

## *Summary of the working program of the academic discipline*

### **«MICROBIOLOGY, VIROLOGY»**

General Educational Program of higher education **31.05.01 GENERAL MEDICINE**

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

**The purpose of mastering the discipline:** (*participation in the formation of relevant competencies*): The purpose of mastering the discipline: participation in the formation of competencies - UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16 (learning by students of the theoretical foundations and patterns of interaction of micro - and macroorganism, microbiological diagnostics, the main directions of the treatment of human infectious diseases, the combination of general biological knowledge of students with elements of clinical thinking, the education of a preventive approach - the main thing in the fight against the spread of infectious diseases).

### **2. Position of the academic discipline in the structure of the General Educational Program (GEP).**

**2.1.** The discipline "**Microbiology, virology**" refers to the core part of Block 1 of GEP HE ((B1.O.18)).

The discipline is taught in 4 and 5 semester/ II and III year of study.

### **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

№	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	Able to carry out a critical analysis of problem situations based on a systematic approach, develop an action strategy	1.1 Knows: methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis 1.2 Able to: gain new knowledge based on analysis, synthesis, etc.; collect data on complex scientific problems related to the professional field; search for information and solutions based on action, experiment and experience 1.3 Has practical experience: researching the problem of professional activity using analysis, synthesis and other methods of intellectual activity; developing an action strategy to solve professional problems	1.1 Knows: methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis	1.2 Able to: gain new knowledge based on analysis, synthesis, etc.; collect data on complex scientific problems related to the professional field; search for information and solutions based on action, experiment and experience	1.3 Has practical experience: researching the problem of professional activity using analysis, synthesis and other methods of intellectual activity; developing an action strategy to solve professional problems
2.	UC-8	Able to: create and maintain safe living conditions in everyday and professional life for the preservation of	8.1 Knows: factors of harmful influence on vital activity; algorithms of actions in case of emergencies and military conflicts; 8.3 safety regulations in the workplace	8.1 Knows: factors of harmful influence on vital activity; algorithms of	8.2 Able to: identify dangerous and harmful factors within the framework of its	8.3 Has practical experience in: participation in planned exercises to work out the

		the natural environment, ensuring sustainable development of society, including in the case of a threat and occurrence of emergency situations and military conflicts	8.2 Is able to: identify dangerous and harmful factors in the framework of the activities carried out, create and maintain safe living conditions in everyday life and in professional activities 8.3 Has practical experience: participation in scheduled exercises to develop rules of conduct in case of emergencies, first aid; adheres to safety regulations at work	actions in case of emergencies and military conflicts	activities, create and maintain safe living conditions in everyday and professional life	rules of conduct in case of emergencies, first aid; complies with safety regulations at the workplace
3.	GPC-4	GPC-4. Able to apply medical products, provided by the order of healthcare delivery, as well as examine patients for the purpose of determining the diagnosis	4.1 Knows the methodology for collecting anamnesis of life and diseases, complaints from patients (their legal representatives); method of examination and physical examination; clinical picture, diagnostic methods of the most common diseases; methods of laboratory and instrumental studies for assessing the state of health, medical indications for conducting studies, rules for interpreting their results; international statistical classification of diseases and related health problems (ICD); conditions requiring emergency medical care; the procedure for the use of medical devices in accordance with the current procedures for the provision of medical, clinical recommendations (treatment protocols) on the provision of medical care, care, taking into account the standards of medical care 4.2 Is able to: identify risk factors and causes of diseases; apply methods of examination and physical examination of patients; interpret the results of the examination and physical examination of patients; diagnose the most common pathology in patients; identify risk factors for cancer; formulate a preliminary diagnosis, draw up a plan for conducting laboratory, instrumental and additional studies in patients in accordance with the procedures for providing medical care, clinical recommendations, taking into account the standards of medical care; refer patients for laboratory,	4.1 Knows the methodology of collecting anamnesis of life and diseases, complaints of patients (their legal representatives); examination procedure; and physical examination; clinical aspect, methods of diagnosis of the most common diseases; methods of laboratory and instrumental investigations to assess the state of health, medical indications for conducting research, rules for interpreting their results; international statistical classification of diseases and health-related problems (ICD); conditions requiring emergency medical care; procedure for the use of medical devices in accordance with the current procedures for providing medical care, clinical	4.2 Able to: collect complaints, anamnesis of life and disease of patients (their legal representatives), identify risk factors and causes of diseases; apply methods of examination and physical survey of patients; interpret the results of examination and physical examination of patients; diagnose the most common pathology among patients; identify risk factors for cancer; formulate a preliminary diagnosis, to make a plan for conducting laboratory, instrumental and additional investigations of patients in accordance with the procedures for providing medical care, clinical recommendations taking into account the standards of medical care; to refer patients to	4.3 Has practical experience in: collecting complaints, anamnesis of life and disease of patients (their legal representatives), identifying risk factors and causes of disease development; examination and physical survey of patients; diagnosis of the most common diseases; identification of risk factors for major oncological diseases; formulation of a preliminary diagnosis, drawing up a plan for instrumental, laboratory, additional investigations, consultations of specialist doctors; referral of patients for instrumental, laboratory, additional investigations, consultations of specialist

