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	Medical Institute. Department of Public Health
Author(s)	Ivakhniuk Tetiana Vasylivna, Holubnycha Viktoriia Mykolaivna
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
Semester	20 weeks across 4 semester, 18 weeks across 5 semester
Workload	The volume of the discipline is 7 credits. ECTS, 210 hours, of which 150 hours. is contact work with the teacher (20 hours of lectures, 130 practical classes)
Language(s)	English

2. Place in the study programme

Relation to curriculum	Compulsory course available for study programme "Medicine"
Prerequisites	Basic (school) knowledge of biology; chemistry and physics; History of medicine; Latin; human anatomy, medical biology; human physiology; histology, cytology and embryology
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 train medical professionals who can solve complex problems and solve problems in the field of microbiology, virology and immunology with the formation and acquisition of medical competencies, skills, abilities and understanding of microorganisms in the development of infectious and non-infectious human pathology. microbiological diagnostics, specific therapy and prevention of infectious diseases for further professional activity.

4. Contents

Module 1. Morphology and physiology of microorganisms. 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. Bacterial metabolism. Cultural media. Growth and reproduction of microorganisms. Cultural properties of microorganisms. Isolation of pure cultures of aerobic and obligate anaerobic bacteria. Bacterial enzymes, their classification; genetic regulation. Specificity of enzymes. Methods of studying the enzymatic activity of bacteria and using them to identify bacteria. Methods of accelerated identification of bacteria using automated indicators of enzymatic activity. The value of the bacteriological method in the diagnosis of infectious diseases.

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. Genetics and molecular biology of microorganisms. Principles of conducting and interpreting the results of molecular genetic methods for diagnosing infectious diseases. Fundamentals of nucleic acid extraction and polymerase chain reaction (PCR). Microbiological basis of genetic engineering. Biotechnology.

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

The principle of decontamination. Physico-chemical bases of decontamination. Concepts: asepsis, antiseptics, disinfection and sterilization. Methods of disinfection and sterilization: purpose, principles of carrying out, quality control. Pre-sterilization treatment. Relevance of biorisk management. Main risk concentrations and risk assessment. Biological waste management. Biosecurity. Emergency response / incidents. Biosafety in special environments. Definition of chemotherapy, chemoprophylaxis, chemotherapeutic index. Antibiotics: definition, principles of obtaining. Antimicrobial drugs: mechanism of action, classification. AWARE classification. Methods of laboratory determination (EUCAST) and assessment of susceptibility of microorganisms to antimicrobial drugs. Units of measurement of antimicrobial activity of antibiotics. Antibiotic chart. Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Causes and mechanisms of drug resistance of bacteria. Ways to prevent the formation of bacterial resistance to antibiotics. Adverse reactions of antimicrobial therapy. Rational antibiotic therapy. Review of regulations on antimicrobial resistance. Quality indicators of antimicrobial therapy. European Strategic Action Plan on 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. Contacts between the human body and microorganisms: pathogenic, opportunistic and saprophytic microorganisms. Human microbiome in normal and in case of pathology; methods of study and analysis. Examples of physiological disorders and diseases caused by microbiome imbalance (dysbiosis). Principles of microbiological diagnosis, treatment and prevention of dysbiosis. Infectious process, definition. Pathogenicity and virulence of microorganisms: genetic determinism. Stages of infection. Pathological patterns associated with infection. Dynamics of infectious disease development. Characteristics of different forms of infection depending on the course, source of infection, location. The concept of the pathogenesis of infectious disease. Methods for determining the source of infection.

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

Immunity: definition. Structure and functions of the immune system. Types of immunity by origin and conditions of formation (innate and adaptive immunity): strategy and tactics of pathogen recognition; mechanism of their action; interaction of T-, B-lymphocytes and macrophages. Antigens: definition, structure, properties, chemical nature, material basis of specificity, types. Antigenic structure of bacterial cells and viruses. Antibodies, classes of immunoglobulins, their definition. Autoantibodies and autoantigens, their importance in infectious pathology. The concept of poly- and monoclonal antibodies. Serological diagnosis of infectious diseases. Practical use of antigens and antibodies in medicine. Immunological memory and tolerance. Primary and secondary immune response. The concept of "immunoprophylaxis". Classification of drugs for immunoprophylaxis. Types of prevention: primary, secondary, tertiary, planned, emergency, vaccination for health reasons, immunoprophylaxis of travelers. Fundamentals of the immune response to vaccines; methods of studying the intensity of post-vaccination immunity. Contraindications to preventive vaccinations. Adverse events after vaccination. 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. Prevention of HIV / AIDS, tuberculosis, STIs, viral hepatitis.

Module 3. Special microbiology.

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

General characteristics of bacteria of the family Enterobacteriaceae and their importance in the etiology of acute intestinal infections. Physiological role of Escherichia coli and its sanitary significance. Shigella spp. their characteristics and biological features. Salmonella spp. as a pathogen in humans. Pathogenicity factors (exotoxins and endotoxins, adhesion factors, invasion and aggression), biological properties and antigenic structure of Escherichia coli, Shigella and Salmonella. Biological features and pathogenicity factors of cholera, pseudotuberculosis and intestinal yersiniosis, campylobacteriosis and Helicobacter pylori. Principles of laboratory diagnosis of acute intestinal infections (bacteriological, serological and rapid methods). Principles of treatment and prevention of acute intestinal infections. Microbiology of food poisoning. Intestinal infections caused by opportunistic pathogens. Pathogens of food poisoning. Microbiology of botulism and staphylococcal food intoxication: epidemiology, pathogenesis, principles of microbiological diagnosis, specific prevention and therapy.

Topic 7 Microbiology of coccal infections.

Characteristics of pathogens of coccal infections (staphylococcal, streptococcal, meningococcal, gonococcal). Staphylococci and streptococci, the diseases they cause. Pathogenic species of staphylococci (Staphylococcus aureus) and streptococci (hemolytic group A streptococci): biological properties, pathogenic factors, role in the occurrence of nosocomial infections. Antibiotic resistance of staphylococci (MRSA - methicillin-resistant Staphylococcus aureus). Laboratory diagnosis of staphylococcal and streptococcal infections. Pneumococcal infection and successes in overcoming it. General characteristics of bacteria of the family Neisseriaceae. Gonococcal and meningococcal infections: biological properties of pathogens; epidemiology, pathogenesis and microbiological diagnosis of 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 and their importance in the development of human pathology.

Topic 9 Microbiology of respiratory bacterial infections.

