – date of birth without spaces (for example – 05022002)</p> <p>directly on the DLS "Doctor's Consultant" platform or on the DLS "Student's Consultant" platform. To access the resource, it is necessary to pass a personal registration from the computers of the Scientific Library or University. Please note: for users already registered in the</p>	Not limited Access until 31.12.23

			<p>Student's Consultant DLS, the re-registration is not required.</p> <p>In the future, you can work from any computer or mobile device.</p>	
3.	The digital library BookUp	The digital library BookUp contains educational and scientific medical literature of Russian publishers. The list of publications available for reading can be found in the section "My Books".	<p>on the <i>platform of the PRMU Digital Library</i> through the appropriate banner or directly through the e-book found in the catalog. To access the full text, you need to log in to the reader's Personal Account (login – the number of the campus card (eleven numerals), password – date of birth without spaces (for example – 05022002)</p> <p>directly on the platform <i>DLS "BookUp"</i>:</p> <ul style="list-style-type: none"> - access is free from university computers (without authorization); - to access from external IP addresses, it is necessary to pass a personal registration from the computers of the Scientific Library or University. <p>In the future, you can work from any computer or mobile device.</p>	<p>Not limited</p> <p>31.05.2022</p>
4.	The digital library "Urait".	has a collection of publications on psychology, ethics, conflictology	<p>1. By means of the corresponding banner on the home page <i>of the PRMU Digital Library</i> or directly through an e-book found in the catalog. To access the full text, you need to log in (login – the number of the campus card, password – date of birth without spaces (for example – 05022002));</p> <p>2. Next, select the section "Catalog", "Subscriptions of educational institutions" (Privolzhsky Research Medical University). To work with a specific digital publication, you need to go to the section you are interested in, select the desired book and click the "Study" button.</p>	<p>Not limited</p> <p>Access until 11.02.2023</p>
5.	Electronic periodicals as part of the database "Scientific Electronic Library eLibrary https://elibrary.ru	Electronic medical magazines	<p>From university computers.</p> <p>Access mode: https://elibrary.ru</p>	<p>Not limited until 31.12.2022</p>
6.	Integrated Information and Library system (IBS) of the scientific and educational medical cluster of the Volga Federal	Electronic copies of scientific and educational publications from the collections of libraries participating in the scientific and educational medical cluster of the	<p>Access by individual login and password from any computer and mobile device.</p> <p>Access mode: websites of libraries participating in the project</p>	<p>Not limited</p> <p>Unlimited</p>

	District - "Srednevolzhsky" (contract on a free basis)	Volga Federal District "Srednevolzhsky"		
7.	Electronic legal reference system "Consultant Plus" (contract on a free basis) http://www.consultant.ru	Regulatory documents regulating the activities of medical and pharmaceutical institutions	From the computers of the scientific library. Access mode: http://www.consultant.ru/	Not limited Unlimited
8.	National Digital Library (NDL)	The Virtual Reading Room of the National Digital Library (NDL) contains a combined digital catalog of the collections of major Russian libraries, archives, museums and digital copies of works on a wide range of subject areas. Some publications (works that have passed into the public domain; works of educational and scientific significance that have not been reprinted in the last 10 years) are on open access.	Works restricted by copyright are accessible only from the Library computers (Medizinskaya Str.3a, Hall of Catalogues and Electronic Information Resources). You can get acquainted with the content of the NDL at: rusneb.ru	Not limited Access to the resource until 13.11.2023