		<p>instrumental and additional studies in accordance with the current procedures for the provision of medical care, clinical recommendations, taking into account the standards of medical care; refer patients for consultations to specialist doctors in accordance with the procedures for providing medical care, clinical recommendations, taking into account the standards of medical care; interpret and analyze the results of consultations with patients' specialists; interpret and analyze the results of basic (clinical) and additional (laboratory, instrumental) examination methods; to carry out differential diagnostics of diseases in patients; identify clinical signs of sudden acute diseases, conditions, exacerbations of chronic diseases without obvious signs of a threat to life, requiring emergency medical care; apply medical devices in accordance with the current procedures for the provision of medical, clinical recommendations (treatment protocols) on the provision of medical care, care, taking into account the standards of medical care</p> <p>4.3 Has practical experience in: collecting complaints, anamnesis of life and disease in patients (their legal representatives), identifying risk factors and causes of diseases; examination and physical examination of patients; diagnosis of the most common diseases; identification of risk factors for major cancers; formulating a preliminary diagnosis, drawing up a plan for instrumental, laboratory, additional studies, consultations with specialist doctors; referral of patients for instrumental, laboratory, additional studies, consultations of medical specialists in accordance with the current procedures for the provision of medical care, clinical recommendations, taking into account the standards of medical care;</p>	<p>recommendations (treatment protocols) on the medical care delivery taking into account the standards of medical care</p>	<p>laboratory, instrumental and additional investigations in accordance with the current procedures for providing medical care, clinical recommendations, taking into account the standards of medical care; refer patients for consultations to medical specialists in accordance with the procedures of medical care, clinical recommendations taking into account the standards of medical care; to interpret and analyze the results of consultations by medical specialists of patients; to interpret and analyze the results of basic (clinical) and additional (laboratory, instrumental) examination methods; carry out differential diagnosis of diseases of patients; identify clinical signs of sudden acute diseases, conditions, exacerbations of chronic diseases without obvious signs of life-threatening, requiring medical care in an urgent form; use medical devices in accordance with</p>	<p>doctors in accordance with the current procedures for providing medical care, clinical recommendations taking into account the standards of medical care; interpretation of data from additional (laboratory and instrumental) examinations of patients; making a preliminary diagnosis in accordance with the international statistical classification of diseases and problems related to health (ICD); differential diagnosis of diseases; recognition of conditions arising from sudden acute diseases, exacerbation of chronic diseases without obvious signs of a threat to the patient's life and requiring urgent medical care; the use of medical devices in accordance with current medical procedures, clinical recommendations (treatment</p>
--	--	---	---	---	--

