COURSE PROGRAM

SYLLABUS

1. General information on the course

Full course name	Microbiology, Virology and Immunology
Full official name of a higher education institution	Sumy State University
Full name of a structural unit	Academic and Research Medical Institute. Кафедра громадського здоров'я
Author(s)	Ivakhniuk Tetiana Vasylivna, Shtainberher Raian Markovych, Pikhtirova Alina Volodymyrivna
Cycle/higher education level	The Second Level Of Higher Education, National Qualifications Framework Of Ukraine – The 7th Level, QF-LLL – The 7th Level, FQ-EHEA – The Second Cycle
Duration	two semesters
Workload	7 ECTS, 210 hours. For full-time course 154 hours are working hours with the lecturer (20 hours of lectures, 134 hours of seminars), 56 hours of the individual study.
Language(s)	English

2. Place in the study programme

Relation to curriculum	Compulsory course available for study programme "Medicine"
Prerequisites	Necessary knowledge: human anatomy, histology, cytology and embryology, Latin language and medical terminology, medical biology, life safety; basics of bioethics and biosafety, biological and bioorganic chemistry, physiology.
Additional requirements	There are no specific requirements
Restrictions	There are no specific restrictions

3. Aims of the course

The aim of the discipline is to achieve modern knowledge and professional skills in microbiology, virology and immunology based on knowledge of anatomical and physiological features of the body, medical biology, normal physiology, histology and embryology, biological and bioorganic chemistry, in compliance with the principles of medical ethics and biosafety.

4. Contents

Module 1. Morphology, physiology and genetics of microorganisms.

Topic 1 General microbiology. Bacterial physiology.

Subject and tasks of medical microbiology. The importance of medical microbiology in the professional activity of a doctor. Stages of development of microbiology. Prospects for the development of modern microbiology. Modern systematics and classification of microorganisms. Organization of a bacteriological laboratory. Classification of microorganisms by degree of biological danger; the principle of good laboratory practice; GLP standards. Morphology and structure of prokaryotes, eukaryotes. L-forms of bacteria, protoplasts, spheroplasts. Modern methods of microscopic diagnosis. Simple and complex methods of staining bacteria. Physiology of microorganisms. Bacterial metabolism. Growth and reproduction of microorganisms. Isolation and identification of pure cultures of aerobic and obligate anaerobic bacteria. Microscopic and bacteriological methods of diagnosis.

Topic 2 Bacteriophages. Bacterial genetics. Molecular genetic methods for diagnosing infectious diseases.

Bacterial viruses (bacteriophages): structure, properties, classification, mechanisms of their interaction with a bacterial cell. Practical use of bacteriophages from the standpoint of evidence-based medicine. Genetics of bacteria: genetic apparatus of bacteria, variability of bacteria. Microbiological foundations of genetic engineering. Biotechnology. Principles of conducting and interpreting the results of molecular genetic methods for the diagnosis of infectious diseases. Fundamentals of nucleic acid extraction and polymerase chain reaction (PCR).

Topic 3 Basics of disinfection and sterilization in medicine. Biorisk management. Antibiotics and antibiotic resistance. Antibacterial therapy of infectious processes.

Asepsis, antiseptics, disinfection and sterilization: purpose, principle of implementation, quality control. Management of biohazards and biological waste. Biosecurity. Emergency response / incidents. Biosafety in special environments. Definition of chemotherapy, chemoprophylaxis, chemotherapeutic index. Antimicrobial chemotherapeutic drugs: definition, classification, producers, principles of production. AWaRe classification. Requirements for antimicrobial drugs. Methods of laboratory determination (EUCAST) and assessment of the sensitivity of microorganisms to antimicrobial drugs. Units of measurement of antimicrobial activity of antibiotics. Antibiotic chart. Antibiotic resistance: causes and ways to prevent it is formation. Adverse reactions of antimicrobial therapy, taking into account the characteristics of the organism and the etiology of the disease. Rational antibiotic therapy. Regulatory acts on antimicrobial resistance. Quality indicators of antimicrobial therapy. European strategic action plan on the problem of antibiotic resistance.

Module 2. The microflora of the human body. The doctrine of infection. Immunology.

Topic 4 Microbial ecology of the human body. Dysbacteriosis. The doctrine of infection.

The nature of the human microbiome and infection. Concept of normal microflora. Resident and transit microflora. Characteristics of the normal microflora of different bioloci of the human body. Interrelationship and interdependence of the organism and its microflora. Regulation of species and quantity composition of microflora. Changes in the normal microflora associated with age characteristics of the host. The role of normal microflora in the vital activity of the host's organism. The participation of normal flora in the formation of colonization resistance of the organism. Dysbiosis: definition, causes, diagnosis, treatment and prevention. Basics of infectology and epidemiology from the standpoint of evidence-based medicine. Methods of determining the source of infection. Biological method of diagnosis.

Topic 5 The doctrine of immunity. Immune reactions. Fundamentals of immunoprophylaxis.

Immunity: definition, concept. Development of immunology in Ukraine and the world. Structure and functional organization of the immune system. Innate and adaptive immunity; immunological tolerance. Regulation of immune responses. Immunological research methods. Basics of immunopathology. Immunodeficiencies, types of allergic reactions and allergic diseases, autoimmune and immunoproliferative diseases. Immunology of tumor growth. Immunology of infectious processes. Principles of immunoprophylaxis from the standpoint of evidence-based medicine. Laws and orders regulating immunoprophylaxis in Ukraine. National guidelines for vaccination in the context of the COVID-19 pandemic. WHO policy and strategy for infection prevention.

Module 3. Special bacteriology and mycology. Protozoology.

Topic 6 Microbiology of acute intestinal bacterial infections and food intoxication.

Microbiology of escherichiosis, shigellosis, typhoid fever, paratyphoid A and B. Microbiology of cholera. The concept of "quarantine" or "conventional" infections, preventive and anti-epidemic measures regarding these infections, which are regulated by the "International Sanitary Regulations", international agreements - conventions. Microbiology of pseudotuberculosis and intestinal yersiniosis. Microbiology of campylobacteriosis and helicobacteriosis. Microbiology of food toxic infections and food poisoning. Intestinal infections are caused by opportunistic microorganisms.

Topic 7 Microbiology of coccal infections.

Characteristics of pathogens of coccal infections (staphylococcal, streptococcal, meningococcal, gonococcal). Evolution of the coccal group of bacteria, general characteristics. Microbiology of staphylococcal and streptococcal infections. Antibiotic resistance of staphylococci (MRSA - methicillin-resistant Staphylococcus aureus). Microbiology of meningococcal and gonococcal infections.

Topic 8 Microbiology of anaerobic infections.

The concept of anaerobic infection, pathogens, their classification. Genus Clostridium: classification, ecology, properties, evolution, resistance to environmental factors, toxigenicity, genetic control of toxin formation. Microbiology of wound anaerobic infection, tetanus: biological properties, pathogenic factors, toxin formation of pathogens; features of epidemiology and pathogenesis of infections, features of formation of immunity, methods of microbiological diagnostics, specific treatment and prevention of diseases. Tetanus in newborns. Characteristics of the main pathogens of non-clostridial anaerobic infection (Bactroides spp., Fusobacterium spp.) and their importance in the development of infectious pathology from the standpoint of evidence-based medicine.

Topic 9 Microbiology of respiratory bacterial infections.

Diphtheria, tuberculosis, pertussis and parapertussis: characteristics of pathogens, epidemiology, microbiological and immunological features of pathogenesis from the standpoint of evidence-based medicine, principles of microbiological diagnosis, specific prevention and treatment. The problem of multiple resistance of the causative agent of tuberculosis. Epidemic spread of tuberculosis in modern conditions. Other pathogenic mycobacteria (non-tuberculous mycobacteria). Microbiology of leprosy: etiology, biological and antigenic properties of the pathogen, epidemiology, pathogenesis, diagnosis and specific prevention of leprosy.

Topic 10 Microbiology of zoonotic bacterial infections.

Microbiological characteristics of pathogens of zoonotic infections - plague, tularemia, anthrax and brucellosis. Peculiarities of epidemiology, pathogenesis, microbiological diagnostics, specific prevention and therapy of zoonotic bacterial infections. The importance of zoonotic infectious diseases in modern society. Basic concepts of socially significant infectious diseases. Especially dangerous infectious diseases: modern ideas, medical geography, prevalence, main factors of occurrence and spread. Approaches to ensuring biosecurity in Ukraine.

Topic 11 Microbiology of spirochetosis, rickettsiosis, chlamydia and mycoplasmosis.

Characteristics of pathogenic spirochetes (the causative agent of syphilis, typhus, leptospirosis). Syphilis: etiology, sources of infection, features of pathogenesis, congenital syphilis and consequences for the child, principles of microbiological diagnosis, prevention and treatment. General characteristics of chlamydia. The life cycle of chlamydia development. Chlamydia: etiology, epidemiology, microbiological aspects of pathogenesis, principles of microbiological diagnosis, prevention and treatment. The importance of chlamydia in the structure of TORCH-infections. Mycoplasma infections: etiology, structural features and antigenic properties of pathogens, epidemiology and microbiological bases of pathogenesis, principles of microbiological diagnosis, prevention and treatment. Rickettsia: properties, classification. Microbiology of rickettsioses: typhus and Brill-Zinsser disease. Actinomycetes and their role in human infectious pathology.

Topic 12 Fundamentals of medical mycology. Microbiology of mycoses.

General characteristics of pathogenic fungi. Morphological characteristics and physiology of pathogenic and potential pathgenic fungi. Classification of mycoses: superficial mycoses (keratomycoses), dermatomycoses, subcutaneous mycoses, mycetomas, systemic (deep) mycoses, opportunistic mycoses. Epidemiology, microbiological features of pathogenesis, principles of microbiological diagnosis, prevention, and treatment of mycoses from the standpoint of evidence-based medicine.

Topic 13 Pathogenic protozoa - pathogens of parasitic invasions.

Pathogenic protozoa are the causative agents of parasitic infestations. Protozoa - general characteristics, pathogenicity factors. Parasitological diagnosis. Protozoa are human pathogens: Entamoeba histolytica, Trichomonas vaginalis, Toxoplasma gondii. Epidemiology and pathogenesis of parasitic invasions from the perspective of evidence-based medicine. Antiprotozoal drugs: classification, mechanism of action. Public and personal prevention of parasitic infestations.

Module 4. General and special virology. Clinical and sanitary microbiology.

Topic 14 General virology. Morphology, ultrastructure of viruses. Principles of microbiological diagnosis of viral infections. Features of antiviral immunity. Pathogens of respiratory viral infections.

Definition of virology as a science. Tasks and importance of medical virology in the activity of a doctor. Principles of structural organization, classification and biological properties of viruses. Principles of laboratory diagnostics of viral diseases. Virological method of diagnosis: cultivation, indications, identification of viruses. Features of antiviral immunity. Antiviral chemotherapeutic drugs, their classifications. Interferons and their inducers, the mechanism of their antiviral action. Microbiology of acute respiratory viral infections from the perspective of evidence-based medicine: influenza, parainfluenza, mumps, adenovirus infection, rhinovirus infection, RS-infection, measles, rubella, bocavirus infection and diseases caused by SARS-CoV and SARS-CoV-2 coronaviruses.

Topic 15 Microbiology of enteroviruses infections.

General characteristics and classification of the Picornaviridae family. Microbiology of poliomyelitis, Coxsackie- and ECHO-infections. The problem of polio eradication worldwide. Rotavirus infection: biological properties, sensitivity to physical and chemical environmental factors; epidemiology and microbiological features of pathogenesis from the standpoint of evidence-based medicine, significance in childhood infectious pathology; principles of microbiological diagnosis, prevention and treatment.

Topic 16 Microbiology of viral hepatitis.

Viruses of parenteral and enteral hepatitis: classification, systematic position, features of antigenic structure and replication in human cells. Microbiological features of the pathogenesis of viral hepatitis A, B, C, D, E, F, G. Modern approaches to the microbiological diagnosis of viral hepatitis, the diagnostic value of pathogen markers. HBV/HDV coinfection. HBV/Tuberculosis. Approaches to specific prevention of hepatitis A and B. Prevention of transmission of hepatitis B and C in medical institutions.

Topic 17 Retroviruses. HIV infection. AIDS-associated pathology. Oncogenic viruses.

Retroviruses: general characteristics, classification. Representatives of the subfamilies Oncovirinae, Lentivirinae. Human immunodeficiency viruses, their morphology, genome strategy, antigenic structure, virus variability, HIV types, origin and evolution, stages of interaction with sensitive cells; sensitivity to physical and chemical factors. Epidemiology and pathogenesis of HIV infection from the perspective of evidence-based medicine. Pathogenesis of HIV/HBV co-infection. Methods and criteria of microbiological diagnosis of HIV infection, prospects for specific prevention. Pre-contact and post-contact prevention of HIV infection. General principles of antiretroviral therapy. Vaccination of HIV-infected persons. AIDS-associated pathology: etiology, pathogenesis, peculiarities of microbiological diagnosis. T-cell leukemia virus: systematic position, biological and antigenic properties; peculiarities of epidemiology and pathogenesis, principles of disease diagnosis and prevention. General characteristics and classification of oncogenic viruses. The virus-genetic theory of tumor formation according to O. Zilber. Mechanisms of viral carcinogenesis.

Topic 18 Pathogens of natural-focal infections.

Emergent and re-emergent infections: definition, types, prevalence, zoogeographic factors, main factors of occurrence and spread. Emergent infections in Ukraine. Approaches to ensuring biosecurity in Ukraine. Naturally occurring infections in Ukraine. Genus Flavivirus - viruses of yellow fever, tick-borne encephalitis (European, Siberian and East Siberian, Omsk hemorrhagic fever (OGH), etc.), dengue, etc. Bunyaviridae – viruses of Crimean hemorrhagic fever and fever with renal syndrome. Medical ecology of diseases. Biological and antigenic properties of viruses of naturally occurring infections, sensitivity of viruses to physical and chemical factors of the external environment; natural reservoirs of viruses, epidemiology and microbiological features of disease pathogenesis. Principles of specific and non-specific disease prevention.

Topic 19 Microbiology of herpesviruses infections.

Viruses of the Herpesviridae family: classification, morphology, features of herpesvirus reproduction in the cell, cultivation. Herpesvirus infections: herpes simplex virus of the 1st and 2nd types, herpesvirus of chickenpox - shingles; cytomegalovirus herpesvirus; Epstein-Barr herpesvirus, herpesvirus types 6, 7, 8: epidemiology and pathogenesis, clinical manifestations and immunogenesis. Mechanisms of the transforming action of oncogenic herpesviruses from the standpoint of evidence-based medicine. Principles and methods of laboratory diagnosis of herpesvirus infections, treatment and prevention.