8.3.3 Open access resources

№	Name electronic resource	Brief description (content)	Access conditions	Number of users
Russian resources				
1.	Federal Electronic Medical Library (FEMB) http://неб.рф	Full-text electronic copies of printed publications and original electronic publications on medicine and biology	From any computer located on the Internet. Access mode: http://неб.рф	Not limited
2.	Scientific Electronic Library eLIBRARY.RU https://elibrary.ru	Abstracts and full texts of scientific publications, electronic versions of Russian scientific journals	From any computer located on the Internet. Access mode: https://elibrary.ru	Not limited
3.	Scientific electronic library of the Open CyberLeninka access http://cyberleninka.ru	Full texts of scientific articles with annotations published in scientific journals of Russia and neighboring countries	From any computer located on the Internet. Access mode: http://cyberleninka.ru	Not limited
Foreign resources				
1.	digital scientific resources of Springer publishing house	• Access to digital scientific resources of Springer publishing house is open for students and employees of	from PRMU computers - free access;- from external IP ad-	Not limited

		<p>PRMU. Materials from the following digital collections are available:</p> <ul style="list-style-type: none"> • Full-text collection of digital journals (1997-2021) and Springer e-books (2005-2021): https://rd.springer.com/ • Full-text collection of digital journals Springer Nature : http://www.nature.com/siteindex/index.html • Collection of scientific protocols on various branches of knowledge Springer Protocols: www.springerprotocols.com • Abstract database on pure and applied mathematics Zentralblatt MATH: https://zbmath.org/ • Collection of scientific materials in the field of physical sciences and engineering Springer Materials: http://materials.springer.com/ • Nano database (information about nanomaterials and nanodevices): http://nano.nature.com/ 	<p>addresses: with individual login / password (personal registration from the university network using corporate mail is required - pimunn.net); send an email to lib@pimunn.ru with indication of full name, personal corporate mail).</p>	
2.	the full-text database of periodicals of the American publishing house "Wiley"	<p>Journals annually occupy leading positions in the Journal Citation Report and have high impact factors. The content is represented by more than 1,600 scientific journals in various disciplines, including medicine and natural sciences. Chronological coverage: 2015-2022</p>	<p>- from PRMU computers- free access; - from external IP addresses - with individual login / password (<i>personal registration from the university network is required</i>). Attention! Remote access is valid for 60 days. To renew, you need to log in to your account from the university network. Access to the collection at: www.onlinelibrary.wiley.com</p>	Not limited
3.	the digital collection " Freedom "	<p>the platform Science Direct (over 3000 periodicals published by Elsevier). Subject: natural, technical and medical sciences.</p>	<p>From the computers of the university, from any computer with an individual login and password.</p>	<p>from PRMU computers at: https://www.science-direct.com</p>

		Chronological coverage: 2011-2022		Online catalog of publications at the link
4.	Scopus Database www.scopus.com	Scopus is an international scientometrical database of abstracts and citations of peer-reviewed scientific literature with built-in tools for monitoring, analysis and visualization of research data.	Access to the resource only from PRMU computers: www.scopus.com .	Not limited
5.	Web of Science Core Collection Database https://www.webofscience.com	International Abstract Database of Scientific Citation	From the computers of the university, from any computer with an individual login and password. Access mode: https://www.webofscience.com	Not limited
6.	Questel database Orbit https://www.orbit.com	The patent database of the company Questel	From university computers. Access mode: https://www.orbit.com	Not limited
Foreign open access resources (the main ones are indicated)				
1.	PubMed URL: www.ncbi.nlm.nih.gov/pubmed US National Library of Medicine search engine PubMed (Bookshelf) URL: www.ncbi.nlm.nih.gov/books Full-text collection of books on medicine and biological sciences of the US National Library of Medicine	The search engine of the US National Library of Medicine for the databases "Medline", "PreMedline"	From any computer and mobile device. Access mode: https://www.ncbi.nlm.nih.gov/pubmed	Not limited
2.	Directory of Open Access Journals http://www.doaj.org	Directory of open access to the full-text collection of periodicals	From any computer and mobile device. Access mode: http://www.doaj.org	Not limited
3.	Directory of open access books (DOAB) URL: www.doabooks.org Directory of open access to the full-text collection of scientific books (over 10 thousand)	Directory of open access to the full-text collection of scientific books	From any computer and mobile device. Access mode: http://www.doabooks.org	Not limited

9. Material and technical support for mastering an academic discipline

9.1. List of premises for classroom activities for the discipline

1. For lectures there are:

- lecture halls of the BFC (large and small halls); equipped with presentation equipment, a projector, a screen, a computer / laptop, an *acoustic amplifier and speakers*.
- lecture hall of the Morphological Building;
- lecture hall of building No. 3;
- lecture hall of building No. 9.