			interpretation of data from additional (laboratory and instrumental) examinations of patients; making a preliminary diagnosis in accordance with the international statistical classification of diseases and related health problems (ICD); carrying out differential diagnostics of diseases; recognition of conditions arising from sudden acute diseases, exacerbation of chronic diseases without obvious signs of a threat to the patient's life and requiring emergency medical care; the use of medical devices in accordance with the current procedures for the provision of medical, clinical recommendations (treatment protocols) on the provision of medical care, assistance taking into account the standards of medical care		current medical procedures, clinical recommendations (treatment protocols) on the provision of medical care, assistance taking into account the standards of medical care	protocols) on the issues of medical care delivery, assistance taking into account the standards of medical care
4.	GPC-5	GPC-5. Able to assess morphofunctional, physiological conditions and pathological processes in the human body to solve professional problems	5.1 Knows: anatomy, histology, embryology, topographic anatomy, physiology, pathological anatomy and physiology of human organs and systems 5.2 Able to: evaluate the basic morphological and functional data, physiological conditions and pathological processes in the human body 5.3 Has practical experience: assessment of basic morphological and functional data, physiological conditions and pathological processes in the human body when solving professional problems	5.1 Knows: anatomy, histology, embryology, topographic anatomy, physiology, pathological anatomy and physiology of human organs and systems	5.2 Able to: evaluate the basic morphological and functional data, physiological conditions and pathological processes in the human body	5.3 Has practical experience in: assessment of basic morphological and functional data, physiological conditions and pathological processes in the human body when solving professional problems
5.	GPC-10	GPC-10. Able to understand the principles of modern information technologies and use them to solve the tasks of professional activity	10.1 Knows: the possibilities of reference and information systems and professional databases; methods of information search, information and communication technologies; modern medical and biological terminology; basics of information security in professional activity 10.2 Able to: apply modern information and communication technologies to solve the problems of professional activity; to carry out an effective search for information necessary to solve the problems of professional	10.1 Knows: the capabilities of reference information systems and professional databases; methods of information retrieval, information and communication technologies; modern medical and biological terminology; fundamentals of information security in	10.2 Able to: apply modern information and communication technologies to solve the tasks of professional activity; carry out an effective search for information necessary to solve the tasks of professional activity using reference systems and professional databases; use	10.3 Has practical experience in the use of modern information and bibliographic resources, the use of special software and automated information systems to solve standard tasks of professional activity, taking into

			activity using reference systems and professional databases; use modern medical and biological terminology; master and apply modern information and communication technologies in professional activities, taking into account the basic requirements of information security 10.3 Has practical experience in: using modern information and bibliographic resources, using special software and automated information systems to solve standard tasks of professional activity, taking into account the basic requirements of information security	professional activities	modern medical and biological terminology; master and apply modern information and communication technologies in professional activity, taking into account the basic requirements of information security	account the basic requirements of information security
6.	PC-16	PC-16 Able to: organize and monitor the immunoprophylaxis of infectious diseases in the adult population, prescribe preventive measures to patients taking into account risk factors in accordance with the current <b>procedures</b> for providing medical care, <b>clinical recommendations</b> (treatment protocols) on the provision of medical care taking into account the <b>standards</b> of medical care and monitor compliance with preventive measures	16.1 Knows: the principles of application of specific and non-specific prevention of infectious diseases, the national calendar of preventive vaccinations and the calendar of preventive vaccinations according to epidemic indications; legislation of the Russian Federation in the field of health protection, sanitary rules and regulations; preventive measures, taking into account the diagnosis in accordance with the current procedures for the provision of medical care, clinical recommendations (treatment protocols) on the provision of medical care, taking into account the standards of medical care 16.2 Knows how to: organize and conduct immunoprophylaxis of infectious diseases in the adult population in accordance with the current procedures for the provision of medical care, clinical recommendations (treatment protocols) on the provision of medical care, taking into account the standards medical care; prescribe preventive measures to patients, taking into account risk factors for the prevention and early detection of diseases, including socially significant diseases	16.1 Knows: principles of application of specific and non-specific prevention of infectious diseases, the national calendar of preventive vaccinations and the calendar of preventive vaccinations for epidemic indications; legislation of the Russian Federation in the field of health protection, sanitary rules and regulations; preventive measures taking into account the diagnosis in accordance with the current procedures for medical care, clinical recommendations (treatment protocols) about medical care delivery taking into account the standards of medical care	16.2 Able to: organize and carry out immunoprophylaxis of infectious diseases in the adult population in accordance with the current procedures for the provision of medical care, clinical recommendations (treatment protocols) on the provision of medical care taking into account standards of medical care; prescribe preventive measures to patients taking into account risk factors for the prevention and early detection of diseases, including socially significant diseases	