Topic 20 Poxviruses. Rhabdoviruses. Laboratory diagnosis of infections.

General characteristics of poxviruses: morphology, cultivation, resistance, antigenic structure, features of replication. Smallpox: etiology, epidemiology, pathogenesis, principles of microbiological diagnosis of smallpox depending on the stage of pathogenesis, specific prevention and treatment from the standpoint of evidence-based medicine. The works of E. Jenner. Smallpox virus is a potential pathogen of biological weapons: effectiveness and countermeasures. Basic biological properties of rhabdoviruses and their classification. Fixed and street rabies viruses, their distinctive properties. Epidemiology, pathogenesis and clinic of rabies from the standpoint of evidence-based medicine. Peculiarities of laboratory diagnosis of rabies. Principles of specific prevention and treatment of rabies.

Topic 21 Oncogenic viruses. Pathogens of slow infections. Prion diseases.

Oncogenic viruses: general characteristics, classification. The virus-genetic theory of tumor formation L.A. Zilber. Modern theories of carcinogenesis. Features of antitumor immunity, causes of inefficiency. Immunodiagnosis of tumors. Prospects of immunotherapy and immunoprophylaxis of tumors. Slow viral infections: etiology, features of pathogenesis, methods of diagnosis and prevention. Modern aspects of prion diseases: morphology and properties of prions, epidemiology, risk groups, pathogenesis, immunity, laboratory diagnosis, treatment and prevention.

Topic 22 Clinical and sanitary microbiology. General information about clinical microbiology. Biological features of opportunistic microorganisms and diseases caused by them. Peculiarities of microbiological diagnosis of hospital infections. General characteristics of pathogens of nosocomial and opportunistic infections. Hospital strains and ecovars of opportunistic microbes, causes of occurrence and ways to prevent their spread. Methods of identification of hospital strains. Etiology, epidemiology of pathogenesis and clinic of nosocomial infections. The problem of "healthy" carriers of opportunistic pathogens and sanitation of bacterial carriers. Opportunistic infections associated with medical intervention. Microbiological basis of prevention and treatment of opportunistic infections. Microbiological diagnosis of bacteremia and sepsis; infections of the urinary tract and reproductive system; infections of the respiratory system; intestinal infections and food poisoning; wound infection; infections of the central nervous system. Criteria for the etiological role of microorganisms isolated during bacteriological diagnosis of nosocomial infections. Sanitary-microbiological supervision of school and preschool institutions and sanitary-epidemiological regime of rural institutions. Sanitary and microbiological research of objects of the external environment, water, air, soil, foodstuff.
Topic 23 Execution of test tasks. Carrying out the list of practical skills. Testing. Carrying out the list of practical skills.
Topic 24 Practically oriented exam. Conducting the exam in accordance with the regulations.

5. Intended learning outcomes of the course

After successful study of the course, the student will be able to:

LO1	To analyze the biological properties of pathogenic and opportunistic microorganisms, patterns of their interaction with macroorganism and external environment. Determine the most likely nosological diagnosis of the disease based on the microbiological and immunological history.
LO2	To carry out differential diagnosis of infectious diseases in practice non-infectious diseases that occur in medical practice, to be able to choose the necessary volume of additional studies based on the results of microbiological and immunological methods of researching the material and the pathogenesis of diseases.
LO3	To choose modern and informative methods of microbiological and immunological diagnostics to understand the manifestations of infectious diseases and immunopathologies. Be able to interpret the results of examination of patients within age norms.
LO4	To generate innovative solutions for establishing a diagnosis for results of basic and additional methods of microbiological and immunological diagnostics of infectious and non-infectious diseases.
LO5	To be able to work with professional literature, analyze and use the received information in terms of its practical application in the medical, diagnostic and preventive activities of the doctor.

6. Role of the course in the achievement of programme learning outcomes

Programme learning outcomes achieved by the course.

For 222 Medicine:

PO2	To understand and know basic and clinical biomedical sciences, at a level sufficient for solving professional problems in the field of healthcare.
PO4	To detect and identify the leading clinical symptoms and syndromes (according to List 1); to establish the most probable preliminary clinical diagnosis of diseases (according to List 2) using standard methods, preliminary data of the patient's anamnesis, patient's examination data, and knowledge about a human, his organs and systems.
PO5	To collect information about the patient's complaints, anaemnesis vitae and morbi; to assess the patient's psychomotor and physical development and the state of organs and systems of the body; to assess information on the diagnosis based on laboratory, instrumental findings (according to the List 4) and patient age.
PO6	To establish a final clinical diagnosis at a medical institution under control of a supervising doctor by means of informed decision and analysis of the obtained subjective and objective data of clinical and additional examinations, and differential diagnosis, following the relevant ethical and legal norms (according to the List 2).
PO7	To order and analyze additional (mandatory and optional) examinations (laboratory, functional, and/or instrumental) (according to List 4) in order to perform a differential diagnosis of diseases (according to List 2).
PO21	To search for the necessary information in the professional literature and databases; to analyze, evaluate, and apply this information.

7. The role of the course in the development of program competencies

Program competencies addressed by the course:
For 222 Medicine:

8. Teaching and learning activities

Topic 1. General microbiology. Bacterial physiology.
lect.1 "Medical microbiology: subject, tasks, history of development. Morphology and structure of bacteria. Bacterial physiology." (full-time course) Medical microbiology: history of development, achievements, tasks, importance in medical practice. Principles of classification of microorganisms. Classification of microorganisms by risk groups. The principle of good laboratory practice; GLP standards. Morphology and structure of bacteria, study methods. L-forms, bacterial polymorphism, medical significance. Features of the structure of actinomycetes, rickettsia, chlamydia and mycoplasma; methods of their detection. Physiology of bacteria. Methods of microbiological diagnosis of infectious diseases from the standpoint of evidence-based medicine. Teaching is conducted in the form of multimedia lectures (in case of quarantine - in online mode).

pr.tr.1 "Rules of work in the bacteriological laboratory. Morphology of bacteria. Light microscopy using an immersion lens. Simple painting methods." (full-time course)

Medical microbiology: history of development, achievements, tasks, importance in pediatric practice. Principles of classification of microorganisms. Bergey's classification of prokaryotes. Classification of microorganisms by risk groups. The principle of good laboratory practice; GLP standards. Morphological classification of bacteria, methods of studying morphology. Simple methods of staining microorganisms. Light microscopy: purpose of use, principles of immersion microscopy. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation on the Labster "Light Microscopy" platform. In addition, during the lesson, preparation of preparations from cultures of microorganisms from liquid (E.coli) and dense (E.coli) nutrient media, their staining by simple methods is expected; study of demonstration preparations from bacteria of different morphological groups stained by simple methods followed by interpretation of the results and discussion.

pr.tr.2 "The structure of the bacterial cell. Complex painting methods. Features of the ultrastructure of spirochetes, rickettsiae, chlamydia, mycoplasmas. Modern methods of microscopic examination. Microscopic method for diagnosis of infectious diseases." (full-time course)

The structure of a bacterial cell: structure, functions, methods of study. Complex staining methods (Gram, Ozheshko, Ziehl-Neelsen, Neisser, Buri-Gins, Leffler method): meaning, technique and principle, interpretation of results. L-forms of bacteria; factors causing their formation, medical significance. Differences between prokaryotic and eukaryotic cells. Features of the ultrastructure of spirochetes, rickettsia, chlamydia, mycoplasma; methods of their detection. Modern methods of microscopic research: types. Microscopic method of diagnosis of infectious diseases: purpose, principle of implementation, interpretation of results. The study of this topic involves theoretical and practical work in the classroom: microscopic examination of demonstration preparations of various microorganisms (K.pneumoniae, C.perfingens, C.diphthteriae, a mixture of gram-positive and gram-negative bacteria, S. aureus, S. pyogenes, N.meningitidas, Lactobaccilus spp.), painted with complex methods. In addition, the study of this topic involves the use of immersive technologies - performing virtual practical work on the Labster platform "Bacterial Cell Structures: An introduction to the bacterial cell Virtual Lab", "The Gram Stain", "Gram Stain: How stains and counterstain works"; performing practical work - preparation of fixed preparations from a mixture of bacteria, staining it according to the Gram method and microscopic examination.

pr.tr.3 "Physiology of microorganisms. Nutrition and respiration of microorganisms. Cultural media. Isolation of pure culture of aerobic bacteria (stage I)." (full-time course)

Physiology of bacteria. Chemical composition of a bacterial cell. Mechanisms of transport of nutrients into the bacterial cell. Bacterial enzymes: functions, classification and detection methods. Bacterial metabolism. Types of nutrition of bacteria. Energy metabolism of bacteria. Types of bacterial respiration. Constructive metabolism of bacteria. Transport of substances from the bacterial cell. Nutrient media: classification, requirements, purpose of use. Growth and reproduction of bacteria. Phases of the development of microorganisms in a liquid medium in batch culture. Bacteriological method of diagnosis: purpose, tasks, implementation algorithm. The first stage of the bacteriological method of diagnosis: purpose, tasks, manipulations. The study of this topic involves theoretical and practical work in the educational laboratory: the use of immersive technologies - performing virtual practical work on the Labster "Bacterial isolation" platform; carrying out microbiological manipulations of the 1st stage of isolation of a pure culture of E.coli from a mixture of bacteria and S.aureus from the material from the nasopharynx: inoculation of the material on nutrient media by various methods with further discussion of the results.

pr.tr.4 "Enzymes of bacteria. Isolation of a pure culture of aerobic bacteria (II-IV stages)." (full-time course)

Bacterial enzymes: classification, genetic regulation, specificity of action. Bacteriological method of diagnosis: purpose, tasks, implementation algorithm. Associations of microorganisms and pure cultures. Colonies of microorganisms: features of their formation, properties. Methods of studying the enzymatic activity of bacteria. Methods of accelerated identification of bacteria using automated indicators of enzymatic activity. II-IV stages of the bacteriological diagnostic method: purpose, tasks, manipulations. The value of the bacteriological method in the diagnosis of infectious diseases. Use of microbes and their enzymes in biotechnology. The study of this topic involves theoretical and practical work in the educational laboratory: the use of immersive technologies - the Labster platform - the virtual simulator "Biosafety Virtual Lab"; studying the demonstration (growth of different types of bacteria on nutrient media; performing manipulations of the II-IV stages of the bacteriological diagnostic method; carrying out the identification of the causative agents of infectious diseases (setting up, taking into account and interpreting tests for the identification of bacteria) with further discussion of the results.

pr.tr.5 "Anaerobes. Isolation of a pure culture of anaerobic bacteria. Biological method of diagnosis of infectious diseases." (full-time course)

Concept of anaerobiosis. Distribution of microorganisms according to their attitude to oxygen. Physiology of microorganisms performing anaerobic respiration. Mechanisms of protection of microorganisms against the toxic action of oxygen. Purposes and methods of cultivation of anaerobic bacteria, nutrient media for obligate anaerobes. Methods of creating anaerobic conditions in bacteriological laboratories. Stages of isolation of pure cultures of obligate anaerobic bacteria. Methods of identification of selected cultures of obligate anaerobic bacteria. Biological method of diagnosis of infectious diseases. The study of this topic involves theoretical and practical work in the educational laboratory: the use of immersive technologies - the Labster platform - the virtual simulator "Bacterial Growth Curves: Experiment with bacterial growth Virtual Lab"; studying the demonstration (growth of different types of anaerobic bacteria on nutrient media; taking into account and interpreting identification tests; Fortner's biological method, physical methods of cultivation of obligate anaerobes); microscopic examination of spore-forming anaerobic bacteria isolated from the soil slurry) and drawing up a plan for the isolation and identification of bacteria.

Topic 2. Bacteriophages. Bacterial genetics. Molecular genetic methods for diagnosing infectious diseases.

pr.tr.6 "Bacteriophages. Use of bacteriophages in microbiology and medicine. Genetics of microorganisms. Plasmids, transposons, IS-sequences. Polymerase chain reaction." (full-time course)

Structure, properties and chemical composition of bacteriophages. Classification of bacteriophages by spectrum of lytic action and mechanism of interaction with cells. Phage resistance. Phage interaction with a bacterial cell. Prophage, lysogeny, phage conversion. Participation of bacteriophages in genetic exchange in bacteria. Practical use of bacteriophages: phage diagnosis, phage prophylaxis, phage therapy. Genetic apparatus of bacteria. Plasmids: types, properties, biological significance. IS-elements, transposons, integrons, "islands of pathogenicity": properties, biological significance. Variability of bacteria: phenotypic and genotypic, physiological significance of the phenomenon. Genetic engineering. Molecular genetic method of diagnosis of infectious diseases(PCR, DNA sensing): purpose, implementation principles and interpretation of results. The study of this topic involves theoretical and practical work in the classroom: execution of Labster virtual simulators "Genetic Transfer in Bacteria: Prevent the rise of superbugs! Virtual Lab", "PSR"; setting up and taking into account the results of phagotyping, studying the study of liquid and tableted bacteriophages, as well as demonstration experiments on conjugation, transformation, transduction, interpretation of the PCR result with further discussion of the results; visiting the PCR laboratory and participation of applicants in various stages of PCR.