2. For practical training on the basis of building No. 2 (BFC) there is:

4 specially equipped rooms (classrooms) for seminars and practical classes in the study of disciplines with an area of 12, 15, 43, 44.3 m²;
including a training laboratory for practical classes in microbiology and immunology with an area of 59 m².

9.2. List of equipment for classroom activities for the discipline

Name	Quantity
Computers:	3
- Celeron 1700	1
- Core i3, i7-920	2
- NEW/C2D	1
- Fujitsu Siemens Amilo laptop	1
Laser printers: ML-1645	1
- Samsung ML-1210	1
MFP Canon ME- Y018, 3110	2
Projector-overhead H 1110	1
Epson EMP-S3 Multimedia projector	1
Microscopic and macroscopic preparations for practical training*	86
Tables for practical classes**	80
Tables for lectures**	80
Stands:	12
- on the organization of the educational process at the department	8
- chronology of discoveries in microbiology and immunology	5
- virology	1
Equipment	
1. Immersion microscopes.	28
2. Luminescent microscope.	1
3. Thermostats.	8
4. Autoclaves.	1
5. Anaerostats.	3
6. Centrifuges.	9
7. FEC.	1
8. Laminar box	1
9. Analytical electronic scales	1
10. Household refrigerators	6
11. Micro – aerostats	1
12. Disintegrators	1
13. Spectrophotometer	1
14. Pipette dispensers	8
15. pH-micovoltmeter	1
16. Writing tables	15
17. Student and classroom tables	42
18. Aquadistillator	1
19. Microtitrator of the Tokachi system	1
20. Drying cabinet	2
21. Air sterilizer	2
22. Laboratory table	4
23. Bactericidal portable irradiator	1
24. Bactericidal wall-mounted irradiator	2
25. Single-element board for chalk 1000*2000	4

Sets of slides for the lecture course.

- a set of electronic presentations (slides),
- an audience equipped with presentation equipment (projector, screen, computer), etc.

Electronic educational resources - films for classes in immunology.

The set of methodological support for the control of students includes 3 computer tests in general, private microbiology and immunology.

*MICROSCOPIC PREPARATIONS

1. Staphylococci
2. Streptococci
3. Sarcines
4. Vibrio
5. Escherichia
6. Diphtheria Corynebacteria (volutin grains)
- 7 Pneumococcus (capsule) - fuchsin staining
8. Capsule bacteria in Burry-Gins coloring
9. Staphylococcus cell wall
10. Flagella in Leffler coloration
11. Proteus flagella - silver impregnation
12. Anthrax bacilli (central spores)
13. Tetanus clostridium (terminal spores)
14. Anthrax bacilli (capsule)
15. Bacilli in color by Ozheshko
16. Treponemes (silvering)
17. Borrelia (Romanovsky-Gimza coloring)
18. Leptospira (silvering)
19. Actinomycetes in a smear from culture
20. Druse of actinomycetes in the organ section.
21. Yeast
22. Yeast-like fungi of the genus Candida
23. Rickettsias
24. Viral inclusions (Babesh-Negri corpuscles)
25. Taurus Guarnieri
26. Taurus Morozov-Plowed
27. Bifidobacteria
28. Streptococcus salivarius
29. Completed phagocytosis (staphylococci)
30. Incomplete phagocytosis (gonococcus in pus)
31. N.S.T. - test (cytochemical criterion of completion of phagocytosis)
32. Shigella
33. Salmonella
34. Whooping cough bordetella
35. Mycobacterium tuberculosis in sputum
36. Meningococci
37. Clostridium anaerobic infection
38. Clostridium botulism
39. Plague bacteria
40. Brucella
41. Tularemia bacteria.