Characteristics of pathogens of respiratory bacterial infections: diphtheria, tuberculosis, pertussis. General characteristics of bacteria of the genus Corynebacterium: morphological and cultural properties; antigenic structure; toxigenicity of the diphtheria pathogen, methods of determination. Microbiological features of the pathogenesis of diphtheria; post-infectious immunity. Methods used for microbiological diagnosis of diphtheria. Features of specific prevention and treatment of diphtheria. Bordetella spp .: morphological, cultural and antigenic properties; pathogenicity factors. Pathogenesis of diseases caused by brothels. Stages of microbiological diagnosis and principles of specific prevention of pertussis. Pathogens of tuberculosis and mycobacteriosis: microbiological characteristics, types, features of tinctorial properties. Microbiological methods of tuberculosis diagnosis. Features of immunity in tuberculosis. Epidemiology and pathogenesis of tuberculosis. The problem of multiple resistance of the pathogen of tuberculosis. Epidemic spread of tuberculosis in modern conditions. Tuberculosis and HIV infections. The situation regarding tuberculosis in the world and in Ukraine. Specific prevention of tuberculosis. Other pathogenic mycobacteria. Leprosy microbiology: etiology, biological and antigenic properties of the pathogen; epidemiology, pathogenesis, diagnosis, specific prevention.

Topic 10 Microbiology of zoonotic bacterial infections.

Microbiological characteristics of pathogens of plague, tularemia, anthrax and brucellosis. Features of epidemiology, pathogenesis, laboratory diagnostics, specific prevention and treatment of zoonotic bacterial infections. Zoonotic infections of medical and social importance (brucellosis, tularemia, anthrax, plague, etc.). The importance of zoonotic infectious diseases in modern society. Basic concepts of socially significant infectious diseases. Particularly dangerous infectious diseases: modern ideas, medical geography. prevalence, the main factors of occurrence and spread. Approaches to ensuring biosafety in the country.

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

Characteristics of pathogenic spirochetes (causative agent of syphilis, causative agent of typhoid fever, causative agent of leptospirosis). Rickettsiae: properties, classification. The causative agent of typhus. Brill-Zinser's disease. General characteristics of chlamydia. Pathogenesis of diseases caused by chlamydia. Life cycle of chlamydia development. Mycoplasmas are pathogens in humans. Features of laboratory diagnosis, specific prevention and therapy of spirochetosis, rickettsiosis, chlamydia and mycoplasmosis.

Topic 12 Fundamentals of medical mycology. Microbiology of mycoses.

Morphology and physiology of clinically important fungi. Opportunistic mycoses: definition, causes. Stages of the life cycle of yeasts and molds. Aspergillosis, basidiomycosis, hyalogiophomycosis, zygomycosis, candidiasis, cryptococcosis, Marneff's penicillosis, pneumocystosis: characteristics of pathogens, systematic situation, ecology and biology, microbiological aspects of disease pathogenesis. Pathogens of deep mycoses (blastomycosis, histoplasmosis, cryptococcosis): characteristics of pathogens, systematic situation, ecology and biology, microbiological aspects of disease pathogenesis. Methods of microbiological diagnosis of opportunistic mycoses. Criteria for the diagnosis of candidiasis. Antifungal preparates: classification, mechanisms of action; methods for determining the sensitivity of pure culture to antifungal preparates.

Topic 13 Pathogenic protozoa - pathogens of parasitic invasions.

Pathogenic protozoa - general characteristics, pathogenic factors. Parasitological diagnosis. The simplest - human pathogens. Dysenteric amoeba (Entamoeba histolytica) is the causative agent of amoebiasis. Ecology and biology, microbiological aspects of pathogenesis, laboratory diagnosis of amebiasis. Trichomonas vaginalis is the causative agent of trichomoniasis. Ecology and biology, microbiological aspects of pathogenesis, laboratory diagnosis of trichomoniasis. Toxoplasma gondii is the causative agent of toxoplasmosis. Ecology and biology, microbiological aspects of pathogenesis, laboratory diagnosis of toxoplasmosis. Antiprotozoal preparates: 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 activities of the doctor. Principles of structural organization, classification and biological properties of viruses. Methods of cultivation, indication, identification of viruses. Principles of laboratory diagnosis of viral diseases. Features of antiviral immunity. Antiviral chemotherapeutic drugs, their classification. Interferons and their inducers, the mechanism of their antiviral action. Human influenza and parainfluenza viruses: virion structure, antigenic structure, sensitivity to physical and chemical factors, cultivation. Types of antigenic variability of influenza virus, its mechanisms. Adenoviruses: importance in human pathology and the development of nasopharyngeal carcinoma. Measles virus: biological properties, pathogenesis of the disease, immunity and specific prevention. Features of structure and sensitivity of coronaviruses to physical and chemical factors. Factors in the development and spread of diseases caused by coronavirus SARS-CoV and SARS-CoV-2 (the causative agent of coronavirus infection COVID-19); pathogenesis of diseases. Coronavirus infection COVID-19: epidemic situation in the world and in Ukraine. Microbiological features of the pathogenesis of respiratory viral infections and methods of microbiological diagnosis. Specific disease prevention.

Topic 15 Microbiology of enteroviruses infections.

General characteristics and classification of the family Picornaviridae. Genus of enteroviruses (Enterovirus). Classification: polio viruses, Coxsackie, ECHO, enteroviruses 68 - 72 types. Rotaviruses. The role of enteroviruses in human pathology. Characteristics of polio, Coxsackie and ECHO viruses. Features of the structure of rotaviruses. Biological properties, sensitivity to physical and chemical factors of the environment; epidemiology and microbiological features of disease pathogenesis. Laboratory diagnosis, specific prevention of polio, Coxsackie, ECHO, rotavirus infections. The problem of polio eradication worldwide.

Topic 16 Microbiology of viral hepatitis.

Viruses of parenteral and enteral hepatitis: classification, systematic position, features of antigenic structure, replication in the cell of the human body. Approaches to specific prevention of hepatitis A and B. Microbiological features of pathogenesis of viral hepatitis. Laboratory diagnosis of viral hepatitis: diagnostic value of markers of pathogens. HBV / HDV co-infection. HBV / Tuberculosis. Prevention of hepatitis B and C transmission 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 virus (HIV): morphology, antigenic structure, genome features, virus variability, types of HIV, origin and evolution, stages of interaction with sensitive cells; sensitivity to physical and chemical factors. Pathogenesis of HIV infections, stages. Pathogenesis of HIV / HBV co-infection. Methods and criteria for diagnosis of HIV infection, treatment and prospects for specific prevention. Pre-contact and post-contact prevention of HIV infection. Principles of antiretroviral therapy. Vaccination of HIV-infected people. AIDS-associated pathology: etiology, pathogenesis, features of microbiological diagnosis. T-cell leukemia virus: systematic position, biological and antigenic properties; features of epidemiology and pathogenesis, principles of diagnosis and prevention of the disease. Oncogenic viruses: general characteristics, classification. Viral-genetic theory of tumors L.A. Zilber. Modern theories of carcinogenesis. Pathogenesis of human diseases. Diagnostic methods. Prevention.

Topic 18 Pathogens of natural-focal infections.