Topic 3. Basics of disinfection and sterilization in medicine. Biorisk management. Antibiotics and antibiotic resistance. Antibacterial therapy of infectious processes.

lect.2 "Microbiological bases of antimicrobial therapy. Antiseptics and asepsis." (full-time course)

Environmental factors and their influence on microorganisms, practical use. Concept of aseptic and antiseptic. Acquired resistance of microorganisms to antiseptics. Sterilization: definition, classification of methods, methods of quality control. Disinfection: disinfectants, mechanism of action, methods of quality control. Microbial antagonism, its mechanisms. Definition of the concept of chemotherapy, chemoprophylaxis, chemotherapeutic agents, chemotherapeutic index. Antimicrobial drugs: nature, spectrum, mechanism of action, classification. Antibiotics: AWaRe classification; bactericidal and bacteriostatic effect; units of measurement of antimicrobial activity. Methods of determining the sensitivity of bacteria to antibiotics, the EUCAST method. The concept of minimum inhibitory and bactericidal concentrations. Antibiotic chart. Natural and acquired resistance to antibiotics. Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Ways to prevent the formation of bacterial resistance to antibiotics. Side effects of antimicrobial therapy. Principles of rational antibiotic therapy. Quality indicators of antimicrobial therapy. European strategic and national action plan on the problem of antibiotic resistance. Teaching is conducted in the form of interactive lectures (in case of quarantine - in online mode).

pr.tr.7 "Basics of asepsis and antiseptics. Sterilization. Disinfection. Biorisk management in the laboratory." (full-time course)

Environmental factors and their influence on microorganisms, practical use in medicine. Concept of aseptic and antiseptic. Acquired resistance of microorganisms to antiseptics. Sterilization: concepts, types, methods, methods of quality control. Disinfection: types, control methods. Sanitary and epidemiological regime in hospitals and units of various profiles. Relevance of biorisk management. Basic risk concepts and risk assessment. Proper practice of laboratory work. Biological waste management. Bioprotection. Responding to emergencies/incidents. The study of the topic involves theoretical and practical work in the teaching room and autoclave room of the department: implementation of virtual simulators on the Labster platform - "Biosafety Virtual Lab", "Pasteurization and Sterilization Virtual Lab"; determining the activity of disinfectants against different strains of bacteria (demonstration). In addition, as part of this topic, applicants will be familiarized with the principles of operation and quality control of autoclaves VK-75 and GK-75 (autoclave room of the department); study of the microflora of non-sterile suture material (microscopy) with further discussion of the results.

pr.tr.8 "Antibiotics. Antimicrobial resistance. Methods for determining and assessing the sensitivity of microorganisms to antimicrobial drugs. Quality indicators of antimicrobial therapy. Antibiotic therapy and antibiotic prophylaxis." (full-time course)

Definition of the concept of chemotherapy, chemoprophylaxis, chemotherapeutic agents, chemotherapeutic index. Antimicrobial drugs: nature, origin, spectrum, mechanism of action, classification. Antibiotics: AWARE classification; bactericidal and bacteriostatic effect; units of measurement of antimicrobial activity. Methods of determining and evaluating the sensitivity of microorganisms to antimicrobial drugs (EUCAST). The concept of minimum inhibitory and bactericidal concentrations. Antibiotic chart. Natural and acquired resistance to antibiotics. Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Ways to prevent the formation of bacterial resistance to antibiotics. Quality indicators of antimicrobial therapy. Side effects of antimicrobial therapy. Empiric antimicrobial therapy based on stratification of patients taking into account the risks of antimicrobial resistance and data from local microbiological monitoring. Principles of rational antibiotic therapy. European strategic action plan on the problem of antibiotic resistance. National Action Plan to Combat Antimicrobial Resistance. The study of this topic involves theoretical and practical work in the classroom: preparation and interpretation of the results of the disco-diffusion method, the method of serial dilutions of antibiotics, E-test(demonstration); interpretation of antibioticogram results with further discussion of the results

pr.tr.9 "Final control on the content module I "Morphology, physiology and genetics of microorganisms." (full-time course)

Test of theoretical knowledge (computer testing) and practical skills on topics 1-3.

Topic 4. Microbial ecology of the human body. Dysbacteriosis. The doctrine of infection.

pr.tr.10 "Normal microflora of the human body. Dysbacteriosis." (full-time course)

The concept of symbiosis. Human microbiome: definition, composition, stages of formation in the process of ontogenesis, significance. The human microbiome is normal. Microflora of different parts of the human body and its significance. The concept of colonization resistance and its role in infectious pathology. Factors affecting the quantitative and qualitative composition of the microflora of the human body. Dysbacteriosis: definition, causes, classification, diagnostic methods. Therapeutic possibilities of restoring the microbiome. Prebiotics, probiotics and synbiotics: composition, purpose of use, mechanism of action. The study of this topic involves work in the classroom: study of demonstration drugs (pro-, pre-, synbiotics); microscopic study of the microflora of meconium and feces of an adult (demonstration), dental plaque (preparation, staining, and microscopy of the micropreparation); interpretation of the results of microbiological examination of stools for dysbacteriosis (archives of the department) taking into account age characteristics; drawing up a microflora correction plan based on the results of a microbiological study (practice-oriented task) with further discussion.

pr.tr.11 "The doctrine of infection." (full-time course)

Definition of concepts: infection, infectious process, infectious disease. Factors necessary for the emergence of an infectious process. Properties characteristic of pathogens of infectious diseases, their characteristics. Epidemic process. Source of infection. Methods of determining the source of infection. Reservoir of infection. Mechanisms of transmission of infectious agents, their characteristics. Characteristics of the epidemic process. Phases of the development of the infectious process. The dynamics of infectious disease development. The role of microorganisms in the development of the infectious process. Pathogenicity and virulence of microbes, methods of their determination. Classification of infections and the concept of the pathogenesis of an infectious disease. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films) with further discussion; performing group practical work on setting up and interpreting the results of a phagotyping experiment in order to determine the source of infection, interpreting the results of laboratory tests on the study of the pathogenicity factors of bacteria on nutrient media with the subsequent burning of the results.

Topic 5. The doctrine of immunity. Immune reactions. Fundamentals of immunoprophylaxis.

lect.3 "Immunity. Factors and mechanisms of innate protection of the body. Antigens." (full-time course)

The role of immunology in the development of medicine. History of the development of immunology. Immunity: definition, role of factors and reactions of immunity in infectious and non-infectious human pathology. Organs and cells of the immune system. Functional organization of the immune system. Antigens and patterns. Antigens: definition, structure, properties, chemical nature, specificity, types. Antigenic structure of bacterial cells and viruses. Molecules of the immune system. Innate and adaptive immune factors, the first line of defense. Humoral factors and mechanisms of innate resistance, their function and definition. Cellular factors and mechanisms of innate immunity, their function and definition, methods of study. The value of the works of I. I. Mechnikov. Teaching is conducted in the form of a multimedia interactive lecture (in case of quarantine - in online mode).

lect.4 "Adaptive response. Immune reactions. Basics of immunodiagnostics, immunoprophylaxis and immunotherapy of infectious diseases." (full-time course)

Types of adaptive immunity by origin and conditions of formation: strategy and tactics of pathogen recognition; the mechanism of their action; interaction of T-, B-lymphocytes and macrophages. Types of anti-infective immunity. Antibodies, classes of immunoglobulins, their definition. Autoantibodies and autoantigens, their significance in infectious pathology. Poly- and monoclonal antibodies. The use of antigens and antibodies in the practice of a doctor. Primary and secondary immune response. Serological reactions used for the diagnosis of infectious diseases: types, principle of conduct, interpretation of results. Concepts of "immunoprophylaxis" and "immunotherapy". Classification of immunoprophylactic drugs. Types of prevention. Basics of the immune response to vaccines; methods of studying the intensity of post-vaccination immunity. Contraindications to preventive vaccinations. Adverse events after vaccination. Teaching is conducted in the form of a multimedia interactive lecture (in case of quarantine - in online mode).

pr.tr.12 "Immunity. Mechanisms and factors of innate immunity." (full-time course)

The role of immunology in the development of medicine. Immunity: definition. Functional organization of the immune system. The role of immune factors and reactions in infectious and non-infectious human pathology. Types of immunity by origin and conditions of formation. General physiological factors of innate immunity, their function. Humoral factors and mechanisms of innate immunity (complement system, lysozyme, bactericidal substances of blood serum, antiviral humoral factors of innate immunity), their function and methods of study. Cellular factors and mechanisms of innate resistance, their function and definition. The value of the works of I. I. Mechnikov. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing an educational film on the topic) with further discussion; the performance of group practical work on determining the antibacterial activity of saliva lysozyme, blood serum complement system in in-vitro tests and individual - determination of phagocytic activity (microscopy of the drug); application of immersive technologies (performance of a virtual simulator on the Labster platform "Introduction to Immunology: Explore the immune system and save the world! Virtual Lab") with further discussion.

pr.tr.13 "Antigens. The role of antigens in the infectious process and the development of the immune response. Practical use of antigens." (full-time course)

Antigens: definition, structure, properties, chemical nature, material basis of specificity, types. Classification of antigens by origin, chemical nature, level of immunogenicity. The main properties of antigens: antigenicity, immunogenicity, specificity. Antigenic structure of bacterial cells and viruses. Antigenic properties of microbial toxins. Antigens of the human body: antigens of the human blood group, antigens of the major histocompatibility complex: definition, localization, HLA system, nomenclature, functions, role in the immune response. Heterogeneous antigens. Autoantigens. CD-antigens of cells of the immune system. Antigen processing in the body. Superantigens. Practical use of antigens of microorganisms, significance for diagnosis, and specific prevention. The study of this topic involves theoretical and practical work in the classroom: the study of immunobiological preparations of antigenic origin (diagnostics, antigens, erythrocyte diagnostics, allergens, vaccines) with further discussion of the purpose of use.

pr.tr.14 "Adaptive humoral immune response. Immunoglobulins (antibodies): definition, classes, structure, functions, properties, practical use." (full-time course)

Forms and types of immune response. Humoral immune response and its stages: antigen recognition, processing, antigen presentation to T-helpers and B-lymphocytes, proliferation and differentiation of B-lymphocytes. T- and B-dependent antigens, their influence on the immune system, synthesis of antibodies by plasma cells. Regulation of the immune response. The concept of mediators of the immune system. Immunological memory, memory cells. Primary and secondary immune response. Interaction of cells of the immune system in the process of immune response. Interleukins. Antibodies: structure, classification, properties, functions, heterogeneity of molecules, determination of their content in blood. Infectious diseases in which antibodies play a leading role in protective immunity. Genetic control of antibody production. The mechanism of interaction of antibodies with antigens. Antigenic structure of immunoglobulins. Concept of polyclonal and monoclonal antibodies. The study of this topic involves theoretical and practical work in the classroom: the study of antibody therapeutic and preventive and diagnostic immunobiological drugs with further discussion. In addition, within the framework of this topic, it is provided for the performance of a group practical task - determination of the total number of serum antibodies with further discussion of the results.

pr.tr.15 "Serological tests: purpose and principle of production. Agglutination, flocculation and precipitation tests (varieties, purpose of production), neutralization of toxins." (full-time course)

Principles and purposes of conducting serological reactions in medical practice. Serological reactions: varieties, specificity, sensitivity, biphasic nature, reversibility. Mechanism of interaction of antigens and antibodies in serological reactions. The main components of serological reactions, principles of staging and interpretation of results. Agglutination reactions: mechanisms, types, interpretation of results, practical use. Precipitation reactions: purpose, types, principle of setting, interpretation of results, practical use. Flocculation reaction: purpose and principle of setting, scope of use, interpretation of results. Neutralization reactions: purpose, types, principle, interpretation of results, practical use. The study of this topic involves theoretical and practical work in the classroom, presentation, and interpretation of the obtained results of serological reactions - AT on glass, AT in test tube, PHAT, PT in gel, ring precipitation reactions (demonstration) with further discussion of the results.

pr.tr.16 "Serological tests: complement fixation test (CFT), reactions using labeled antibodies and antigens - ELISA, IFT, RIA. Immunoblot." (full-time course)

Principles and purposes of conducting serological reactions in medical practice. Complement fixation test (CFT): goals, components, mechanisms, interpretation of results. Reactions using labeled antibodies or antigens. Immunofluorescence reaction: types, purpose of staging, components, mechanism, interpretation of results. Enzyme-linked immunosorbent assay (ELISA): purpose, practical use, types, components, mechanism, interpretation of results. Radioimmunoassay (RIA): purpose, components, mechanism, interpretation of results. The essence and features of immunoblotting, mechanism, and scope of use. The advantages of different methods of serological research in the diagnosis of infectious diseases at different stages of an infectious disease. Concepts of "antibody titer", "diagnostic titer", "diagnostic increase in antibody titer", and "paired sera". The principle of differentiation is based on the results of serological reactions of an existing infectious disease from a previously transferred one. Criteria of serological diagnosis. The study of this topic involves theoretical and practical work in the classroom, the use of immersive technologies (virtual trainer on the Labster "ELISA" platform) with further discussion; performance of group practical tasks - interpretation of the obtained results of serological reactions - CFT, IFT, RIA (demonstration) with further discussion of the results.

pr.tr.17 "Adaptive cellular immune response. Types of cellular immune response. Immunological tolerance." (full-time course)

Cellular immune response and its stages: recognition, antigen processing, antigen presentation to Thl lymphocytes, proliferation and differentiation of effector T-cells (helpers, suppressors, effectors, delayed-type hypersensitivity, memory cells). Cytotoxic and inflammatory type of cellular immune response: mechanisms, cells, cytokines and their role in the formation of cellular immune responses. Diseases characterized by a cytotoxic and inflammatory type of cellular immune response. Purpose and methods of studying the components of the adaptive cellular immune response. Immunological tolerance: definition, types, mechanisms, practical use. Tolerogens. Artificial tolerance. Tolerance to bacterial and viral antigens. Induction of tolerance to haptens. Factors contributing to the creation of artificial tolerance. The study of this topic involves theoretical and practical work in the classroom: interpretation of the Mantoux test (archives of the department) with further discussion of the results; study of immunobiological prophylactic and diagnostic preparations that form an artificial adaptive immune response.

pr.tr.18 "Basics of immunopathology." (full-time course)

Types of disorders of the functions of the immune system (immunopathology): definition, types. Immunodeficiencies: definition, classification, causes, clinical manifestations, principles of diagnosis and treatment from the standpoint of evidence-based medicine. Allergy (hypersensitivity): definition, allergens, classification of allergic reactions according to Gel and Coombs, mechanisms of development, clinical manifestations, diagnostic tests, and prevention from the standpoint of evidence-based medicine. Autoimmune (autoaggressive) diseases: definitions, mechanisms of development, principles of treatment and prevention of autoimmune diseases from the standpoint of evidence-based medicine. Atopy: bronchial asthma, pollinosis. Immunology of tumor growth. Immunodiagnosis. The study of this topic involves theoretical and practical work in the classroom: interpretation of the results of immunological methods of diagnosing immunopathologies (departmental archive of results - immunograms).

pr.tr.19 "Anti-infective immunity. Principles of functioning of the immune system. Regulation of the immune response." (full-time course)

Pathogens, natural and acquired immunity. Reactions of the immune system that are formed in response to the pathogen entering the body and the role of immunity in the pathogenesis of infectious diseases: types, essence and mechanisms. Mechanisms of evasion of microorganisms from the immune response. Involvement of innate immunity factors in the pathogenesis of infectious diseases (phagocytosis, natural killers, complement system, acute phase proteins: pentraxins, biogenic amines, histamine and serotonin, eicosanoids, prostaglandins, leukotrienes, cytokines). Types of anti-infectious adaptive immunity: humoral, cellular (cytotoxic, inflammatory), anti-toxic, antibacterial, mucosal, antiviral, local, general, antifungal, anti-protozoal, protective, non-protective, sterile, non-sterile. Mechanisms of primary and secondary anti-infective immune response, qualitative and quantitative differences. Regulation of the immune response. Principles of functioning of the immune system. The use of indicators of humoral and cellular immunity in the diagnosis, treatment, and prevention of infectious diseases. The study of this topic involves theoretical and practical work in the classroom: presentation and interpretation of the results of serological, bacteriological, allergological, and express diagnostic methods (archives of the department, demonstration) of infectious diseases with further discussion.

pr.tr.20 "Assessment of the immune status of the human body: purpose, principles, methods." (full-time course)