MACROSCOPIC PREPARATIONS

1. A set of nutrient media for various purposes.
2. Standard dry nutrient media.
3. Growth of microorganisms on media to detect enzymes.

4. A set of SIB (paper indicator systems).
5. A set of special media for growing anaerobes.
6. Growth of actinomycetes, candida on nutrient media.
7. Crops on media for isolation of pure anaerobic cultures.
8. Cell cultures in test tubes and mattresses.
9. The effect of antagonistic microbes and phytoncides on bacteria (crops on liquid and dense nutrient media).
10. Sets of disks with antibiotics.
11. Phagolysis of bacteria (on dense and liquid nutrient media).
12. Dissociation of bacteria (crops on agar in cups).
13. Crops for the detection of dysbiosis.
14. Biological preparations for the prevention and treatment of dysbiosis.
15. Ingredients for staging a hemagglutination reaction
16. Sets of ingredients for the formulation of immunochemical analysis reactions (RA, RP, RTGA, RPGA, immunoelectrophoresis, RSC, enzyme immunoassay, immunoblotting)
17. Biological preparations for the diagnosis of infectious diseases (main types).
18. Biological preparations for treatment and prevention (main types).
19. Sets of nutrient media and reagents for sanitary and bacteriological studies.
20. Sets of sterile and seeded nutrient media for the diagnosis of intestinal infections.
21. Diagnostic kits, diagnostic serums, therapeutic and prophylactic biologics against intestinal infections.
22. Sets of nutrient media for the diagnosis of cocci infections, demonstration crops on media.
23. A set of biological preparations for the prevention and treatment of coccal infections.
24. Demonstration of growth on nutrient media of various pathogens of purulent-septic infections.
25. The growth of whooping cough sticks on the AMC medium.
26. Biologics used for whooping cough.
27. Sowing of dressing material for sterility.
28. Biologics used in anaerobic infections.
29. Growth of corynebacteria on special media - coagulated serum, blood tellurite agar, a medium for determining toxigenic properties.
30. Biologics used for diphtheria.
31. The growth of Mycobacterium tuberculosis.
32. Biopreparations for the diagnosis and prevention of tuberculosis.
33. Sets of ingredients for Wasserman, Kahn reactions and demonstration of their results.
34. Biological and other drugs for the diagnosis, prevention and treatment of spirochetosis.
35. Demonstration reaction of indirect hemagglutination with Provacek's diagnosticum. A set of ingredients for RSK.
36. Biological preparations for the diagnosis and prevention of rickettsiosis.
37. Sets of ingredients for RGA and RTGA in influenza (virus identification and detection of antibody titer increase).
38. Biological preparations used for influenza, measles, rubella.
39. Biological preparations for the prevention of rabies.
40. Preparations of cell cultures infected with enteroviruses and adenoviruses.
41. A set of ingredients for RSC in tick-borne encephalitis.
42. Biological preparations used for the diagnosis and prevention of entero-, adeno- and arbovirus infections.
43. A set of vaccines and immunoglobulins from Pasteur Merrier (France).
44. A set of phages for diagnosis, prevention and treatment.
45. A set for determining the pathogenicity factors of staphylococcus.