Emergent and re-emergent infections: definition, types, prevalence, zoogeographical factors, main factors of occurrence and spread. Emergent infections in Ukraine. Approaches to ensuring biosafety in Ukraine. Naturally mediated infections in Ukraine. Genus Flavivirus - viruses of yellow fever, tick-borne encephalitis (European, Siberian and East Siberian, Omsk hemorrhagic fever (OGG), 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 natural-fire infections, sensitivity of viruses to physical and chemical factors of the environment; natural reservoirs of viruses, epidemiology and microbiological features of the pathogenesis of diseases. Principles of specific and nonspecific disease prevention.

Topic 19 Microbiology of herpesviruses infections.

Family Herpesviridae: general characteristics and classification; virion structure, antigenic properties, cultivation, sensitivity to physical and chemical factors. Herpes viruses pathogenic to humans: herpes simplex virus types 1 and 2, chickenpox herpesvirus - shingles; cytomegalovirus herpesvirus; Epstein-Barr herpesvirus, herpesviruses 6, 7, 8 types: biological properties, role in human pathology, mechanisms of persistence of herpes viruses, diagnosis, specific prevention and treatment of herpesvirus infections. Mechanisms of transforming action of oncogenic herpesviruses. Laboratory diagnosis of herpesvirus infections, principles of prevention.

Topic 20 Poxviruses. Rhabdoviruses. Laboratory diagnosis of infections.

General characteristics of poxviruses: morphology, cultivation, resistance. Pathogenesis of the disease in humans, clinic and epidemiology. Material for laboratory examination depending on the stage of pathogenesis. Virological diagnosis of smallpox. Serological diagnosis of smallpox. Express diagnostics of smallpox. History of the issue of specific prevention of smallpox. Robots E. Jenner. The main biological properties of rhabdoviruses and their classification. Fixed and street rabies viruses, their distinctive properties. The pathogenesis of rabies. Features 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. Viral-genetic theory of tumors L.A. Zilber. Modern theories of carcinogenesis. Features of antitumor immunity. Causes of inefficiency. Immunodiagnosis of tumors. Tumor antigens. Diagnostic methods. Prospects for immunotherapy and immunoprophylaxis of tumors. Slow viral infections. Prions. Pathogenesis of prion diseases in humans. Diagnostic methods. Prevention.

Topic 22 Clinical and sanitary microbiology.

General information about clinical microbiology. Biological features of opportunistic microorganisms and diseases caused by them. Features of microbiological diagnosis of nosocomial infections. General characteristics of pathogens of nosocomial and opportunistic infections. Hospital strains and ecovars of opportunistic pathogens. Causes and ways to prevent their spread. Methods of identification of hospital strains. Etiology, epidemiology, pathogenesis and clinic of nosocomial infections. The problem of "healthy" carriers of opportunistic pathogens and remediation of bacteria. Opportunistic infections associated with medical intervention. Features of immunity. Microbiological bases of prevention and treatment of opportunistic infections. Microbiological diagnosis of bacteremia and sepsis; urinary tract and genital infections; respiratory infections; 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. Principles of sanitary-microbiological research of objects of external environment, water, air, soil, foodstuff.

5. Intended learning outcomes of the course

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

LO1	Analyze current information and apply new ideas on microbiological, immunological aspects of the course and spread of infectious agents.
LO2	Apply knowledge and generate innovative solutions based on the principles of basic and additional methods of microbiological and immunological diagnosis of infectious and non-infectious diseases; to correctly interpret the results of microbiological and immunological methods of research of infectious diseases and sanitary microbiological research of environmental objects.
LO3	Know, choose and apply methods of microbiological and virological diagnostics, etiotropic therapy and specific prophylaxis of infectious diseases. To be able to analyze the results of laboratory and instrumental studies and, on their basis, evaluate information about the patient's diagnosis.
LO4	Apply theoretical knowledge and practical skills in microbiology, virology and immunology in planning and conducting preventive measures for the spread and control of infectious diseases, draw reasoned conclusions, search for reliable information.

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

Programme learning outcomes achieved by the course.
For 222 Medicine:

PO1	To detect and identify the leading clinical symptoms and syndromes (according to the List 1); to establish the most probable nosological or syndromic preliminary clinical diagnosis of diseases (according to the 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.
PO2	To collect information about the patient's general condition; 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 (according to the List 4) based on laboratory and instrumental findings.

PO3	To order and analyze additional (mandatory and optional) examinations (laboratory, radiological, functional and/or instrumental) (according to the List 4) in order to perform a differential diagnosis of diseases (according to the List 2).
PO4	To establish a final clinical diagnosis at a medical institution under control of a supervising doctor by means of informed decision and logical 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).
PO18	To search for the necessary information in the professional literature and databases; to analyze, evaluate, and apply this information. To apply modern digital technologies, specialized software, statistical methods of data analysis to solve complex health problems.

7. Teaching and learning activities

7.1 Types of training

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) Microbiology and medicine. Morphology and nature of microorganisms. Classification, identification, typing and diversity of bacteria. Basic forms and sizes of bacteria, methods of study. The structure of the bacterial cell. L-forms, bacterial polymorphism. Subcellular forms of bacteria. Features of structure and physiology of actinomycetes, rickettsiae, chlamydia and mycoplasmas; methods of their detection. Features of metabolism and energy in bacteria. Nutrition, respiration, bacterial reproduction. Algorithm for isolating pure culture of aerobes and anaerobes. Features of cultivation of rickettsiae, chlamydia, spirochetes. Bacterial enzymes, their classification; genetic regulation. Specificity of enzymes. Methods of studying the enzymatic activity of bacteria and using them to identify bacteria, methods of accelerated identification of bacteria using automated indicators of enzymatic activity. Methods of microbiological research of infectious diseases. The value of the bacteriological method in the diagnosis of infectious diseases. Classification of microorganisms by risk groups; the principle of good laboratory practice; GLP standards. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line 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) Microbiology and medicine. Organization of bacteriological laboratory (excursion to the bacteriological laboratory of the department). Rules of work in the bacteriological laboratory. Morphology and classification of microorganisms. Classification of microorganisms by degree of biological danger; the principle of good laboratory practice; GLP standards. Morphology of prokaryotes, eukaryotes. Methods of studying the size of a bacterial cell and their morphological properties. Rules of preparation of preparations from cultures of microorganisms from liquid and dense nutrient media (mastering of practical skills). Simple methods of staining microorganisms using aniline dyes (preparation of drugs from pure cultures of bacteria, staining by a simple method). Light microscopy: purpose of use, principles of immersion microscopy (mastering practical skills of immersion microscopy of micropreparations).

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)

Bacterial cell structure: cell wall, plasma membrane, cytoplasm, nucleoid, ribosomes, mesosomes, inclusions, saws, flagella, capsules and spores. Functions of structural components of a bacterial cell. Spore formation. L-forms of bacteria, the factors that determine their formation. Complex methods of staining microorganisms: Gram staining (watching a training video) and Zill-Nielsen method for the detection of acid-fast bacteria. Methods of detection of flagella, capsules and spores. Differences between prokaryotic and eukaryotic cells. Features of ultrastructure of spirochetes, rickettsiae, chlamydia, mycoplasmas; general characteristics of the diseases they cause; methods of their detection (study of demonstration preparations). Modern methods of microscopic diagnosis. The study of this topic involves practical work in the training laboratory: microscopic examination of demonstration drugs prepared by complex methods; preparation of the pteparates from a mixture of bacterial cultures, staining it by the Gram method and microscopic examination; preparation of the drug "crushed drop", microscopy of the pteparates.