Concept of immune status and immunogram, age characteristics of indicators, purpose of study. Interpretation of the immunogram and clinical indications for its implementation, taking into account the age-related capabilities of the body. Immunological tests of the 1st and 2nd levels when studying the immune status: purpose and principle of setting, interpretation of results. Immunological markers and their clinical and diagnostic value. Immunoregulatory index. Peculiarities of immune status in autoimmune diseases. Features and dynamics of immunograms in some infectious diseases. Classification of immunograms in infectious inflammation. The study of this topic involves theoretical and practical work in the classroom, the use of immersive technologies (performance of virtual laboratory work on the Labster platform "Antibodies: Why are some blood types incompatible? Virtual Lab") with further discussion; performing a group practical task - recording the results of tests of the 1st and 2nd levels of studying the immune status and interpreting the results of the immunogram with further discussion of the results.

pr.tr.21 "Specific prevention and treatment of infectious diseases. Therapeutic, prophylactic and diagnostic immunological preparations." (full-time course)

Historical, medical, social and economic aspects of controlled infections in Ukraine and the world. Organization of immunoprophylaxis in Ukraine. Active immunoprophylaxis. Classification, composition, method of obtaining drugs for active immunoprophylaxis. Storage of vaccines and toxoids. Cold chain. Basics of the immune response as a result of vaccination. Methods of studying the intensity of post-vaccination immunity. Types of prevention. Contraindications to vaccination. Side effects of vaccination, their prevention. Adverse events after immunization. Passive immunoprophylaxis. Preparations of normal human immunoglobulin. Specific (hyperimmune) immunoglobulins. Hyperimmune serums of animal origin. Immunotherapy. Diagnostic sera and antigen preparations: method of obtaining and field of use. Studying the topic involves working in a classroom, using virtual simulation (watching movies) with further discussion; study of therapeutic and preventive and diagnostic immunobiological drugs. In addition, during the study of this topic, it is expected to perform and interpret tests for studying the intensity of post-vaccination immunity (demonstration), in the absence of quarantine restrictions, work in the vaccination office of the University Clinic of SSU.

pr.tr.22 "Final control of the content module "Microflora of the human body. The doctrine of infection. Immunology."" (full-time course)

Testing of theoretical knowledge (computer testing) and practical skills on topics 4-5.

Topic 6. Microbiology of acute intestinal bacterial infections and food intoxication.

lect.5 "General characteristics of pathogens of acute intestinal infections. Microbiology of Escherichiosis, Shigellosis, Salmonellosis." (full-time course)

General characteristics of representatives of the enterobacteria family (Enterobacteriaceae), biological and antigenic properties; classification. Definition, etiology, biological and antigenic properties of pathogens, microbiological features of pathogenesis, microbiological diagnosis and treatment of acute intestinal diseases (escherichiosis, shigellosis, salmonellosis) from the standpoint of evidence-based medicine. Specific prevention of acute intestinal diseases in children. Teaching is conducted in the form of interactive lectures (in the case of quarantine - in online mode).

pr.tr.23 "Microbiology of Escherichiosis." (full-time course)

General characteristics of acute intestinal infections of bacterial etiology. Diarrheic escherichia: classification by antigenic structure; division into categories depending on virulence factors, serological markers and clinical and epidemiological features. Escherichia: epidemiology; microbiological features of pathogenesis and immunity; microbiological diagnosis and treatment from the standpoint of evidence-based medicine. Prevention of Escherichiosis. Clinical syndromes associated with extraintestinal infections caused by E.coli. Studying the topic involves theoretical and practical work in the classroom: solving a practice-oriented case with further discussion; conducting and interpreting the results of microbiological diagnostics (demonstration: growth of bacteria on nutrient media, biochemical identification tests, and serotyping tests, antibiotic regimen) with further discussion of the results; study of therapeutic and preventive and diagnostic immunobiological preparations.

pr.tr.24 "Microbiology of Shigellosis." (full-time course)

Genus Shigella - causative agents of dysentery: antigenic and pathogenic properties, biochemical activity. Shigellosis: epidemiology, pathogenesis; features of the pathogenesis of Grigoriev-Shiga dysentery from the standpoint of evidence-based medicine; the problem of specific prevention. Microbiological diagnosis of bacterial dysentery. Specific prevention and treatment of Shigellosis. Studying the topic involves theoretical and practical work in the classroom, the use of immersive technologies (performance of virtual practical work on the Labster "Fluorescence Microscopy Virtual Lab" platform; performance of a group practical task: conducting and interpreting the results of microbiological diagnosis of shigellosis (demonstration: growth of bacteria on nutrient media, identification tests, antibiotic regimen); solution of a practical situational problem with further discussion; study of therapeutic and diagnostic immunobiological preparations (serums, bacteriophages).

pr.tr.25 "Microbiology of typhoid fever, paratyphoid A and B." (full-time course)

General characteristics of bacteria of the genus Salmonella. Classification of salmonella according to biochemical properties and antigenic structure. Kaufman-White classification. Salmonella pathogenicity for humans. Biological features and pathogenicity factors of the causative agents of typhoid, paratyphoid A and B. Pathogenesis and features of immunity in typhoid, paratyphoid A and B from the standpoint of evidence-based medicine. Features of the course of typhoid fever in adults and young children. Bacteriocarriery of S.typhi. Microbiological diagnostics, principles of specific prevention and treatment of typhoid, paratyphoid A and B. The study of the topic involves theoretical and practical work in the classroom, the use of immersive technologies (performance of virtual practical work on the Labstar platform "Identification of Unknown Bacteria: Help save baby Kuppelfangs from an epidemic! Virtual Lab"); role games; carrying out and interpreting the results of microbiological diagnosis of diseases within the framework of the topic (demonstration: growth of bacteria on nutrient media, identification tests - AT on glass slide, growth on Hiss media, antibiotic spectrum, Widal Test); study of therapeutic and preventive and diagnostic immunobiological preparations. In addition, the solution of a practical structured case with further discussion is provided within the framework of this topic.

pr.tr.26 "Microbiology of cholera. NAG - vibrios." (full-time course)

Vibrios are the causative agents of Cholera: classification, properties; virulence factors. Epidemiology of Cholera as a causative agent of particularly dangerous infections, wartime risks. Pathogenesis and immunity in cholera from the standpoint of evidence-based medicine, features of the course of the disease. Laboratevidence-based medicine. Laboratory diagnostics, methods of rapid diagnostics. Nonspecific and specific prevention of cholera. The concept of "quarantine" or "conventional" infections, preventive and anti-epidemic measures for these infections are regulated by the "International Sanitary Rules", international agreements - conventions. Screening methods for the diagnosis of cholera in epidemic arteries. A Global Roadmap to 2030 (GTFCC's). NAG - vibrios. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films of the Public Health Center of the Ministry of Health of Ukraine) with further discussion; study of therapeutic, preventive, and diagnostic immunobiological preparations. In addition, when studying the topic, a group practical task is expected - taking into account and interpreting the results of the agglutination reaction with cholera O1 serum - the rectal tube method, with further discussion; study and interpretation of the results of microbiological diagnostics (demonstration) of Cholera with further discussion.

pr.tr.27 "Microbiology of pseudotuberculosis and intestinal yersiniosis." (full-time course)

Pseudotuberculosis and intestinal yersiniosis: morphological, tincture, cultural, antigenic and pathogenic properties of pathogens; epidemiology, pathogenesis, features of immunity, prevention and treatment from the position of evidence-based medicine. Epidemiological features of pseudotuberculosis and intestinal yrsiniosis in Ukraine. Plasmids of virulence pYV (plasmid associated with Yersinia virulence), encoding proteins that ensure the survival of microorganisms in the macroorganism. Microbiological diagnosis of pseudotuberculosis and intestinal yersiniosis. Principles of identification of Y.enterocolitica and Y.pseudotuberculosis. Preparations for diagnosis, prevention and treatment of pseudotuberculosis, intestinal yersiniosis. The study of the topic involves theoretical and practical work in the classroom: performance of a group practical task - preparation and interpretation of the results of PHAT and ELISA for serodiagnosis of diseases with further discussion; identification of pathogens from urine and feces (demonstration). In addition, when studying the topic, solving a practical case and role-playing games with further discussion of the results are expected.

pr.tr.28 "Microbiology of Campylobacteriosis and Helicobacteriosis." (full-time course)

Campylobacteriosis and Helicobacteriosis: biological and antigenic properties of pathogens; epidemiology, microbiological features of pathogenesis in adults and children, features of immunity from the perspective of evidence-based medicine. Microbiological diagnosis of campylobacteriosis and helicobacteriosis. Pathogenesis of helicobacter-associated form of gastric and duodenal ulcers, principles of diagnosis. Chronic Helicobacter pylori-associated gastritis and its role in the development of gastric cancer from the perspective of evidence-based medicine. Microbiological principles of prevention and treatment of campylobacteriosis and helicobacteriosis. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method (growth of pathogens on nutrient media, identification tests) with further discussion; and study of therapeutic and preventive and diagnostic immunobiological preparations. In addition, when studying the topic, it is expected to solve a group practical task - interpretation of the results of microbiological diagnosis of diseases (including the cultural method, express test), respiratory (urease) test for Helicobacter with further discussion.

pr.tr.29 "Microbiology of acute intestinal bacterial infections. Intestinal infections caused by opportunistic pathogens." (full-time course)

Peculiarities of food-borne toxic infections(FTIs)and intoxications.Agents of FTIs and their biological properties.Serological classification of salmonella, age-related features of the epidemiology and pathogenesis of salmonellosis, causes of the chronic course of the disease.Salmonellosis infection: microbiological diagnosis, ways and methods of prevention in the children's team, principles of treatment.Klebsiella: biological properties;the etiological role in the development of FTIs;role in nosocomial infections of departments of various profiles.Proteus, Citrobacter: biological and antigenic properties, species and etiological role in FTIs.Pseudomonas aeruginosa: biological properties, place of toxic infection in the group of food poisoning. FTIs:microbiological features of pathogenesis from the perspective of evidence-based medicine,natural reservoirs and sources of pathogens, microbiological diagnosis, prevention,and treatment.The study of the topic involves theoretical and practical work in the classroom, the application of the demonstration method with further discussion: the study of the growth of bacteria on nutrient media, therapeutic and preventive, and diagnostic preparations. When studying the topic, solving a practical case is expected; innoculation of material according to Gold's method, interpretation of tests for identification of pathogens of FTIs: AT, PCR, antibioticograms with further discussion.

pr.tr.30 "Pathogens of food poisoning. Microbiology of botulism and staphylococcal food poisoning." (full-time course)

Food poisoning: structure, microbiological features of the course from the point of view of evidence-based medicine. Clostridium botulinum: biological and pathogenic properties, classification by antigenic structure of toxins; characteristics of botulinum toxins and their pathogenetic action. Botulism: epidemiology, microbiological features of pathogenesis, microbiological diagnosis, specific treatment and prevention. Microbiology of Clostridium difficile-associated infection. S. aureus: antigenic and pathogenic properties. The mechanism of occurrence and pathogenesis of staphylococcal food poisoning from the standpoint of evidence-based medicine; characteristics of the toxin, methods of its detection. Studying the topic involves theoretical and practical work in the classroom, solving a practical case with further discussion; study of therapeutic and preventive and diagnostic immunobiological drugs. In addition, when studying the topic, it is expected to carry out and interpret the results of the biological method of diagnosis (demonstration - NT on white mice) of botulism, determination of the source of contamination of food products with staphylococci (demonstration - phagotyping) with further discussion.

Topic 7. Microbiology of coccal infections.

lect.6 "Microbiology of coccal infections (staphylococcal, streptococcal, meningococcal, gonococcal)." (full-time course)

Characteristics of causative agents of coccal infections(staphylococcal, streptococcal, meningococcal, gonococcal). Evolution of the coccal group of bacteria, general characteristics. The genus Staphylococcus and Streptococcus: classification, biological properties, pathogenicity factors, pathogenesis of processes. Carriage of staphylococci and streptococci, role in the occurrence of nosocomial infections. Antibiotic resistance of staphylococci(MRSA - methicillin-resistant Staphylococcus aureus). Preparations for the specific prevention and therapy of staphylococcal and streptococcal infections. Pneumococcal infection:etiology, pathogenesis and features of immunity from the standpoint of evidence-based medicine, successes in overcoming it, specific prevention. S. pneumoniae in the structure of child mortality in the world.Methods of microbiological diagnosis of staphylococcal and streptococcal infections. General characteristics of bacteria of the Neisseriaceae family. Gonococcal and meningococcal infections: antigenic and pathogenic properties of pathogens, epidemiology and pathogenesis of infections. Peculiarities of treatment of the chronic form of gonorrhea. Principles of specific prevention of meningococcal infection. Laboratory diagnosis of meningococcal and gonococcal infections.Teaching is conducted in the form of an interactive lecture(in case of quarantine - in online mode).

pr.tr.31 "Microbiology of staphylococcal infections." (full-time course)

General characteristics of pathogenic cocci.Classification, morphological, cultural and antigenic properties of staphylococci.Factors of pathogenicity of staphylococci:determining the pathogenic potential of selected strains. The role of staphylococci in infectious pathology.Microbiological features of pathogenesis and immunity of diseases of staphylococcal etiology: furunculosis; scalded skin syndrome(Staphylococcal Scalded Skin Syndrome);bullous impetigo; acute endocarditis; pneumonia; osteomyelitis;toxic shock syndrome; staphylococcal sepsis from the standpoint of evidence-based medicine.Methods of microbiological diagnosis of staphylococcal infections.Treatment and prevention of staphylococcal infections.The importance of staphylococci in the occurrence of nosocomial infections.Antibiotic resistance of staphylococci and MRSA(methicillin-resistant S. aureus).The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation(watching the educational video"Biological action of staphylococcal exotoxins"),solving a practical task with further discussion; study of therapeutic and preventive and diagnostic immunobiological preparations. When studying the topic, it is expected to conduct and interpret the results of microbiological diagnostics (demonstration) of staphylococcal infections, the sensitivity of staphylococci to antibiotics, phagotyping; and role play followed by discussion.

pr.tr.32 "Microbiology of streptococcal infections." (full-time course)

Streptococcus spp.: classification according to Lancefield, morphological, cultural, antigenic properties. Streptococcus pyogenes: virulence factors, features of the pathogenesis of diseases caused by them (streptoderma, dysentery, phlegmon, sore throat, scarlet fever). Etiological significance of S. pyogenes in the development of rheumatoid arthritis, glomerulonephritis. Streptococcus agalactiae: virulence factors, epidemiology and microbiological features of the pathogenesis of diseases caused by them. Streptococcus pneumoniae: significance in the structure of child mortality, virulence factors, epidemiology and pathogenesis of streptococcal pneumonia, meningitis in adults and children; favorable and provoking factors. Principles of microbiological diagnosis, treatment and prevention and control of streptococcal infections. The study of the topic involves theoretical and practical work in the classroom: the solution of a practical case supplemented by the performance of a group task - conducting and interpreting the results of microbiological diagnostics (demonstration, including the ASO-test) of streptococcal infections; microscopic examination of material from a patient with suspected streptococcal sepsis with further discussion.

pr.tr.33 "Microbiology of meningococcal and gonococcal infections." (full-time course)

Neisseria: taxonomic position, morphological, biological, antigenic and pathogenic properties. Meningitis: definition, etiology, epidemiology, pathogenesis and features of immunity from the standpoint of evidence-based medicine. Peculiarities of microbiological diagnosis of meningococcal infection. Gonococcal infection: definition, etiology, epidemiology, forms of the disease (acute, chronic, blenorrhea), pathogenesis and features of immunity from the standpoint of evidence-based medicine. Features of gonococcal infection in adults and children. Microbiological diagnostic methods used in acute and chronic gonorrhea, blenorrhea. Prevention and treatment of infections caused by pathogenic Neisseria. Studying the topic involves theoretical and practical work in the classroom using the demonstration method; solution of a practical case supplemented by the performance of a group task - study and interpretation of the results of CFT with gonococcal antigen and ELISA; preparation and staining by a simple method of a preparation from material from a patient suspected of gonorrhea and meningococcal infection; study of therapeutic and preventive and diagnostic immunobiological preparations. In addition, when studying this topic, a role-playing game with further discussion is expected.