#### 4. Volume of the academic discipline and types of academic work

Total labor intensity of the discipline is 7 CU (252 AH)

Type of educational work	Labor intensity		Labor intensity (AH) in semesters	
	volume in credit units (CU)	volume in academic hours (AH)	4	5
Classroom work, including	<b>3,7</b>	<b>132</b>	<b>66</b>	<b>66</b>
Lectures (L)		28	14	14
Laboratory practicum (LP)*				
Practicals (P)		104	52	52
Seminars (S)				
Student's individual work (SIW)	<b>2,3</b>	<b>84</b>	<b>42</b>	<b>42</b>
Mid-term assessment	<b>1</b>	<b>36</b>		<b>36</b>
credit/exam ( <i>specify the type</i> )				
<b>TOTAL LABOR INTENSITY</b>	<b>7</b>	<b>252</b>	<b>108</b>	<b>144</b>

#### 5. Sections of the academic discipline and competencies that are formed

№	Competence code	Section name of the discipline	The content of the section in teaching units
	UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16	General medical microbiology	1. Medical microbiology. Subject and tasks. Significance in the practice of a doctor. The main stages of development. The role of domestic scientists in the development of microbiological science. Principles of classification and nomenclature of bacteria. 2. The structure of a bacterial cell. Chemical composition and functions of the structural elements of the cell. Morphological features of individual groups of microorganisms (actinomycetes, rickettsia, chlamydia, mycoplasmas, spirochetes). 3. Physiology of microorganisms Types of metabolism: anabolism and catabolism. Classification of microorganisms according to the types of nutrition and energy production. Bacterial respiration as biological oxidation. Growth and reproduction of microorganisms. bacterial enzymes. Practical use of enzymes of microbial origin by humans. Basic principles of cultivation and identification of bacteria by cultural and enzymatic properties. 5. Atypical bacteria. Morphological features of actinomycetes, rickettsia, chlamydia, mycoplasmas, spirochetes. Significance in biology and medicine. 6. Microbiological bases of chemotherapy for infectious diseases. Sulfonamides. Antibiotics. Classification, spectrum and mechanism of action. Side effect on the body. The problem of drug resistance of microorganisms.
	UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16	Ecology of microorganisms	Spread of microbes in the environment. The role of microbes in the cycle of substances in nature. Microflora of soil, water, air, domestic and medical facilities. Microflora of the human body and its functions. Probiotics (eubiotics). Sanitary microbiology. Destruction of microbes in the environment. Disinfectology. The principle of decontamination. The concept of disinfection and sterilization. Aseptic and antiseptic. Physical and chemical factors of decontamination. The concept of antibiotics, antiseptics, disinfectants. Methods for monitoring the effectiveness of sterilization and disinfection. The practical significance of phages in biology and medicine.
	UC-1, UC-8, GPC-4, GPC-5, GPC-10,	General virology	1. Viruses. Bases of classification. History of development of virology. Hypotheses about the origin and nature of viruses. 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. Concept of virus and