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

The chemical composition of the bacterial cell. Features of metabolism and energy in bacteria (metabolic intensity, variety of types of metabolism, metabolic plasticity, excessive synthesis of metabolites and energy). Constructive and energy exchange, their relationship. Bacterial nutrition. Sources of nitrogen, carbon, minerals and growth factors. Autotrophs and heterotrophs. Holophyte diet. Mechanisms of nutrient transfer into the bacterial cell. Classification of bacteria by types of food. Bacterial respiration. Aerobes, anaerobes, facultative anaerobes, microaerophiles, drip bacteria. Energy consumption of bacteria. Sources and ways of obtaining energy in photoautotrophs, chemoautotrophs. Types of biological oxidation of the substrate and methods of energy production in heterohemoorganotrophs. Cultural media: classification, requirements. Bacteriological method of diagnosis: purpose, tasks, algorithm. 1st the stage of bacteriological method of diagnosis: purpose, tasks, manipulations. Biological method of research: purpose of application, principle of carrying out, interpretation of results. The study of this topic involves practical work in the training laboratory: consolidation of practical skills in microbiological manipulations of the first stage of isolation of pure culture of E. coli from a mixture of bacteria and S. aureus from nasopharyngeal material: inoculation of material on cultural media by different methods.

pr.tr.4 "Growth and reproduction of microorganisms. Isolation of pure culture of aerobic bacteria (II-IV stages). Bacterial enzymes." (full-time course)

Growth and reproduction of microorganisms. Methods of reproduction of microorganisms. Periodic culture. Phases of development of microorganisms in a liquid medium in periodic culture. Continuous cultivation, its importance in biotechnology. Associations of microorganisms and pure cultures. Colonies of microorganisms: features of their formation, properties. Bacterial enzymes: classification, genetic regulation, specificity of action. Methods of studying the enzymatic activity of bacteria and using them to identify bacteria. Methods of accelerated identification of bacteria using automated indicators of enzymatic activity (demonstration of identification results). II-IV stages of bacteriological method of diagnosis: purpose, tasks, manipulations. The value of bacteriological (cultural) method in the diagnosis of infectious diseases. The use of microbes and their enzymes in biotechnology for the production of amino acids, peptides, organic acids, vitamins, hormones, antibiotics, feed protein, for food and industrial processing, biological wastewater treatment. The study of this topic involves practical work in the training laboratory: the study of demonstration (growth of different types of bacteria in cultural media; implementation of stages II-IV of bacteriological diagnostic method; mastering practical skills of identifying the causative agent of an infectious disease (setting, accounting and interpretation).

pr.tr.5 "Anaerobes. Isolation of pure culture of anaerobic bacteria." (full-time course)

The concept of anaerobiosis. Distribution of microorganisms according to their relation to oxygen. Physiology of microorganisms that perform anaerobic respiration. Mechanisms of protection of microorganisms from toxic action of oxygen. Objectives and methods of culturing anaerobic bacteria, nutrient media for obligate anaerobes (demonstration), anaerobic boxes (demonstration). Methods of creating anaerobic conditions in bacteriological laboratories (demonstration review: Fortner's biological method, physical methods of culturing obligate anaerobes). Stages of isolation of pure cultures of obligate anaerobic bacteria. Methods of identification of isolated cultures of obligate anaerobic bacteria. The study of this topic involves practical work in the training laboratory: the study of demonstration (growth of different species of anaerobic bacteria on nutrient media; taking into account and interpretation of identification tests); microscopic examination of spore anaerobic bacteria isolated from the soil mulch).

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

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

Bacteriophages: structure, properties, classification, mechanisms of interaction with a bacterial cell. Practical use of bacteriophages in medicine (study of liquid and tablet bacteriophages - demonstration). Bacterial cell genotype and phenotype. Modification variability in microorganisms. Preservation and transmission of hereditary traits in bacteria. The genetic apparatus of the prokaryotic cell. Chromosome maps, "genetic markers". Plasmids: species, properties, biological significance (educational video). Mutations: species. The concept of repair in bacterial cells. Practical use of mutant bacteria. The concept of "genetic recombination", the physiological significance of the phenomenon. Transformation: mechanism (training video). The concept of the state of competence. Transduction: mechanism, concept of transducing phages (educational video). Lysogeny and lysogenic conversion. Conjugation: mechanism, concept of fertility (educational video). Genetic engineering: methods, achievements. Principles of conducting and interpreting the results of molecular genetic methods for diagnosing infectious diseases. Fundamentals of nucleic acid extraction and polymerase chain reaction (educational video). The study of this topic involves the study and consideration of demonstration experiments on transduction, transformation and conjugation; phagotyping; interpretation of the PCR result with further discussion.

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

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

Environmental factors and their impact (results of action) on microorganisms. Practical use of knowledge about the effects of environmental factors on microbes. The concept of asepsis and antiseptics. Acquired resistance of microorganisms to antiseptics. Sterilization: definition, classification of methods, control methods. Disinfection: disinfectants, mechanism of action, quality control methods. Microbial antagonism, its mechanisms. Definition of chemotherapy, chemoprophylaxis, chemotherapeutic agents, chemotherapeutic index. Antimicrobial drugs: nature, spectrum, mechanism of action, classification. Antibiotics: AWARE classification; bactericidal and bacteriostatic action; units of antimicrobial activity. Methods for determining the sensitivity of bacteria to antibiotics, EUCAST method. The concept of minimum inhibitory and bactericidal concentrations. Antibiotic chart. Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Adverse reactions of antimicrobial therapy. Natural and acquired resistance to antibiotics. Ways to prevent the formation of bacterial resistance to antibiotics. Principles of rational antibiotic therapy. Quality indicators of antimicrobial therapy. European Strategic and National Action Plan on Antibiotic Resistance. Teaching is conducted in the form of multimedia interactive lectures (in quarantine - in the on-line mode).

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

The principle of decontamination. Physico-chemical bases of decontamination. Physical, chemical and biological factors of decontamination. Environmental factors and their impact (results of action) on microorganisms. The concept of asepsis and antiseptics. Development of scientific principles of antiseptics (I. Zemelweiss, D. Lister). Sterilization: concepts, types, methods, control methods. Modern equipment for sterilization (demonstration of autoclave VK-75 and GK-75). Disinfection: types, control methods. Sanitary and epidemiological regime in hospitals and departments of various profiles. Relevance of biorisk management. Main risk concentrations and risk assessment. Good practice of laboratory work (educational film). Human factors. Personal protective equipment: selection and use. Biosafety cabinets and ventilated exhaust facilities. Biological waste management. Decontamination and sterilization: principles of application. Biosecurity. Management of biorisks associated with animals. Emergency response / incidents. Biosafety in special environments (educational film). The study of the topic involves practical work in the autoclave room of the department near the autoclave VK-75 and GK-75; in the training laboratory: mastering practical skills of studying the activity of disinfectants against different strains of bacteria (demonstration); study of the microflora of non-sterile suture material (microscopy).