Topic 8. Microbiology of anaerobic infections.

pr.tr.34 "Microbiology of wound infection." (full-time course)

The concept of anaerobic wound infection, pathogens, their classification. The genus Clostridium: classification, ecology, properties, evolution, resistance to environmental factors, toxigenicity, genetic control of toxin production. Microbiology of gas gangrene and tetanus: biological properties of pathogens, pathogenicity factors and their biological action; peculiarities of epidemiology and pathogenesis, peculiarities of the formation of immunity, methods of microbiological diagnosis, specific treatment and prevention of diseases from the standpoint of evidence-based medicine. Peculiarities of the microbiology of tetanus in newborns. Characteristics of the main causative agents of non-clostridial anaerobic infection (Bacteroides spp., Fusobacterium spp.) and their significance in the development of human pathology. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method with further discussion; study of therapeutic and preventive and diagnostic immunobiological preparations. In addition, when studying this topic, it is expected to solve a group practical task - conducting and interpreting the results of microbiological diagnostics (demonstration, including the growth of pathogens on nutrient media, identification tests) of diseases with further discussion.

Topic 9. Microbiology of respiratory bacterial infections.

lect.7 "Microbiology of respiratory bacterial infections: diphtheria, tuberculosis, pertussis." (full-time course)

Characteristics of causative agents of respiratory bacterial infections: diphtheria, tuberculosis, whooping cough. Diphtheria: morphological, cultural and antigenic properties of pathogens, toxigenicity of the pathogen of diphtheria and methods of determination; epidemiology and pathogenesis, features of immunity, methods of microbiological diagnosis, specific prevention and treatment of the disease. Pertussis: morphological, cultural and antigenic properties of pathogens, toxigenicity of the pertussis pathogen; epidemiology and pathogenesis, features of immunity, methods of microbiological diagnosis, specific prevention and treatment of the disease. Tuberculosis: microbiological characteristics of pathogens, epidemiology and pathogenesis, features of immunity, methods of microbiological diagnosis, specific prevention and treatment of the disease. The problem of multiple resistance of the causative agent of tuberculosis. Epidemic spread of tuberculosis in modern conditions. State strategy for the development of the system of anti-tuberculosis medical care for the population. Teaching is conducted in the form of an interactive lecture (in case of quarantine - in online mode).

pr.tr.35 "Microbiology of diphtheria and bordeteliosis." (full-time course)

General characteristics of bacteria of the genus Corynebacterium. Diphtheria: morphological, cultural and antigenic properties of pathogens, toxigenicity of the pathogen of diphtheria and methods of determination; epidemiology and pathogenesis, features of immunity, methods of microbiological diagnosis, specific prevention and treatment of the disease. Pertussis, parapertussis A and B: morphological, cultural and antigenic properties of pathogens, pathogenicity factors of pathogens and their biological effects; epidemiology and pathogenesis, features of immunity, methods of microbiological diagnosis, specific prevention and treatment of diseases from the standpoint of evidence-based medicine. Peculiarities of whooping cough in vaccinated children and adults from the standpoint of evidence-based medicine. Studying the topic involves theoretical and practical work in the classroom, using the method of demonstrations followed by discussion; study of therapeutic and preventive and diagnostic immunobiological drugs. In addition, when studying the topic, it is envisaged to carry out and interpret the results of PT in the gel in order to determine the toxigenicity of C.diphtheriae; drawing up a plan for post-contact prevention of diphtheria; ELISA to study post-vaccination immunity against diphtheria with further discussion.

pr.tr.36 "Microbiology of tuberculosis, leprosy and mycobacteria." (full-time course)

Mycobacteria: general characteristics of representatives, classification by pathogenicity, structural features. M.tuberculosis:structural features, cultural properties, resistance in the external environment, pathogenicity factors, variability. Tuberculosis:epidemiology, immunopathogenesis, clinical manifestations, microbiological methods of diagnosis, principles of treatment and specific prevention from the standpoint of evidence-based medicine.The problem of multiple resistance of the causative agent of tuberculosis.Epidemic spread of tuberculosis in modern conditions. State strategy for the development of the antituberculosis medical care system. Leprosy: definition of the disease, etiology and geographical distribution of the disease, epidemiology, microbiological features of pathogenesis, clinical manifestations of the leptomatous and tuberculoid forms, principles of microbiological diagnosis, treatment and prevention.Non-tuberculous mycobacteria and microbiology of mycobacteria.The study of the topic involves theoretical and practical work in the classroom with the use of virtual simulation(watching films), and the method of demonstrations(growth of pathogens on nutrient media, vaccines) with further discussion. In addition, when studying the topic, solving a practical structured case is expected; performance of a group practical task - conducting and interpreting the results of the Mantoux test with further discussion.

Topic 10. Microbiology of zoonotic bacterial infections.

pr.tr.37 "Microbiology of plague and tularemia." (full-time course)

Concept of zoonotic infections and especially dangerous infection (quarantine infection). Morphological, tinctorial and cultural features of causative agents of plague and tularemia. Epidemiology and pathogenesis of plague and tularemia infection. Virulence factors of pathogens of plague and tularemia. Peculiarities of laboratory diagnosis of plague, tularemia. Specific prevention and treatment of plague and tularemia. Preventive measures to prevent the occurrence and spread of plague and tularemia. The study of the topic involves theoretical and practical work in the classroom, the application of the demonstration method (express methods of diagnosis: determination of the causative agent of the plague in the material by IFT, precipitation reaction in standard agar plates, PCR) with further discussion of the results; study of therapeutic and preventive and diagnostic immunobiological drugs. In addition, when studying the topic, it is expected to solve a practical-oriented task with further discussion of the results.

pr.tr.38 "Microbiology of brucellosis and anthrax." (full-time course)

The concept of zoonotic infections. Epidemiology and pathogenesis of brucellosis, anthrax. Morphological, tinctorial and cultural features of causative agents of brucellosis, anthrax. Virulence factors of causative agents of brucellosis, anthrax. Peculiarities of microbiological diagnosis of brucellosis, anthrax. Principles of specific prevention and treatment of brucellosis, anthrax. Bioterrorism. The study of the topic involves theoretical and practical work in the classroom, application of the method of demonstrations (AT Wright in test tubes and AT Huddleson on glass, Ascoli reactions, diagnostic and preventive drugs) with further discussion. In addition, when studying the topic, it is expected to solve a practical-orientative case with further discussion of the results.

Topic 11. Microbiology of spirochetosis, rickettsiosis, chlamydia and mycoplasmosis.

pr.tr.39 "Spirochetes. Microbiological diagnosis of spirochetoses." (full-time course)

General characteristics of spirochetes: morphology, features of ultrastructure, systematics, pathogenic and non-pathogenic spirochetes. The causative agent of syphilis: morphology, culture and antigenic properties of treponemes. Pathogenesis, clinical features, immunity in General characteristics of the spirochete family, classification. Historical data on causative agents of typhus, syphilis, leptospirosis. The causative agent of syphilis, biological properties. Epidemiology and microbiological features of pathogenesis, immunity. Microbiological diagnosis and treatment of syphilis. Leptospires, their characteristics, classification. Pathogenesis, immunity and microbiological diagnosis, specific prevention and therapy of leptospirosis. Borrelia, biological properties, role in human pathology. The causative agents of epidemic and endemic relapsing typhus, Lyme disease. Pathogenesis, immunogenesis, microbiological diagnosis of relapsing typhus, Lyme disease, specific prevention and therapy. Pathogenic spiracles. The causative agent of rat bite fever (Sodoku's disease), microbiological diagnosis of the disease. Theoretical and practical work in the classroom, application of the demonstration method(demonstration: interpretation of RW results, ELISA)with further discussion; study of therapeutic and preventive and diagnostic immunobiological drugs.The solution of a practical case is expected, followed by a discussion of the results

pr.tr.40 "Microbiology of rickettsiosis." (full-time course)

Taxonomic position and basic biological properties of rickettsia, which brings them closer to bacteria and viruses. Methods of cultivation of rickettsia. The role of rickettsiae in human pathology. Pathogenesis and immunogenesis in rickettsioses (typhoid fever, Brill's disease, Q-fever) from the standpoint of evidence-based medicine. Methods of microbiological diagnosis of rickettsioses. Serological markers of rickettsiosis from the perspective of evidence-based medicine. Prevention and treatment of rickettsioses. The study of the topic involves theoretical and practical work in the classroom, the application of the demonstration method (microscopy of slides stained according to the Zdrodovsky and Romanowsky-Giemsa methods); study of therapeutic and preventive and diagnostic immunobiological drugs. In addition, when studying the topic, solving a practical structured case is expected; acquisition of practical skills for carrying out and interpreting the results of microbiological diagnostics (demonstration: accounting for CFT, ELISA and PHAT, set for the purpose of serological diagnosis of rickettsioses) of diseases with further discussion.

pr.tr.41 "Microbiology of mycoplasmosis." (full-time course)

axonomic position, basic biological properties and structures of mycoplasmas, polymorphism. Antigenic properties and facts of pathogenicity of mycoplasmas, resistance to environmental factors. Methods of cultivation of mycoplasmas. Mycoplasma and ureaplasma infections: characteristics of pathogens, epidemiology, microbiological features of pathogenesis and immunity. Pathology of pregnancy and fetus and mycoplasma infection; intrauterine mycoplasmosis. Methods of microbiological diagnosis of mycoplasmosis. Prevention and therapy of mycoplasmosis. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. When studying the topic, it is assumed to solve a practical-orientative case; carrying out and interpreting the results of microbiological diagnosis of mycoplasmosis (group practical task) with further discussion.

pr.tr.42 "Chlamydia microbiology. Actinomycetes." (full-time course)

The importance of chlamydia in the structure of infectious diseases and atypical infections, TORCH-infections. Chlamydia: morphology, biology and systematics; life cycle; cultivation and antigenic properties; resistance to environmental factors; pathogenicity factors. Epidemiological characteristics of chlamydia: congenital chlamydial infection, conjunctivitis, respiratory chlamydia, Reiter's disease, cat scratch disease, urogenital chlamydia. Microbiological features of chlamydia pathogenesis. The significance of chlamydia in the structure of problems of adolescent gynecology and pregnancy pathology. Methods of microbiological diagnosis of chlamydia. Serological markers are characteristic for the acute and chronic phase of chlamydial infection. Prevention of relapses, reinfections and complications of chamydiases. Prevention and treatment of chlamydia. Taxonomic position and basic biological properties of actinomycetes. The role of actinomycetes in human pathology, pathogenesis, diagnosis, and treatment. The study of the topic involves theoretical and practical work in the classroom, the study of therapeutic and preventive and diagnostic immunobiological preparations. In addition, when studying the topic, solving a practical case is expected; role games; conducting and interpreting the results of microbiological diagnostics (interpretation of the results of PCR, ELISA) of diseases with further discussion.

Topic 12. Fundamentals of medical mycology. Microbiology of mycoses.

pr.tr.43 "Microbiology of opportunistic and deep mycoses." (full-time course)

Classification of mushrooms. Morphology and cultural properties of mushrooms. Stages of the life cycle of yeast and mold fungi. Fungi are pathogenic for humans. Diseases they cause. Opportunistic mycoses: definition, causes. Aspergillosis, basidiomycosis, hyalogifomycosis, zygomycosis, candidiasis, cryptococcosis, Marnef's penicillosis, pneumocystosis: characteristics of pathogens, their systematic position, ecology and biology, microbiological aspects of the pathogenesis of diseases. Pathogens of deep mycoses (blastomycosis, histoplasmosis, cryptococcosis): characteristics of pathogens, systematic position, medical ecology and biology, microbiological aspects of disease pathogenesis. Methods of microbiological diagnosis of opportunistic and fungal mycoses. Criteria for the diagnosis of candidiasis from the standpoint of evidence-based medicine. Antifungal drugs: classification, mechanisms of action; methods of determining the sensitivity of a pure culture to antifungal drugs (demonstration).Mechanisms of formation of resistance to antifungal preparations. Studying the topic involves working in the classroom, using the method of demonstrations followed by discussion. In addition, when studying the topic, it is expected to solve a group practical task - culture of material from a patient with suspected candidiasis on Sabouraud agar, taking into account the results of mycological and microscopic research with further discussion.

pr.tr.44 "Microbiology of dermatomycoses." (full-time course)

Characterization of pathogens of dermatomycosis, pathogenicity for humans. Classification of dermatomycoses by causative agent, by type of tissue damage. Epidermomycosis, onychomycosis (tineaun guium), trichomycosis. Medical ecology and natural outbreaks of dermatomycetes: anthropophilic, zoophilic, geophilic dermatomycoses. Classification of superficial mycoses according to their localization on the body: inea capitis, tinea corporis, tinea barbae, tinea manuum, tinea pedis, tinea cruris. Trichomycosis and features of damage to the hair shaft: ectothrix, endothrix, favus or scabies. Microbiological features of the pathogenesis of dermatomycoses from the perspective of evidence-based medicine. Microbiological diagnosis of dermatomycoses. Antifungal drugs: classification, mechanisms of action; methods of determining the sensitivity of a pure culture to antifungal preparations. The study of the topic involves theoretical and practical work in the classroom, the application of the demonstration method (growth of dermatomycosis pathogens on Sabouraud agar nutrient medium) with further discussion. When studying the topic, the solution of a practical structured case is assumed; conducting and interpreting the results of microscopic and mycological diagnosis of dermatomycosis (onychomycosis) with further discussion.