	PC-16		virion. Viroids and prions, their role in pathology. Stages of interaction of the virus with the cell. Methods for culturing viruses. 2. Molecular bases of virus reproduction. Features of the reproduction of RNA viruses (plus-RNA viruses, minus-RNA viruses), DNA viruses, retroviruses. Outcomes of the interaction of the virus with the cell. Productive, abortive and integrative infections. Virus persistence. Mechanisms and types of persistence. Virogeny. Methods for studying viruses. Bacteriophages. Classification, mechanisms of interaction of a bacteriophage with a cell. Lysogeny. The concept of a prophage.
	UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16	Genetics of bacteria	Variability of microorganisms. Phenotypic and genotypic variability. Modifications. Mutations. Spontaneous and induced mutations. genetic recombination. Transformation. Transduction (general and specific). Conjugation. Extrachromosomal factors of heredity (plasmids), their properties. The concept of genetic engineering.
	UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16	Antibiotics	Symbiosis and antibiosis. Antibiotics. Discovery history. Classification by origin, chemical composition. Narrow and broad spectrum, bacteriostatic and bactericidal action. The mechanism of action of antibiotics on prokaryotic cells. Bacteriocins.
	UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16	Infectious process Pathogenicity and virulence of microorganisms	1. Infection. infectious process. Infectious disease. The role of the microorganism in the infectious process. pathogenicity and virulence. The role of the macroorganism in the infectious process. Nonspecific factors protecting the body from infection. The role of the environment and social conditions in the occurrence of infectious diseases. Principles of combating infectious diseases. 2. Pathogenicity virulence The main factors of bacterial virulence at various stages of the interaction of a microorganism with a sensitive macroorganism. Toxins of bacteria, classification of toxins.
	UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16	Special medical microbiology	1. Methods of laboratory diagnostics of infectious diseases of microbiological research (express diagnostics, microbiological and immunological). 2. Pyogenic cocci. Staphylococci. Streptococci. Meningococcus. Gonococcus. Classification. Characteristic. role in pathology. Immunity. Laboratory diagnostics. Treatment and prevention. 3. Family Enterobacteriaceae. Escherichia. Shigella. Salmonella. causative agents of cholera. Taxonomy and classification. Morphology and other biological properties. Pathogenesis and clinic of caused diseases. Immunity. Prevention. Nosocomial infections caused by enterobacteria. 4. Pathogens of diphtheria, whooping cough, paraptussis. biological properties. Pathogenesis and clinic of caused diseases. Immunity. specific prophylaxis. 5. Mycobacterium tuberculosis. Characteristic. Pathogenesis and clinic of tuberculosis. Immunity. specific prophylaxis. 6. Causative agents of zoonotic infections: plague, tularemia, brucellosis, anthrax. biological properties. Pathogenesis and clinic of caused diseases. Ecology of pathogens. specific prophylaxis. 7. Pathogenic clostridia and clostridia. Causative agents of tetanus, anaerobic wound infection, botulism. Ecology of pathogens. Pathogenesis and clinic of caused diseases. Specific therapy and prevention of clostridial infections. 8. Pathogenic spirochetes and spirochetosis. The causative agent of syphilis. biological properties. Pathogenesis and clinic of syphilis. Immunity. Prevention. The causative agent of systemic tick-borne borreliosis (Lyme disease). Characteristic. Pathogenesis and clinic of the disease. Prevention. 9. Mycoplasmas. Chlamydia. Rickettsia. Features of morphology, physiology. Pathogenesis and clinic of caused diseases. Prevention.

	<p>UC-1, UC-8, GPC-4, GPC-5, GPC-10, PC-16</p>	<p>Special medical virology</p>	<ol style="list-style-type: none"> <li>1. Orthomyxoviruses. Influenza virus. Structure and other biological properties. Influenza pathogenesis. Immunity. Diagnostics. specific prophylaxis.</li> <li>2. Paramyxoviruses. measles virus. Characteristic. Pathogenesis and clinic of measles. Measles in conditions of mass vaccination. Prevention.</li> <li>3. Rubella virus. Characteristic. congenital rubella syndrome. Rubella prevention.</li> <li>4. Rabdoviruses. Rabies virus. Biological properties and ecology. role in human pathology. Prevention.</li> <li>5. Picornaviruses. Polio virus. Pathogenesis and clinic of poliomyelitis. specific prophylaxis. Coxsackie and ESCO viruses are the causative agents of poliomyelitis-like diseases.</li> <li>6. Hepatitis viruses. Hepatitis A virus. Hepatitis B virus. Hepatitis C, D, E, G viruses. Pathogenesis and clinic of viral hepatitis. Immunity. Prevention.</li> <li>7. Human immunodeficiency virus (HIV). Pathogenesis and clinic of the disease. Diagnostics. Prevention.</li> <li>8. Human herpesviruses. Herpes simplex virus. Primary and recurrent herpes. Varicella zoster virus. Cytomegalovirus. Pathogenesis and clinic of caused diseases. Diagnostics. Prevention.</li> <li>9. Arboviruses. Structure and biological properties. Ecology. Pathogenesis and clinic of caused diseases. Diagnostics. Prevention.</li> </ol>
--	--	---------------------------------	--