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 chemotherapy, chemoprophylaxis, chemotherapeutic agents, chemotherapeutic index. Antimicrobial drugs: nature, origin, spectrum, mechanism of action, classification. Antibiotics: AWARE classification (watching a training video); bactericidal and bacteriostatic action; units of antimicrobial activity. Methods for determination and assessment of susceptibility of microorganisms to antimicrobial drugs (EUCAST). Methods for determining the sensitivity of bacteria to antibiotics. The concept of minimum inhibitory and bactericidal concentrations. Antibiotic chart. Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Quality indicators of antimicrobial therapy. Adverse reactions of antimicrobial therapy. Natural and acquired resistance to antibiotics. Ways to prevent the formation of bacterial resistance to antibiotics. Empirical antimicrobial therapy based on stratification of patients taking into account the risks of antimicrobial resistance and local microbiological monitoring data. Principles of rational antibiotic therapy. European Strategic Action Plan on Antibiotic Resistance. National Action Plan to Combat Antimicrobial Resistance. The study of this topic involves practical work in the training laboratory: the acquisition of practical skills in the formulation and interpretation of the disco-diffusion method, the method of serial dilutions of antibiotics, E-test (demonstration).

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.

lect.3 "Ecology of microorganisms. The microflora of the human body. Dysbacteriosis. The doctrine of infection." (full-time course)

The concept of symbiosis. Normal microflora of the human body, stages of formation of the microbiocenosis of the human body in the process of ontogenesis. Macroorganism as an ecological niche; biotopes of the human body. Indigenous and allochthonous microflora of the human body. Microflora of different parts of the human body, its importance. Gnotobiology, the importance of gnotobiological principles in the clinic. The concept of colonization resistance, the role in infectious pathology. Factors that affect the quantitative and qualitative composition of the microflora of the human body. Dysbacteriosis: definition, causes, classification, diagnostic methods. Prebiotics, probiotics, synbiotics: mechanism of action. Methods of studying the role of normal microflora of the human body. Modern ideas about the process of biofilm formation. Pathogenicity and virulence. Molecular mechanisms of regulation and changes in virulence. Microbial antagonism, its practical use. Infectious process. Forms of infection. Spread of the infectious process. Dynamics of infectious disease development. Characteristics of different forms of infection depending on the course, source of infection, location. Pathogenesis of infectious disease. Determining the source of infection. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

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. The human microbiome is normal. Indigenous and allochthonous microflora of the human body. The microflora of different parts of the human body and its importance. The concept of colonization resistance and its role in infectious pathology. Factors that affect the quantitative and qualitative composition of the microflora of the human body. Dysbacteriosis: definition, causes, classification, diagnostic methods. Prebiotics, probiotics and synbiotics: composition, purpose of use, mechanism of action. Methods of studying the role of normal microflora of the human body. The study of this topic involves work in the classroom: the study of demonstration drugs (pro-, prebiotics); microscopic study of the microflora of meconium and adult feces (demonstration), dental plaque (preparation, staining and microscopy of the micropreparation); interpretation of the results of microbiological examination of feces of adults and children for dysbacteriosis. Drawing up a plan for the correction of microflora and based on the results of microbiological research (practice-oriented task) with further discussion.

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

Definition of "infection", "infectious process", "infectious disease". Development of ideas about the essence of the infectious process. Conditions of occurrence of infectious process. The role of microorganisms in the infectious process. Pathogenicity of microbes, determination. Virulence, definition, units of measurement. Factors of pathogenicity of bacteria, mechanism of biological action. The concept of colonization resistance. Microbial toxins: classification, mechanism of action on the cell. Pathogenic properties of rickettsiae, chlamydia, mycoplasmas, fungi and protozoa. Obligatory intracellular parasitism of viruses. Genetic control of pathogenic factors of microorganisms. Phases of development of the infectious process. Critical doses of microorganisms that cause infectious disease. Ways of penetration of pathogens into the body. Stages of infection. Distribution of microbes and their toxins in the body, consequences. Microbonosystvo. Asymptomatic infection. Dynamics of infectious disease development. Classification of infections, transmission mechanisms. The concept of the source and pathogenesis of infectious disease. Methods for determining the source of infection. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films) with further discussion; mastering practical skills in setting and interpreting the results of the phagotyping experiment.

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

lect.4 "The doctrine of immunity. Cellular and humoral factors of innate immunity. Adaptive immunity. Antibodies. Immune reactions. Fundamentals of immunodiagnostics, immunoprophylaxis and immunotherapy of infectious diseases." (full-time course)

Immunity: definition. Immune system: structure, functions. Types of immunity by origin and conditions of formation (innate and adaptive immunity): strategy and tactics of pathogen recognition; mechanism of their action; interaction of T-, B-lymphocytes and macrophages. Antigens: definition, structure, properties, chemical nature, material basis of specificity, types. Antigenic structure of bacterial cells and viruses. Antibodies, classes of immunoglobulins, their definition. Autoantibodies and autoantigens. Poly- and monoclonal antibodies. Practical use of antigens and antibodies in medicine. Serological diagnosis of infectious diseases: the principle of implementation, interpretation of results. Immunological memory and tolerance. Primary and secondary immune response. The concept of "immunoprophylaxis" and "immunotherapy". Classification of immunoprophylactic drugs. Types of prevention. Fundamentals of the immune response to vaccines; methods of studying the intensity of post-vaccination immunity. Contraindications to preventive vaccinations. Adverse events after vaccination. Laws and orders governing immunoprophylaxis. National guidelines for vaccination in the context of the COVID-19 pandemic. WHO prevention policy and strategy. Prevention of HIV / AIDS, tuberculosis, STIs, viral hepatitis. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line 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. The role of immune factors and reactions in infectious and non-infectious human pathology. Types of anti-infective immunity. Types of immunity by origin and conditions of formation (innate and adaptive immunity): strategy and tactics of pathogen recognition. General physiological factors of innate immunity, their function. Humoral factors and mechanisms of innate immunity (complement system, lysozyme, serum bactericidal substances, antiviral humoral factors of innate immunity), their function and definition. Cellular factors and mechanisms of innate resistance, their function and definition. The value of the works of II Mechnikov. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films on the topic) with further discussion; mastering practical skills to determine the antibacterial activity of salivary lysozyme, serum complement system in in-vitro tests and phagocytic activity (microscopy of the preparate).