Topic 13. Pathogenic protozoa - pathogens of parasitic invasions.

pr.tr.45 "Pathogenic protozoa. Microbiology of protozoonoses." (full-time course)

Pathogenic protozoa are the causative agents of parasitic infestations. Protozoa - general characteristics, pathogenicity factors. Parasitological diagnosis. Protozoa are human pathogens: Entamoeba histolytica, Trichomonas vaginalis, Toxoplasma gondii. Epidemiology and pathogenesis of parasitic invasions from the standpoint of evidence-based medicine. Antiprotozoal drugs: classification, mechanism of action. Public and personal prevention of parasitic infestations. When studying the topic, the solution of a practical-oriented task is assumed; conducting and interpreting the results of the diagnosis of parasitic infestations (accounting for the results of the immune fluorescence reaction (IFT) in toxoplasmosis) with further discussion. In the absence of quarantine restrictions, visiting the parasitological laboratory of the Sumy Laboratory Center of Public Health.

pr.tr.46 "Final control on the content module "Special bacteriology and mycology. Protozoology"." (full-time course)

Testing of theoretical knowledge (computer testing) and practical skills on topics 6-13.

Topic 14. General virology. Morphology, ultrastructure of viruses. Principles of microbiological diagnosis of viral infections. Features of antiviral immunity. Pathogens of respiratory viral infections.

lect.8 "The role of viruses in human pathology. Classification, morphology and physiology of viruses. Features of antiviral immunity. Microbiology of influenza and diseases caused by SARS-CoV and SARS-CoV-2 coronaviruses." (full-time course)

Definition of virology as a science. Tasks and importance of medical virology in the activity of a doctor. Principles of structural organization, classification and biological properties of viruses. Principles of laboratory diagnostics of viral diseases. Virological method of diagnosis: cultivation, indications, identification of viruses. Features of antiviral immunity. Antiviral chemotherapeutic drugs, their classifications. Interferons and their inducers, the mechanism of their antiviral action. Microbiology of influenza and diseases caused by SARS-CoV and SARS-CoV-2 coronaviruses. Factors in the development and spread of diseases caused by the SARS-CoV and SARS-CoV-2 coronaviruses (the causative agent of the COVID-19 coronavirus infection). Specific disease prevention. Teaching is conducted in the form of an interactive lecture (in case of quarantine - in online mode).

pr.tr.47 "Structure, classification and features of virus activity. Methods of laboratory diagnosis of viral infections and their features. Features of antiviral immunity." (full-time course)

Definition of virology as a science. Tasks and importance of medical virology in the activity of a doctor. Principles of structural organization, classification and biological properties of viruses. Principles of laboratory diagnostics of viral diseases. Virological method of diagnosis: cultivation, indications, identification of viruses. Features of antiviral immunity. Antiviral chemotherapeutic drugs, their classifications. Interferons and their inducers, the mechanism of their antiviral action. Mechanisms of immune response avoidance by viruses. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching a movie), the method of demonstrations. When studying the topic, it is expected to perform an individual practical task; conducting and interpreting the results of virological, serological and molecular genetic methods of diagnosis (demonstration tests, growth of viruses on cell culture and chicken embryo) of viral infections with further discussion.

pr.tr.48 "Orthomyxoviruses. Biological features of pathogens and laboratory diagnosis of influenza." (full-time course)

Orthomyxoviruses: general characteristics and classification. Human influenza viruses: virion structure, genome features, antigenic structure, types of antigenic variability, cultivation, sensitivity to physical and chemical factors. Influenza: features of epidemiology and pathogenesis, the role of persistence of influenza virus in humans and animals in the preservation of epidemically significant strains, immunity, laboratory diagnosis, specific prevention and treatment from the standpoint of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching a training video), the method of demonstrations with further discussion. The study of the topic involves solving a practice-oriented case; carrying out and interpreting the results of rapid (IFT), virological (indication and identification of the virus on a chicken embryo), serological (research, ELISA), molecular genetic (PCR, work in the PCR laboratory of the Academic and Research Medical Institute of SumDU) influenza diagnosis with further discussion.

pr.tr.49 "Paramyxoviruses. Pathogens of measles, mumps, parainfluenza, RS infection. Methods of laboratory diagnosis of diseases." (full-time course)

General characteristics and classification of paramyxoviruses. General characteristics of parainfluenza, mumps, measles and respiratory syncytial virus: genome structure and features, chemical composition and antigenic structure. Resistance to parainfluenza, mumps, measles and respiratory syncytial virus, sensitivity to physical and chemical factors. Methods of cultivation of paramyxoviruses. Source of infection and mechanism of transmission of parainfluenza, mumps, measles virus and respiratory syncytial virus. Pathogenesis of parainfluenza, mumps, measles virus and respiratory syncytial virus. Subacute Sclerosing Panencephalitis (SSPE): features of pathogenesis and diagnosis from the standpoint of evidence-based medicine. Peculiarities of laboratory diagnosis of parainfluenza, mumps, measles and respiratory syncytial virus infection. Basics of specific prevention and treatment. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, solving a practical case is expected; as conducting and interpreting the results of virological (hepatic tests for indication and identification) and serological diagnostics (ELISA) of measles, mumps, and RS infection with further discussion.

pr.tr.50 "Togaviruses, the causative agent of rubella. Respiratory adenoviruses. Bocaviruses." (full-time course)

Rubella virus: systematic position, characteristics, antigenic structure. Rubella: epidemiology, pathogenesis and teratogenic effect from the perspective of evidence-based medicine. Principles of microbiological diagnostics, methods of prevention of rubella. Prevention of congenital rubella syndrome. Adenoviruses: features of host and replication, antigens, serotypes. Diseases caused by adenoviruses. Persistence and oncogenic properties of adenoviruses associated with E1A and E1B properties from the perspective of evidence-based medicine. Principles of prevention and laboratory diagnosis of adenovirus infection. Bocavirus infection: etiology, epidemiology, pathogenesis and diagnostic algorithm of bocavirus infection from the standpoint of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, solving a practical case, a role-playing game is expected; carrying out and interpreting the results of virological and serological (ELISA) diagnostics of infectious diseases within the framework of the lesson, making a microbiological diagnosis based on serological markers of diseases (group practical task, archive of research results).

pr.tr.51 "Coronaviruses. Diseases are caused by the coronavirus SARS-CoV and SARS-CoV-2." (full-time course)

Coronavirus infection of COVID-19 in the practice of a pediatrician and a family doctor. Phylogeny of betacoronaviruses, including the novel SARS-CoV-2 coronavirus. Coronaviruses: structural features and sensitivity to physical and chemical factors, life cycle, resistance. Factors of development and spread of diseases caused by SARS-CoV and SARS-CoV-2 coronaviruses, pathogenesis of diseases. Epidemiological features of infections caused by coronaviruses, the epidemic situation in the world and in Ukraine. Principles of diagnosis of the COVID-19 coronavirus infection. Rules for collecting material for testing for COVID-19, the principle of conduct and interpretation of PCR results. Corona virus infection COVID-19: types of diagnostics (PCR, ELISA, express test) and feasibility of use in different periods; specific and non-specific prevention, international medical and social rules. COVID-19: occupational safety and health of medical workers. Studying the topic involves theoretical and practical work in the classroom, application of the demonstration method (interpretation of PCR and ELISA results - department archive, preparation and interpretation of express-test), solution of a practical case with further discussion.

Topic 15. Microbiology of enteroviruses infections.

pr.tr.52 "Picornaviruses. Laboratory diagnosis of enterovirus infections: polio, Coxsackie, ECHO. Rotaviruses." (full-time course)

General characteristics and classification of the Picornaviridae family. Structure and chemical composition of enteroviruses. Sensitivity of enteroviruses to physical and chemical factors. Antigenic structure of enteroviruses. Cultivation and features of reproduction in sensitive cells. Pathogenesis, clinical manifestations and immunogenesis of poliomyelitis, Coxsackie virus and ESNO virus infection. Principles and methods of laboratory diagnosis of enterovirus infections. Principles of specific prevention of enterovirus infections. The problem of polio eradication worldwide. Rotavirus infection (RVI): etiology, features of laboratory diagnosis, pathogenesis and clinical course, prevention in newborns. Studying the topic involves theoretical and practical work in the classroom: implementation of a practical case; performing group practical tasks - carrying out and interpreting the results of virological (NT on cell culture) and serological (ELISA) diagnostics of infectious diseases; indirect hemagglutination reaction (PHAT) was used to determine RVI markers; making a microbiological diagnosis based on serological markers of infections followed by a discussion of the results.

Topic 16. Microbiology of viral hepatitis.

lect.9 "Microbiology of viral hepatitis and HIV infection. AIDS-associated infections." (full-time course)

Viruses of parenteral and enteral hepatitis: classification, systematic position, features of antigenic structure. Viral hepatitis: etiology, epidemiology, pathogenesis, clinical manifestations, characteristics of laboratory diagnostic methods, diagnostic value of serological markers. Approaches to specific prevention of hepatitis A and B. Prevention of transmission of hepatitis B and C in medical institutions. Morphology and chemical composition of human immunodeficiency viruses (HIV). Types of HIV. Origin and evolution of HIV, features of the genome. Stages of interaction of HIV with sensitive cells. Target cells for HIV in the human body, characteristics of surface viral receptors. Mechanism of development of immunodeficiency. AIDS-associated pathology (opportunistic infections and tumors). Methods of laboratory diagnosis of AIDS (immunological, genetic). Principles of antiretroviral therapy. Vaccination of HIV-infected persons. Teaching is conducted in the form of an interactive lecture (in case of quarantine - in online mode).

pr.tr.53 "Pathogens of hepatitis A, E, F. Laboratory diagnosis of hepatitis." (full-time course)

Classification of viral hepatitis. Biological and antigenic properties of viruses - causative agents of enteric hepatitis (HAV, HEV), sensitivity to physical and chemical environmental factors; natural reservoirs of viruses. Viral hepatitis A; etiology, epidemiology, pathogenesis, clinical manifestations, characteristics of laboratory diagnostic methods, specific prevention, post-infectious and post-vaccination immunity. Viral hepatitis E: etiology, epidemiology, pathogenesis, clinical manifestations, features of the course of hepatitis E in children and pregnant women, characteristics of laboratory diagnostic methods. Viral hepatitis F: systematic position, features of the antigenic structure, biological properties of the pathogen, epidemiology, pathogenesis, principles of microbiological diagnosis from the perspective of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching an educational video), the method of demonstrations followed by discussion. In addition, when studying the topic, a practical case study is expected; performance of a group practical task - conducting and interpreting the results of molecular genetic (PCR) and serological diagnostics (ELISA) of enteral hepatitis with further discussion of the results.

pr.tr.54 "Pathogens of parenteral viral hepatitis. Laboratory diagnosis of parenteral viral hepatitis." (full-time course)

Classification of viral hepatitis.Systematic position,biological and antigenic properties of pathogens of parenteral hepatitis(HBV,HDV,HCV,HGV,TTV,SENV),sensitivity to physical and chemical environmental factors. Hepatitis B virus:structural features, characteristics of antigens, reproduction. Epidemiology, pathogenesis and clinic of viral hepatitis B,post-infectious immunity.Laboratory diagnosis of hepatitis B, dynamics of serological markers of hepatitis B, interpretation of serological data. Prevention and treatment of hepatitis B.Viral hepatitis D: etiology, epidemiology, pathogenesis, clinical manifestations, methods of laboratory diagnosis, specific prevention, post-infectious and post-vaccination immunity. Viral hepatitis C:etiology, epidemiology, pathogenesis, clinical manifestations, methods of laboratory diagnosis, post-infectious and post-vaccination immunity. Actions in the event of a situation associated with a high risk of HCV and HBV infection during the performance of professional duties and accidental contact with blood. Prevention of transmission of hepatitis B andC in medical institutions. The causative agents of viral hepatitis G,TTV,SenV. Studying the topic involves practical work in the classroom, using the method of demonstrations followed. In addition, when studying the topic, it is expected to conduct and interpret PCR,ELISA; making a microbiological diagnosis based on serological markers of infections

Topic 17. Retroviruses. HIV infection. AIDS-associated pathology. Oncogenic viruses.

pr.tr.55 "Retroviruses. Laboratory diagnosis of HIV-infection (AIDS) and T-cell leukemia." (full-time course)

Morphology and antigenic structure of human immunodeficiency viruses (HIV). Types of HIV. Origin and evolution of HIV, features of the genome. Stages of interaction of HIV with sensitive cells. Target cells for HIV in the human body, characteristics of surface viral receptors. Mechanism of development of immunodeficiency. AIDS-associated pathology (opportunistic infections and tumors). Methods of laboratory diagnosis of AIDS (immunological, genetic). Principles of antiretroviral therapy. Vaccination of HIV-infected persons. T-cell leukemia virus: systematic position, biological and antigenic properties; peculiarities of epidemiology and pathogenesis, principles of disease diagnosis and prevention from the standpoint of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, it is envisaged to carry out a practical-oriented case study with the additional implementation and interpretation of the results of molecular genetic (PCR) and serological (ELISA) diagnostics of HIV infection and T-cell leukemia; application of immersive technologies (work on the Labster "Western Blot Transfer" platform) with further discussion.

Topic 18. Pathogens of natural-focal infections.

pr.tr.56 "Pathogens of natural focal infections. Flaviviruses. Laboratory diagnosis of European tick-borne encephalitis, yellow fever, dengue fever, Omsk hemorrhagic fever." (full-time course)

Emergent and re-emergent infections: definition, types, prevalence, zoogeographic factors, main factors of occurrence and spread. Emergent infections in Ukraine. Approaches to ensuring biosecurity in Ukraine. Naturally occurring infections in Ukraine. Genus Flavivirus - viruses of yellow fever, tick-borne encephalitis, dengue, etc. Medical ecology of diseases. Biological and antigenic properties of viruses of naturally occurring infections, sensitivity of viruses to physical and chemical factors of the external environment; natural reservoirs of viruses, epidemiology and microbiological features of the pathogenesis of diseases from the standpoint of evidence-based medicine. Principles of specific and non-specific disease prevention. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, it is expected to solve a practical case within the framework of the topic with further discussion of the results.

pr.tr.57 "Pathogens of natural-focal infections. Bunyaviruses. Laboratory diagnosis of Crimean-Congo hemorrhagic fever and Hemorrhagic fever with renal syndrome. Ebola fever." (full-time course)

Family Bunyaviridae - viruses of Crimean hemorrhagic fever and fever with renal syndrome. Medical ecology of diseases. Biological and antigenic properties of viruses of naturally occurring infections, sensitivity of viruses to physical and chemical factors of the external environment; natural reservoirs of viruses, epidemiology and microbiological features of the pathogenesis of diseases from the standpoint of evidence-based medicine. Features of antiviral immunity and the background of Crimean hemorrhagic fever and fever with renal syndrome. Principles of specific and non-specific disease prevention. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, it is assumed that a practical case will be solved within the framework of the topic, followed by a discussion of the results; acquisition of practical skills in the use of personal protective equipment in quarantine restrictions.