**** - Tables for lectures and practical classes:**

1. The comparative size of microbes.

2. Scotobacteria (class Bacteria).
3. The scheme of the structure of bacteria.
4. The scheme of bacterial cell division.
5. Borrelia of recurrent typhus.
6. Leptospira.
7. Pale treponema.
8. Actinomycetes.
9. Filamentous mushrooms.
10. Yeast and yeast-like mushrooms.
11. Rickettsia.
12. Mycoplasma.
13. Ultrastructure of the smallpox virus.
14. The structure of the virion of influenza and parainfluenza. The interaction of the influenza virus with the cell.
15. The form and comparative magnitude of some viruses.
16. Methods of infection of chicken embryos.
17. Types of symmetry of viruses.
18. Visible manifestations of the action of viruses in cell cultures.
19. The results of the process of interaction of the virus with the cell.
20. Types of tissue cultures.
21. Anatomical structure of the T-even phage.
22. Morphological groups of bacteriophages.
23. Cultural properties of bacteria.
24. Enzyme activity of representatives of the intestinal typhoid family.
25. Rabies virus.
26. Smallpox virus.
27. The main forms of microbial cells from S- and R-colonies.
28. A smear of plaque.
29. Immersion system.
30. Phagocytosis.
31. Development of immunology.
32. Types of immunity of the organism.
33. Development of the immune system.
34. RSK scheme.
35. Immunofluorescence methods.
36. The phenomenon of hemagglutination.
37. Precipitation reaction.
38. The structure of immunoglobulin.
39. The immunoglobulin molecule.
40. Mechanisms of F-factor integration into the bacterial chromosome.
41. Types of hereditary substance transmission.
42. Study of the initial strain.
43. Conjugation.
44. Transduction.
45. Transformation.
46. Dissociation.
47. The scheme of the study of pus and blood in staphylococcal infections.
48. Scheme of research in streptococcal infections.
49. Scheme of species identification of staphylococci.
50. Microbiological studies in gonorrhoea.
51. Microbiological studies in meningitis.
52. Microbiological diagnosis of whooping cough.

53. Microbiological diagnosis of diphtheria.
54. Methods of laboratory diagnosis of tuberculosis.
55. Laboratory diagnostics of gas anaerobic infection.
56. Laboratory diagnostics of syphilis.
57. Water research at the stages of purification and neutralization.
58. Microbiological diagnosis of dysentery.
59. Bacteriological diagnosis of escherichiosis.
60. Scheme of bacteriological diagnosis of typhoid fever.
61. Microbiological diagnosis of anthrax.
62. Microbiological diagnosis of tularemia.
63. Microbiological diagnosis of brucellosis.
64. Microbiological diagnosis of the plague.
65. Microbiological examination of food poisoning.
66. Laboratory diagnostics of cholera.
67. Scheme of microbiological diagnosis of rabies.
68. Scheme of microbiological diagnosis of influenza.
69. Scheme of microbiological diagnosis of polio.
70. Scheme of microbiological diagnosis of tick-borne encephalitis.
71. Serological diagnosis of typhus.
72. Laboratory diagnostics of leptospirosis.
73. Laboratory diagnostics of recurrent typhus.
74. Table of biochemical activity.
75. Antigenic structure of salmonella.
76. Scheme of diagnosis of adenovirus infections.
77. Schematic diagram of the induction of the immune response.
78. Participation of immune system cells in the immune response.
79. Realization of effector functions of T-cytotoxic lymphocytes.
80. Natural killers.

10. List of changes to the working program (to be filled out by the template)

Federal State Budgetary Educational Institution of Higher Education
 "Privolzhsky Research Medical University"
 Ministry of Health of the Russian Federation
 (FSBEI HE "PRMU" of the Ministry of Health of Russia)

Department of

EPIDEMIOLOGY, MICROBIOLOGY AND EVIDENCE-BASED MEDICINE

CHANGE REGISTRATION SHEET

working program for the academic discipline

MICROBIOLOGY

Specialty: **PHARMACY 05.33.01**

Qualification: **PHARMACIST**

Mode of study: **FULL-TIME**

Position	Number and name of the program section	Contents of the changes made	Effective date of the changes	Contributor's signature
1				

Approved at the department meeting

Protocol No. _____ of _____ 20__

Head of the Department of Epidemiology,
microbiology and evidence-based medicine, DSci. of
Medical Sciences, Associate Professor

_____ / (Kovalishena O.V.)
(signature) (print name)