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 main histocompatibility complex: definition, localization, HLA system, nomenclature, functions, role in the immune response. Heterogeneous antigens. Autoantigens. CD - antigens of cells of the immune system. Antigens of microorganisms (bacteria, viruses) and pathogenicity. Antigen processing in the body. Superantigens. Practical use of antigens of microorganisms, value for diagnosis and specific prevention. The study of this topic involves theoretical work in the classroom: the study of immunobiological preparates of antigenic origin (diagnosticum, antigens, erythrocyte diagnosticum, allergens, vaccines).

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

Formation of immunocompetent T and B lymphocytes. Their resettlement. Forms and types of immune response. Humoral immune response and its stages: recognition, antigen processing, antigen presentation to T-helpers and B-lymphocytes, proliferation and differentiation of B-lymphocytes. T- and B-dependent antigens, their effect on the immune system, antibody synthesis 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. Involvement of macrophages, T- and B-cells. Interleukins. Antibodies: structure, classification, properties, functions, heterogeneity of molecules, determination of their content in blood. Infectious diseases in which the leading role in protective immunity belongs to antibodies. Genetic control of antibody formation. The mechanism of interaction of antibodies with antigens. Antigenic structure of immunoglobulins. The concept of polyclonal and monoclonal antibodies. The purpose and methods of studying the components of the adaptive humoral immune response. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films on the topic) with further discussion.

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 goals of serological reactions in medical practice. Serological reactions: varieties, specificity, sensitivity, two-phase nature, reversibility. The mechanism of interaction of antigens and antibodies in serological reactions. The main components of serological reactions, principles of formulation and interpretation of results. Agglutination reactions: mechanisms, varieties, practical use. Precipitation reactions: mechanisms, varieties, practical use. Agglutinating and precipitating sera: preparation, titration, practical use. Flocculation reaction: principle of setting, scope. Neutralization reactions: principle, varieties, practical use, interpretation of results. The study of this topic involves theoretical work in the classroom: mastering the practical skills of setting and interpretation of the results of serological reactions - AT on glass slide, AT in test tube, PHAT, PT in the gel, the reaction of ring precipitation (demonstration) with further discussion.

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

Principles and goals of serological reactions in medical practice. Complement fixation test (CFT): delivery goals, components, mechanisms. Components for CFT: antibodies, antigen, complement, hemolytic system (hemolytic serum, sheep erythrocytes). Reactions using labeled antibodies or antigens. Immunofluorescence test (IFT): varieties, purpose of delivery, components, mechanism, interpretation of results. Enzyme-linked immunosorbent assay (ELISA): delivery goals, components, mechanism, interpretation of results. Radioimmunoassay (RIA): purpose, components, mechanism, interpretation of results. The essence and features of immunoblot production, mechanism and scope. Advantages of different methods of serological tests in the diagnosis of infectious diseases. The concept of "antibody titer", "diagnostic titer", "diagnostic increase in antibody titer", "paired sera". The principle of differentiation based on the results of serological reactions of an existing infectious disease from a previous one. Criteria for serological diagnosis. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films on the topic) with further discussion; acquaintance with methods of statement and interpretation of the received results of serological tests - CFT, ELISA (demonstration).

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, presentation of antigen to Th-1 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 cytotoxic and inflammatory type of cellular immune response. The 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 work in the classroom, the use of virtual simulation (watching educational films) with further discussion.

pr.tr.18 "Immunopathology." (full-time course)

Types of disorders of the immune system (immunopathology): definition, types. Immunodeficiency: definition, classification, causes, clinical manifestations, principles of diagnosis and treatment from the standpoint of evidence-based medicine. Allergy (hypersensitivity): definition, allergens, Coombs and Gell's classification, mechanism of development, clinical manifestations, diagnostic tests and prevention from the standpoint of evidence-based medicine. Autoimmune (autoaggressive) diseases: definition, mechanisms of development, principles of treatment and prevention of autoimmune diseases from the standpoint of evidence-based medicine. Atopy: bronchial asthma, hay fever. Immunodiagnostics. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films on the topic) with further discussion; interpretation of the results of immunological methods of diagnosis of immunopathologies (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)

Principles of functioning of the immune system. Pathogens, natural and acquired immunity. Means of cooperation of immunocompetent cells. The essence and mechanisms of immune protection in bacterial, viral, fungal and protozoal infections. Mechanisms of primary and secondary anti-infective immune response. Qualitative and quantitative differences between primary and secondary immune responses. Regulation of the immune response. The concept of mediators of the immune system. Mechanisms of avoidance of microorganisms from the immune response. Methods of diagnosis at different stages of formation of infectious disease. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (viewing training videos) with further discussion. Interpretation of the results of serological, bacteriological, allergological and rapid (express) diagnostic methods (archive of research results on the background of various pathologies).

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

The concept of immune status and immunograms. Interpretation of the immunogram and clinical indications for its implementation. Methods of research of immunological indicators of a condition of innate immunity (cellular and humoral factors); T and B immune systems. Immunological tests of the 1st and 2nd levels in the study of immune status: purpose and principle of formulation, interpretation of results. Immunological markers and their clinical and diagnostic value. Immunoregulatory index. Features 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 work in the classroom, the use of virtual simulation (viewing training videos) with further discussion; acquaintance with methods of statement of tests of the 1st and 2nd levels of studying of the immune status and interpretation of the received results of the immunogram.

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

The concept of "immunoprophylaxis". Types of prevention: primary, secondary, tertiary. Active and passive immunoprophylaxis. History of immunoprophylaxis. Classification of preparets for immunoprophylaxis and immunotherapy. Strategy for the development of immunoprophylaxis and protection of the population from infectious diseases. Fundamentals of the immune response to vaccines. Donor gamma-globulins and plasmas: preparation, use, examples. Storage and transportation of vaccines. Calendar of preventive vaccinations in Ukraine. Contraindications to preventive vaccinations. Adverse events after vaccination. Vaccination for health reasons. Emergency (post-contact) prevention. Immunoprophylaxis of travelers. Post-vaccination immunity. National guidelines for vaccination in the context of the COVID-19 pandemic. WHO prevention policy and strategy. Diagnostic sera and diagnosticums: methods of production and scope. The study of the topic involves theoretical work in the classroom, the use of virtual simulation (watching video) with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparetes. In addition, the study of this topic involves the solution of a structured practice-oriented case. Mastering the practical skills of setting tests to study the intensity of post-vaccination immunity and their interpretation.