Topic 19. Microbiology of herpesviruses infections.

pr.tr.58 "Microbiology of alpha-herpesvirus infections." (full-time course)

Herpesviridae family: general characteristics and classification; virion structure, antigenic properties, cultivation, sensitivity to physical and chemical factors, features of herpesvirus reproduction. Family Alphaherpesvirinae (genus Simplexvirus - herpes simplex virus type 1, herpes simplex virus type 2), genus Varicellovirus (human herpes virus type 3 or Varicella-zoster virus)): structural features and antigenic properties of herpes simplex viruses. Epidemiology and microbiological features of pathogenesis and clinical manifestations of diseases caused by members of the Alphaherpesvirinae family from the perspective of evidence-based medicine. Oncogenicity of herpesviruses from the standpoint of evidence-based medicine. Immunity. Laboratory diagnosis of herpesvirus infections, principles of prevention. Studying the topic involves theoretical and practical work in the classroom: microscopic examination of material from the patient for the presence of specific inclusions, interpretation of PCR and ELISA results, solution of a practical case within the framework of the topic with further discussion of the results.

pr.tr.59 "Microbiology of beta- and gamma-herpesvirus infections." (full-time course)

Subfamilies Betaherpesvirinae: genus Cytomegalovirus (Human betaherpesvirus 5/Human cytomegalovirus), genus Roseolovirus (Human betaherpesvirus 6A, Human betaherpesvirus 6B and Human betaherpesvirus 7) and Gammaherpesvirinae: genus Lymphocryptovirus (Epstein-Barr virus/Human gammaherpesvirus 4), genus Rhadinovirus (Human gammaherpesvirus 8 or herpesvirus associated with Kaposi's sarcoma): morphology, structural features, genome, antigenic structure, life cycle and resistance. Epidemiology and microbiological features of the pathogenesis of diseases caused by beta- and gamma-herpesviruses from the perspective of evidence-based medicine. The carcinogenic effect of viruses from the standpoint of evidence-based medicine. Laboratory diagnosis of beta- and gamma-herpesvirus infections: diagnostic significance of pathogen markers, markers of various clinical forms of herpes infection. Features of immunity, the role of natural resistance factors in herpesvirus infections. Virological principles of specific prevention and treatment of herpesvirus diseases. The study of the topic involves theoretical and practical work in the classroom: performing a group park task - conducting and interpreting the results of molecular genetic (PCR - results archive) and serological diagnosis of the specified infectious diseases, making a microbiological diagnosis based on serological markers of infections with further discussion of the results.

Topic 20. Poxviruses. Rhabdoviruses. Laboratory diagnosis of infections.

pr.tr.60 "Poxviruses. Laboratory diagnosis of smallpox. Vaccine virus: origin, antigens, use in genetic engineering. Rhabdoviruses. Laboratory diagnosis of rabies." (full-time course)

General characteristics of poxviruses: morphology, cultivation, resistance, antigenic structure, features of replication. Smallpox: etiology, epidemiology, pathogenesis, principles of microbiological diagnosis of smallpox depending on the stage of pathogenesis, specific prevention and treatment from the standpoint of evidence-based medicine. The works of E. Jenner. Smallpox virus is a potential pathogen of biological weapons: effectiveness and countermeasures. Basic biological properties of rhabdoviruses and their classification. Fixed and street rabies viruses, their distinctive properties. Epidemiology, pathogenesis and clinic of rabies from the standpoint of evidence-based medicine. Peculiarities of laboratory diagnosis of rabies. Principles of specific prevention and treatment of rabies. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching a film), the implementation of a practical orientation task - the interpretation of the results of virological (PCR, detection of Babes-Negri bodies in micropreparations - demonstration) and serological diagnosis of smallpox, the study of medical prophylactic and diagnostic immunobiological preparations within the framework of the lesson.

Topic 21. Oncogenic viruses. Pathogens of slow infections. Prion diseases.

pr.tr.61 "Oncogenic viruses. Polyomaviruses. Papillomaviruses. Pathogens of slow infections. Prion diseases." (full-time course)

Oncogenic viruses: general characteristics, classification. The virus-genetic theory of tumor formation L.A. Zilber. Modern theories of carcinogenesis. Tumor antigens.Features of antitumor immunity, causes of inefficiency. Immunodiagnosis of tumors. Prospects of immunotherapy and immunoprophylaxis of tumors.Classification position of the Polyomaviridae family, general characteristics.Organization of the genome of members of the Polyomaviridae family and its replication. Oncogenic properties of polyomaviruses and disease pathogenesis from the perspective. T-antigens.Papillomaviridae: characteristics of the family. Genome organization and gene expression of papillomaviruses in different types of infection. Peculiarities of the epidemic process.The most common papillomaviruses and the diseases they cause. Importance of papillomaviruses in the development of cervical intraepithelial neoplasia from the standpoint. HPVs of low and high degree of ocogenic risk. Diagnosis,therapy and specific prevention of papillomavirus infections.Slow viral infections. Prions.Pathogenesis of prion diseases in humans, diagnosis, prevention from the standpoint of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion.When studying the topic, a practical case with a microbiological diagnosis is supposed to be solved,followed by a discussion

Topic 22. Clinical and sanitary microbiology.

lect.10 "Basics of sanitary microbiology." (full-time course)

Sanitary microbiology: subject, research objects, tasks. Principles of conducting sanitary and microbiological research. Microbiological indicators of the sanitary state of environmental objects and control in hospital departments, main groups of sanitary indicator microorganisms, requirements for sanitary indicator microorganisms. Pollution indicators. Sanitary and microbiological research of soil, water, air: purpose, principle of conducting, interpretation of results. Sanitary and microbiological research of food products. Sanitary and microbiological research of medicines. Sanitary and microbiological studies of medical and preventive institutions. Normative documents regulating the sanitary and hygienic condition of medical and preventive institutions. Teaching is conducted in the form of multimedia lectures (in case of quarantine - in online mode).

pr.tr.62 "Basics of sanitary microbiology and virology. Sanitary and microbiological control of objects of the external environment, water, air, soil, food products, medicines." (full-time course)

Sanitary microbiology: subject, research objects, tasks. Principles of conducting sanitary and microbiological research. Microbiological indicators of the sanitary state of environmental objects and control in hospital departments, main groups of sanitary indicator microorganisms, requirements for sanitary indicator microorganisms. Pollution indicators. Sanitary and microbiological research of soil, water, air: purpose, principle of conducting, interpretation of results. Sanitary and microbiological research of food products. Sanitary and microbiological research of medicines. Sanitary and microbiological studies of medical and preventive institutions. Normative documents regulating the sanitary and hygienic condition of medical and preventive institutions. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, it is expected to conduct and interpret the results of sanitary and microbiological research of water (methods of membrane filters, fermentation), air (aspiration and sedimentation methods), soil, dairy products (determination) and washings from medical equipment for sterility, with further discussion results.

pr.tr.63 "General characteristics of clinical microbiology. Clinical microbiology: definition, tasks. The concept of opportunistic infections." (full-time course)

Clinical microbiology:definition, importance in the work of a doctor. Research objects.Pathogenic and conditionally pathogenic microorganisms, population characteristics, role in the development of the pathological process. Microbiocenoses of healthy and pathologically altered biotopes of the child's body. Dysbacteriosis:conditions of occurrence, consequences of development, classification, methods of diagnosis, treatment and prevention. Opportunistic infections: causes of occurrence and features of the course from the point, classification by distribution. Exogenous opportunistic infections(legionellosis, pseudotuberculosis, listeriosis, seraciosis).Endogenous opportunistic infections, the role of representatives of the body's resident microflora in their occurrence, microbiological diagnosis.Criteria for the etiological role of opportunistic microbes isolated from a pathological focus. Opportunistic iatrogenic infections:etiological structure. Hospital strains of opportunistic microbes. Opportunistic infections associated with medical intervention: pathogenesis,clinical features. Microbiological basis of prevention and treatment of opportunistic infections. Studying the topic involves practical work in the classroom, using the method of demonstrations followed by discussion.When studying the topic, the implementation of a practical case is expected; drawing up a plan for microbiological diagnosis and treatment of the patient

pr.tr.64 "Nosocomial infections. Definitions, basic concepts, diagnostic methods." (full-time course)

Nosocomial (hospital, nosocomial) infections: definition, classification; conditions that contribute to their emergence and widespread distribution in hospital institutions. Etiology of nosocomial infections (NCI) from the standpoint of evidence-based medicine. Resistance of pathogens of NCI. Methods of identification of hospital strains. Criteria for the etiological role of microorganisms isolated during bacteriological diagnosis of NCI. The problem of "healthy" carriers of opportunistic pathogens and sanitation of bacterial carriers. Epidemiology, pathogenesis and microbiological diagnosis of nosocomial infections caused by pathogenic and opportunistic bacteria and the principles of their prevention. Principles of perioperative antibiotic prophylaxis. Scientific substantiation of anti-epidemic measures of the center of nosocomial infections. The study of the topic involves theoretical and practical work in the classroom, application of the demonstration method followed by discussion. In addition, when studying the topic, solving a practical case is expected; drawing up a microbiological diagnosis plan, developing a patient treatment algorithm.

pr.tr.65 "Final control of the content module "General and special virology. Clinical and sanitary microbiology."" (full-time course)

Testing of theoretical knowledge (computer testing) and practical skills on topics 14-22.

Topic 23. Execution of test tasks. Carrying out the list of practical skills.

pr.tr.66 "Execution of test tasks." (full-time course)

Computer testing.

pr.tr.67 "Execution of practical skills." (full-time course)

Carrying out the list of practical skills.

Topic 24. Practically oriented exam.

assessm.1 "Exam." (full-time course) Conducting the exam in accordance with the regulations.

9. Teaching methods

9.1 Teaching methods

Course involves learning through:

TM1	Lecture teaching
TM2	Case-based learning
TM3	Team Based Learning
TM4	Research Based Learning
TM5	Practical training
TM6	Self-study
TM7	Immersive learning
TM8	Electronic learning

The discipline is taught using modern teaching methods (CBL, TBL, RBL), which contribute to the development of professional abilities, stimulate creative thinking and scientific activity.

Acquisition of soft skills by students is carried out during the entire period of studying the discipline. The ability to learn and master modern knowledge is formed during lecture, case study, practical orientation training and self-study. The ability to apply knowledge in practical situations is achieved through the implementation of case and practice-oriented learning. Implementation during the educational process of team-, case- and practical-orientation training forms knowledge and understanding of the subject field and professional activity. Electronic and immersive learning forms the ability to use information and communication technologies. The ability to search, process and analyze information from various sources is achieved through the of electro- and case-oriented learning.

9.2 Learning activities

LA1	Interactive lectures
LA2	Analysis of practical structured cases
LA3	Preparation for Step-1
LA4	Performing a group practical task
LA5	Individual research project (student research paper, article, theses, etc.)
LA6	Practicing practical skills in the classroom
LA7	Work with textbooks and relevant information sources
LA8	Preparation for practical classes
LA9	Preparation for the exam

LA10	Virtual simulators
LA11	Electronic learning in systems (Zoom, MIX.sumdu.edu.ua)

10. Methods and criteria for assessment

10.1. Assessment criteria

Definition	National scale	Rating scale
Outstanding performance without errors	5 (Excellent)	170 ≤ RD ≤ 200
Above the average standard but with minor errors	4 (Good)	164 ≤ RD < 169
	4 (Good)	140 ≤ RD < 163
Fair but with significant shortcomings	3 (Satisfactory)	127 ≤ RD < 139
	3 (Satisfactory)	120 ≤ RD < 126
Fail – some more work required before the credit can be awarded	2 (Fail)	70 ≤ RD < 119
	2 (Fail)	0 ≤ RD < 69

10.2 Formative assessment

	Description	**Deadline, weeks**	**Feedback**
FA1 Survey and teacher's oral comments	Survey and teacher's oral comments based on his resultsIt provides an opportunity to identify the state of educational activity acquired by the acquirers of experience in accordance with the set goals, to find out the prerequisites of the state of formation of the obtained results, the causes of difficulties, to adjust the learning process, to track the dynamics of the formation of learning results and to forecast their development.	During the entire period of studying the discipline.	The maximum number of points for the test is 20 points, provided that 100% of the answers are correct. Minimum score successful passing of tests - 12 points (60% of correct answers).

FA2 Solving practical cases	The case method makes it possible to reveal and form the qualities and abilities of applicants necessary for further professional activity, forms clinical thinking, analytical abilities, independence in decision-making, communication skills, skills for working with a sufficiently large amount of information.	During the entire period of studying the discipline.	Assessment of the applicants' ability to think clinically, justify their decisions, clearly express their opinions, determine the level of theoretical training, which is reflected in the corresponding assessment.
FA3 Counseling of the teacher during preparation for STEP-1	Preparation for STEP-1 involves the use of interdisciplinary connections, demonstration of the ability of applicants to work with the microbiological and immunological history of the patient,consolidation of practical skills of various methods of microbiological diagnosis of the patient,establishment of a microbiological or immunological diagnosis, development of an algorithm for specific prevention of infectious diseases.A test system for assessing knowledge based on the questions of the STEP-1	Preparation during the entire period of studying the discipline.	The maximum number of points for the test is 20 points, provided that 100% of the answers are correct. The minimum score for successfully passing the tests is 12 points (60% of correct answers).
FA4 Peer assessment	Partnership interaction aimed at improving the results of educational activities by comparing one's own current level of success with previous indicators. Provides an opportunity to analyze one's own educational activities.	During the entire period of studying the discipline.	Adjustment together with students of approaches to learning, taking into account the results of the assessment.
FA5 Consulting the teacher during the preparation of an individual research project (speech at a conference, competition of scientific papers).	An important factor in the formation of the professional qualities of future specialists is the research work of the applicants. Involvement of the latter in research activities contributes to the formation of their scientific worldview, industriousness, work capacity, initiative, etc.	During the entire period of studying the discipline.	Teacher's oral comments. The applicant is given additional incentive points (from 5 to 10), depending on the type of research project.