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 members of the family Enterobacteriaceae, biological and antigenic properties; classification. Determination, 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. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

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

Diarrheagenic Escherichia coli: classification by antigenic structure; division into categories depending on virulence factors, serological markers and clinical and epidemiological features. Escherichia coli: epidemiology; affected contingent; 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. Genus Shigella - pathogens of dysentery: antigenic and pathogenic properties, biochemical activity. Pathogenesis of dysentery; features of Grigoryev-Shiga dysentery from the standpoint of evidence-based medicine; the problem of specific prevention. Microbiological diagnosis of bacterial dysentery. Specific prevention and treatment of infections caused by Escherichia coli and Shigella spp. The study of the topic involves theoretical work in the classroom, solving a structured case with further discussion; mastering practical skills of conducting and interpreting the results (demonstration: growth of bacteria on nutrient media, identification tests, antibiotic therapy) of microbiological diagnostics; study of treatment-and-prophylactic and diagnostic immunobiological prparates.

pr.tr.24 "Microbiology of typhoid fever, paratyphoid A and B." (full-time course)

General characteristics of bacteria of the genus Salmonella. Classification of salmonella by biochemical properties and antigenic structure. The Kauffmann–White classification. Pathogenicity of salmonella to humans and animals. Biological features and factors of pathogenicity of pathogens of typhoid fever, paratyphoid A and B. Pathogenesis and features of immunity in typhoid fever, paratyphoid A and B from the standpoint of evidence-based medicine. Bacteriocarriers. Microbiological diagnostics, principles of specific prevention and treatment of typhoid fever, paratyphoid fever A and B. The study of the topic involves theoretical work in the classroom, solving a practice-oriented task with further discussion; mastering the practical skills of conducting and interpreting the results (demonstration: growth of bacteria on nutrient media, identification tests, E-test, Vidal test) microbiological diagnosis; study of treatment-and-prophylactic and diagnostic immunobiological preparates.

pr.tr.25 "Microbiology of cholera." (full-time course)

V. cholerae - pathogens of cholera: classification, properties (morphological, cultural, biochemical, antigenic); virulence factors. Epidemiology of cholera as a causative agent of particularly dangerous infections. Pathogenesis and immunity in cholera from the standpoint of evidence-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" (ISR, 1969, 1973 y.), international agreements - conventions. Screening methods for the diagnosis of cholera in epidemic arteries (taking into account the results of the agglutination reaction with cholera O1 serum - the method of rectal tubes, with further discussion). NAG-vibrios. The study of the topic involves theoretical work in the classroom, the use of virtual simulation (watching video) with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological drugs. In addition, the study of the topic provides a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of cholera.

pr.tr.26 "Microbiology of pseudotuberculosis and intestinal yersiniosis." (full-time course)

Pseudotuberculosis and intestinal yersiniosis: morphological, tinctorial, cultural, antigenic and pathogenic properties of pathogens; epidemiology, pathogenesis, features of immunity, prevention and treatment from the standpoint of evidence-based medicine. Epidemiological features of pseudotuberculosis and intestinal irsiniosis in Ukraine. pYV virulence plasmids (plasmid associated with Yersinia virulence), which encode 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. Preparates for diagnosis, prevention and treatment of pseudotuberculosis, intestinal yersiniosis. The study of the topic involves theoretical work in the classroom, study and interpretation of the results of PHAT for serodiagnosis of diseases with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study involves solving a structured case with further discussion.

pr.tr.27 "Microbiology of Campylobacteriosis and Helicobacteriosis." (full-time course)

Campylobacteriosis and Helicobacteriosis: biological and antigenic properties of pathogens; epidemiology, microbiological features of pathogenesis, features of immunity from the standpoint of evidence-based medicine. Microbiological diagnosis of campylobacteriosis and Helicobacteriosis. Pathogenesis of Helicobacter pylori-associated form of peptic ulcer of the stomach and duodenum, principles of diagnosis. Chronic Helicobacteriosis is associated with gastritis and its role in the development of gastric cancer from the standpoint of evidence-based medicine. Modern methods of diagnosis and treatment of Helicobacter pylori infection. Microbiological principles of prevention and treatment of campylobacteriosis and helicobacteriosis. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis of diseases (including the bacteriological method, rapid test for Helicobacter pylori).

pr.tr.28 "Microbiology of acute intestinal bacterial infections. Intestinal infections caused by opportunistic pathogens." (full-time course)

Pathogens of food poisoning and their biological properties: Salmonella typhimurium, Salmonella enterica, Klebsiella pneumoniae, Proteus vulgaris, Proteus mirabilis, Citrobacter freundii, Citrobacter diversus. Serological classification of salmonella. Klebsiella spp.: biological properties; etiological role in scleroma, ozena, pneumonia and other diseases from the standpoint of evidence-based medicine; role in nosocomial infections of newborns and children of different ages. Proteus, Citrobacter: biological and antigenic properties, types and etiological role in food poisoning from the standpoint of evidence-based medicine. Pseudomonas aeruginosa: biological properties, spread as an opportunistic pathogen; place of toxicoinfections in the group of food poisoning. Organs and tissues affected by food poisoning from the standpoint of evidence-based medicine. Natural reservoirs and sources of food pathogens. Laboratory diagnosis, prevention and treatment of food poisoning. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills: seeding material by the method of Gold, bacterial identification tests, AT on glass slide to study the antigenic structure of Salmonella spp.

pr.tr.29 "Pathogens of food poisoning. Microbiology of botulism and staphylococcal food poisoning." (full-time course)

Microbiological features of the course and occurrence of food poisoning from the standpoint of evidence-based medicine. Clostridium botulinum: biological and pathogenic properties, classification by antigenic structure of toxins; characteristics of botulinum toxins, their pathogenetic action; laboratory diagnostics, specific treatment and prevention. Clostridium perfringens - the causative agent of food intoxication: pathogenesis, emergency treatment and prevention. Staphylococci are the causative agents of food poisoning. The mechanism of occurrence and pathogenesis of staphylococcal food intoxication from the standpoint of evidence-based medicine; characteristics of the toxin, methods of its detection. Clostridium difficile-associated infection. The study of the topic involves theoretical work in the classroom, solving a structured case with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves mastering the practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases and determining the source of contamination of food with staphylococci (phagotyping), taking into account the results of the neutralization reaction.

Topic 7. Microbiology of coccal infections.

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

Characteristics of pathogens of coccal infections (staphylococcal, streptococcal, meningococcal, gonococcal). Evolution of the coccal group of bacteria, general characteristics. Genus Staphylococcus and Streptococcus: classification, biological properties, pathogenicity factors, pathogenesis of the processes caused by them from the standpoint of evidence-based medicine. Carriers of staphylococci and streptococci, the role in the occurrence of nosocomial infections. Antibiotic resistance of staphylococci (MRSA - methicillin-resistant Staphylococcus aureus). Drugs for specific prevention and treatment of staphylococcal and streptococcal infections. Pneumococcal infection: etiology, pathogenesis and features of immunity from the standpoint of evidence-based medicine, progress in overcoming it. Methods of microbiological diagnosis of staphylococcal and streptococcal infections. General characteristics of bacteria of the family Neisseriaceae. Gonococcal and meningococcal infections: antigenic and pathogenic properties of pathogens, epidemiology and pathogenesis of infections. Features of pathogenesis and treatment of chronic gonorrhea from the standpoint of evidence-based medicine. Laboratory diagnosis, treatment and prevention of meningococcal and gonococcal infections. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

pr.tr.30 "Microbiology of staphylococcal infections." (full-time course)