FA6 Practical skills test	Practicing practical skills in the educational laboratory, scientific laboratories of AR MI, virtual simulators.	During the all period of studying.	Successful completion of practical skills in the discipline is an admission to take the exam in the 5th semester. The maximum number of points is 20, the minimum is 12.
FA7 Instructions of the teacher in the process of performing practical tasks	The guidelines reveal the methods of pedagogical control over the professional activities of applicants. Efficiency is determined by compliance with all stages of practical tasks. The effectiveness of the formation of the necessary practical skills and abilities depends on the level of formation of practical competence.	During the all period of studying.	Counseling of students in working with a standardized virtual patient, direct and indirect observation of the work of applicants during the implementation of a practical task, with further determination of the level of practical training.
FA8 Discussions in focus groups	The method makes it possible to involve all participants in the process of discussion and justification of one's own opinion through multilateral communication, to develop the ability to conduct a professional discussion, to cultivate respect for colleagues and the ability to generate alternative ideas and proposals.	During the all period of studying.	Assessment of the student's ability to work in a team, ability to justify their decisions, determination of the level of theoretical training, which is reflected in the corresponding assessment.

FA9 The task of assessing the level of theoretical training	Assessment of acquired theoretical knowledge on the subject of the discipline. It is conducted at each practical session in accordance with the specific goals of each topic based on a comprehensive assessment of the applicant's activity, which includes monitoring the level of theoretical training, performing independent work according to the thematic plan.	During the all period of studying.	Feedback is aimed at supporting the independent work of applicants, identifying shortcomings and evaluating the level of acquired theoretical knowledge.
FA10 Tests (automated tests) to control the educational achievements of applicants	A method of effective verification of the level of assimilation of knowledge, abilities and skills from each subject of an educational discipline. Testing allows you to check the assimilation of educational material from each subject.	During the all period of studying.	The applicant must provide 60% of the correct answers, which is an admission to the practical part of the lesson.
FA11 Final testing	A method of effective verification of the level of assimilation of knowledge, abilities and skills from an educational discipline. Testing allows you to check the results of training after completing the discipline.	In the penultimate discipline lesson.	The maximum number of points for the test is 20 points, provided that 100% of the answers are correct. The minimum score for successfully passing the tests is 12 points (60% of correct answers).

10.3 Summative assessment

	Description	**Deadline, weeks**	**Feedback**
SA1 Final control: exam	Passing a practical-oriented exam. Candidates who have successfully mastered the subject material, passed practical skills and final computer testing are allowed to take the exam.	According to the schedule.	The applicant can get 80 points for the exam.

SA2 Current evaluation of the level of theoretical and practical training	It includes an oral interview, interpretation of the results of microbiological and immunological methods of examination of the patient, solving clinical individual and group cases, and current testing. Students who are involved in research activities have the opportunity to present the results of their own research at conferences, student research competitions, etc. (incentive activities, additional points).	During the entire period of studying the discipline.	Held at each class, the result of performing the ND affects the comprehensive assessment for the practical class.
SA3 Assessment of performance of practical skills and manipulations	Comprehensive practice of the practical component of academic programs in a safe simulation environment for students. Provides an opportunity to learn skills from a variety of emergency situations.	At the last lesson in the discipline,the student must successfully compile a list of practical skill	It is mandatory for admission to the exam.
SA4 Final testing	A method of effectively verifying the level of assimilation of knowledge, abilities, and skills from an educational discipline. Testing allows you to check the learning results during the cycle and determine the level of expertise at the end of the discipline.	Final computer test at the end of the course (20 points)	It is an admission to take the exam.

Form of assessment:

	Points	Можливість перескладання з метою підвищення оцінки
The first semester of teaching	**200 scores**	
SA2. Current evaluation of the level of theoretical and practical training	**160**	
It includes an oral interview, interpretation of the results of microbiological and immunological methods of examination of the patient, solving clinical individual and group cases, current testing. Students who are involved in research activities have the opportunity to present the results of their own research at conferences, student research competitions, etc. (incentive activities, additional points).	160	No
SA3. Assessment of performance of practical skills and manipulations	**40**	

	Comprehensive practice of the practical component of academic programs in a safe simulation environment for students. Provides an opportunity to learn skills from a variety of emergency situations. (2x20)	40	No
The second semester of teaching		**200 scores**	
SA1. Final control: exam		**80**	
	answer to theoretical questions (2x30)	60	No
	answer to the question of practical training	20	No
SA2. Current evaluation of the level of theoretical and practical training		**80**	
	Oral interview, performance of a group case, practical case, evaluation, performance of practical tasks, ongoing testing, interpretation of microbiological and immunological examination results	80	No
SA3. Assessment of performance of practical skills and manipulations		**20**	
	Comprehensive practice of the practical component of academic programs in a safe simulation environment for students. Provides an opportunity to learn skills from a variety of emergency situations.	20	No
SA4. Final testing		**20**	
	A method of effectively verifying the level of assimilation of knowledge, abilities, and skills from an educational discipline. Testing allows you to check the learning results during the cycle and determine the level of expertise at the end of the discipline.	20	No

When mastering the materials of the module, the applicant is awarded a maximum of 5 points for each practical session (the grade is given in the traditional 4-point grading system). At the end of the academic year, the student's arithmetic average is calculated. The maximum number of points that a student can receive in practical classes during the 4th semester is 160, in the 5th semester - 80. The number of student points is calculated by multiplying by the arithmetic average and dividing by 5. A mandatory condition for admission to the exam is the successful completion of the list of practical skills in the last discipline lesson. The maximum number of points that a student can receive is 20 points, the minimum is 12 points. The maximum number of points for the current educational activity of the student in each semester is 120. The student is admitted to the exam provided that the requirements of the educational program are met and if he has scored at least 72 points for the current educational activity: 48 points during practical classes, 12 points for performance of practical skills and 12 points for testing. The practice-oriented exam is held according to the schedule during the session. Examination tickets contain 2 theoretical questions on various topics and cover all sections of the academic discipline (30 points each), 1 practical task (20 points). The exam is credited to the student if he scored at least 48 points out of 80. Encouraging points are added to the evaluation of the discipline for the implementation of an individual research project (defense of a student's scientific work 10 points, speech at a conference, poster presentation at a conference, theses of reports - 5 points). The total score for the discipline cannot exceed 200

points. The possibility of re-crediting the points obtained under the system of non-formal education is provided in accordance with the Regulations.

11. Learning resources

11.1 Material and technical support

MTS1	Information and communication systems
MTS2	Library funds; archive of results of microbiological researches, immunograms, antibioticograms
MTS3	Computers, computer systems and networks
MTS4	Laboratory equipment of the microbiological laboratory, ELISA laboratory of the MI Center for Collective Use, PCR laboratory (laminar box 2 classes of BA protection; FTA; aspirator with a flask trap; amplifier; vortex; luminescent automatic detector); thermostats; anaerostats; autoclaves; ionomers; colony counting devices; microscopes; centrifuges; device for painting drugs; medical materials and preparates
MTS5	Microbiological laboratory of the RC "EKOMEDHIM" of Academic and Research Medical Institute of SumDU, PCR laboratory of Academic and Research Medical Institute of SumDU, University Clinic of SSU
MTS6	Multimedia, video and audio, projection equipment (video cameras, projectors, screens, smart boards, etc.)
MTS7	Software (to support distance learning, Internet polls), integrated information system (SSU web system, e-learning information system)
MTS8	Cultures of microorganisms, nutrient media, diagnostic and preventive medicine

11.2 Information and methodical support

Essential Reading	
1	Clinical Microbiology Made Ridiculously Simple / Mark T. Gladwin, William Trattler, C. Scott Mahan - MedMaster, 2023, 449 p.
2	Fundamentals of microbiology / Jeffrey C. Pommerville. - Twelfth edition. | Burlington, Massachusetts : Jones & Bartlett Learning, 2022. 1982 p.
3	Pathogenic Bacteria / S. Kirmusaoglu, S. Bhonchal Bhardwaj. London : IntechOpen, 2020. 246 p.
4	General Microbiology / L. Bruslind. – 1st edition. – Corvallis, Or : Oregon State University, 2020. 206 p.
5	General Microbiology Laboratory: Alice Lee. - North Carolina State University, 2021. 166 p.
Supplemental Reading	
1	Medical Microbiology, Virology and Immunology / T. V. Andrianova, V. V. Bobyr, V. V. Danyleichenko etc. ; ed. V. P. Shyrobokov. — Vinnytsia : Nova Knyha, 2019. 744 p.

2	Clinical Immunology and Allergology / Yu. I. Bazhora, S. F. Goncharuk, A. V. Kasianenko, A. V. Vachnenko. - 3rd edit. - Vinnytsia : Nova Knyha, 2020. 272 p.
3	Infectious diseases : textbook / O. A. Holubovska, M. A. Andreichyn, A. V. Shkurba etc. ; edit. O.A. Holubovska. - K. : AUS Medicine Publishing, 2018. 664 p.
4	Role of Microbes in Human Health and Diseases / N. Singh Chauhan. London : IntechOpen, 2019. 82 p.
4	Foundations of Epidemiology / M. L. Bovbjerg. - Corvallis, Or : Oregon State University, 2019. 180 p.
5	Inflammatory and non-inflammatory diseases of the outer ear : study guide / V. A. Smiyanov, I. O. Plakhtienko, T. V. Ivakhnyuk, E. V. Smiyanov; ed. V. A. Smiyanov. Sumy : Sumy State University, 2023. 120 p. URL: https://essuir.sumdu.edu.ua/handle/123456789/91 531
6	Shaping of Human Immune System and Metabolic Processes by Viruses and Microorganisms / M. I. Arleevskaya, R. Aminov, W. H. Brooks et al. Lausanne : Frontiers Media SA, 2019. 723 p.
7	Antivirals for Emerging Viruses: Vaccines and Therapeutics / L. Rong, L. Lu, C. C. Broder. Lausanne : Frontiers Media SA, 2020. 373 p.
8	Antibiotic Alternatives and Combinational Therapies for Bacterial Infections / S. Sillankorva, M. O. Pereira, M. Henriques. Lausanne : Frontiers Media SA, 2019. 222 p.
9	Primary Immunodeficiencies Worldwide / M. C. van Zelm, A. Condino-Neto, M.-R. Barbouche. Lausanne : Frontiers Media SA, 2020. 224 p.
Web-based and electronic resources	
1	Practical Medical Microbiology for Clinicians https://onlinelibrary.wiley.com/doi/book/10.1002/9781119066767
2	Microbiology and Immunology On-line https://www.microbiologybook.org/
3	Osmosis Study Video https://www.osmosis.org/
4	Lecturio course «Microbiology» https://www.lecturio.com/medical
5	Microbiology and Immunology On-line https://www.microbiologybook.org/
6	Official site of the World Health Organization https://www.who.int/
7	Labster https://www.labster.com/simulations

COURSE DESCRIPTOR

№	Course Bescriptor	Total hours	Classroom work, hours				Independent work of students, hours								
			Total hours	Lectures	Workshops (seminars)	Labs	Total hours	Self-study of the material	Preparation for workshops (seminars)	Preparation for labs	Preparation for assesment	Independent extracurricular tasks			
1	2		3	4	5	6	7	8	9	10	11	12	13		
full-time course															
Module 1. Morphology, physiology and genetics of microorganisms.															
1	General microbiology. Bacterial physiology.	15	12	2	10	0	3	0.5	2.5	0	0	0			
2	Bacteriophages. Bacterial genetics. Molecular genetic methods for diagnosing infectious diseases.	2.5	2	0	2	0	0.5	0	0.5	0	0	0			
3	Basics of disinfection and sterilization in medicine. Biorisk management. Antibiotics and antibiotic resistance. Antibacterial therapy of infectious processes.	10	8	2	6	0	2	0.5	1.5	0	0	0			
Module 2. The microflora of the human body. The doctrine of infection. Immunology.															
1	Microbial ecology of the human body. Dysbacteriosis. The doctrine of infection.	5	4	0	4	0	1	0	1	0	0	0			
2	The doctrine of immunity. Immune reactions. Fundamentals of immunoprophylaxis.	32.5	26	4	22	0	6.5	1	5.5	0	0	0			
Module 3. Special bacteriology and mycology. Protozoology.															
1	Microbiology of acute intestinal bacterial infections and food intoxication.	22.5	18	2	16	0	4.5	0.5	4	0	0	0			
2	Microbiology of coccal infections.	10	8	2	6	0	2	0.5	1.5	0	0	0			
3	Microbiology of anaerobic infections.	2.5	2	0	2	0	0.5	0	0.5	0	0	0			
4	Microbiology of respiratory bacterial infections.	7.5	6	2	4	0	1.5	0.5	1	0	0	0			
5	Microbiology of zoonotic bacterial infections.	5	4	0	4	0	1	0	1	0	0	0			

1	2	3	4	5	6	7	8	9	10	11	12	13
6	Microbiology of spirochetosis, rickettsiosis, chlamydia and mycoplasmosis.	10	8	0	8	0	2	0	2	0	0	0
7	Fundamentals of medical mycology. Microbiology of mycoses.	5	4	0	4	0	1	0	1	0	0	0
8	Pathogenic protozoa - pathogens of parasitic invasions.	5	4	0	4	0	1	0	1	0	0	0
Module 4. General and special virology. Clinical and sanitary microbiology.												
1	General virology. Morphology, ultrastructure of viruses. Principles of microbiological diagnosis of viral infections. Features of antiviral immunity. Pathogens of respiratory viral infections.	15	12	2	10	0	3	0.5	2.5	0	0	0
2	Microbiology of enteroviruses infections.	2.5	2	0	2	0	0.5	0	0.5	0	0	0
3	Microbiology of viral hepatitis.	7.5	6	2	4	0	1.5	0.5	1	0	0	0
4	Retroviruses. HIV infection. AIDS-associated pathology. Oncogenic viruses.	2.5	2	0	2	0	0.5	0	0.5	0	0	0
5	Pathogens of natural-focal infections.	5	4	0	4	0	1	0	1	0	0	0
6	Microbiology of herpesviruses infections.	5	4	0	4	0	1	0	1	0	0	0
7	Poxviruses. Rhabdoviruses. Laboratory diagnosis of infections.	2.5	2	0	2	0	0.5	0	0.5	0	0	0
8	Oncogenic viruses. Pathogens of slow infections. Prion diseases.	2.5	2	0	2	0	0.5	0	0.5	0	0	0
9	Clinical and sanitary microbiology.	12.5	10	2	8	0	2.5	0.5	2	0	0	0
10	Execution of test tasks. Carrying out the list of practical skills.	5	4	0	4	0	1	0	1	0	0	0
11	Practically oriented exam.	0	0	0	0	0	0	0	0	0	0	0
Assesment												
1	Graded Credit	6	0	0	0	0	6	0	0	0	6	0
2	Exam	30	0	0	0	0	30	0	0	0	30	0
Independent extracurricular tasks												
Total (full-time course)		*210*	*154*	*20*	*134*	*0*	*56*	*5*	*33.5*	*0*	*36*	*0*