General characteristics of pathogenic cocci. Biological, morphological, cultural properties of staphylococci. Pathogenic and non-pathogenic staphylococci, determination of pathogenic potential of isolated staphylococcal strains. The role of staphylococci in human pathology. Microbiological features of the pathogenesis and immunity of the disease of staphylococcal etiology: furunculosis; Staphylococcal Scalded Skin Syndrome (SSSS); 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 (MRSA - methicillin-resistant Staphylococcus aureus). The study of the topic involves practical work in the classroom, solving a practice-oriented task with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, when studying the topic of mastering the practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

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

Streptococcus spp .: groups of streptococci according to the Lancefield classification, morphological, cultural, antigenic properties. Streptococcus pyogenes: virulence factors, microbiological features of pathogenesis of diseases caused by them, clinical features of non-invasive streptococcal infections, invasive soft tissue infections, non-purulent complications from the standpoint of evidence-based medicine. Streptococcus agalactiae: virulence factors, microbiological features of the pathogenesis of clinical features of the course of diseases caused by them (infection of newborns, diseases in adults) from the standpoint of evidence-based medicine. Streptococcus pneumoniae: virulence factors, microbiological features of the pathogenesis of pneumonia, meningitis; favorable and provoking factors from the standpoint of evidence-based medicine. Commensal streptococci, role in the occurrence of human pathology. Principles of microbiological diagnosis, treatment and prevention and control of streptococcal infections. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of infections.

pr.tr.32 "Microbiology of meningococcal and gonococcal infections." (full-time course)

Meningococci and gonococci: taxonomic position, mophrological, biological, antigenic and pathogenic properties. Meningitis: definition, etiology, epidemiology, pathogenesis and features of immunity from the standpoint of evidence-based medicine. Features of microbiological diagnosis of meningococcal infection. Gonococcal infection: definition, etiology, epidemiology, forms of the disease (acute and chronic), pathogenesis and features of immunity from the standpoint of evidence-based medicine. Features of gonococcal infection in children. Methods of microbiological diagnosis used in acute and chronic gonorrhea, blenorrhea. Prevention and treatment of infections caused by pathogenic Neisseria. The study of the topic involves practical work in the classroom using the method of demonstrations; solving a practice-oriented case with further discussion; study and interpretation of CFT results with gonococcal antigen; preparation, staining by a simple method of a preparation from a material from a patient with suspected gonorrhea; study of treatment-and-prophylactic and diagnostic immunobiological preparates.

Topic 8. Microbiology of anaerobic infections.

pr.tr.33 "Microbiology of wound infection." (full-time course)

The concept of anaerobic wound 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 of pathogens, pathogenic factors, toxins, features of epidemiology and pathogenesis of infections, features of immunity formation, methods of microbiological diagnosis, specific treatment and prevention of diseases from the standpoint of evidence-based medicine. Tetanus in newborns. Gas gangrene: pathogens and their properties, pathogenesis, diagnosis, treatment, prevention from the standpoint of evidence-based medicine. Characteristics of the main pathogens of non-clostridial anaerobic infection and their importance in the development of human pathology. The study of the topic involves theoretical work in the classroom, the use of the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of this topic involves solving a structured practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

Topic 9. Microbiology of respiratory bacterial infections.

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

Characteristics of pathogens of respiratory bacterial infections: diphtheria, tuberculosis, pertussis. General characteristics of bacteria of the genus Corynebacterium. Morphological and cultural properties of diphtheria pathogens. Toxicity of diphtheria pathogen, methods of determination. Pathogenesis of diphtheria. C. diphtheriae antigens, features of immunity and specific prevention of diphtheria. Methods used for microbiological diagnosis of diphtheria. Features of specific prevention and treatment of diphtheria. Morphology and cultural properties of brothels. Pathogenesis of diseases caused by brothels. Pertussis antigens, immunity, specific prevention. Stages of microbiological diagnosis of pertussis. Pathogens of tuberculosis and mycobacteriosis: microbiological characteristics, types, features of tinctorial properties. Microbiological methods of tuberculosis diagnosis. Features of immunity in tuberculosis. Epidemiology of tuberculosis; resistance of the pathogen in the environment. The problem of multiple resistance of the pathogen of tuberculosis. Epidemic spread of tuberculosis in modern conditions. Tuberculosis on the background of HIV infection. The situation regarding tuberculosis in the world. Specific prevention. Other pathogenic mycobacteria. Microbiological diagnosis of leprosy. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

pr.tr.34 "Microbiology of diphtheria and bordeteliosis." (full-time course)

General characteristics of bacteria of the genus Corynebacterium. Morphological, cultural, antigenic properties of diphtheria pathogens. Toxicity of diphtheria pathogen, methods of determination. Diphtheria: epidemiology, pathogenesis, features of immunity, clinical features from the standpoint of evidence-based medicine. Methods used for microbiological diagnosis of diphtheria. Features of specific prevention and treatment of diphtheria. Bordetella pertussis, B. parapertussis and B. bronchiseptica: morphological, tinctorial, cultural and antigenic properties. Factors of pathogenicity of pertussis and parapertussis pathogens A, B, mechanisms of biological action on organs and cells of the human body. Epidemiology, microbiological features of pathogenesis and immunity against pertussis and parapertussis; features of pertussis in vaccinated children from the standpoint of evidence-based medicine. Methods of microbiological diagnosis of pertussis and parapertussis A, B. Features of specific prevention and therapy of pertussis. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching video), the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves mastering the practical skills of conducting and interpreting the results of PT in the gel to determin

pr.tr.35 "Microbiology of tuberculosis and leprosy." (full-time course)

Pathogens of tuberculosis and mycobacteriosis: microbiological characteristics, types, features of tinctorial properties. Variability of tuberculosis pathogens. Resistance of M. tuberculosis in the environment. Tuberculosis: epidemiology, immunopathogenesis, principles of treatment from the standpoint of evidence-based medicine. Microbiological methods of tuberculosis diagnosis. The problem of multiple resistance of the pathogen of tuberculosis. Epidemic spread of tuberculosis in modern conditions. Tuberculosis on the background of HIV infection. The situation regarding tuberculosis in the world. Specific prevention of tuberculosis. Other pathogenic mycobacteria. Leprosy: etiology, epidemiology, pathogenesis, features of immunity from the standpoint of evidence-based medicine. Features of microbiological diagnosis, prevention and treatment of leprosy. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching vodeo), the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

Topic 10. Microbiology of zoonotic bacterial infections.

pr.tr.36 "Microbiology of plague and tularemia." (full-time course)

Plague and tularemia, as zoonotic infections that have medical and social significance, modern ideas, medical geography, prevalence, the main factors of occurrence and spread. Approaches to ensuring biosafety in Ukraine. The causative agent of plague: the history of the study; biological properties; virulence factors. Pathogenesis and methods of microbiological diagnosis; specific prevention and treatment of plague from the standpoint of evidence-based medicine. The causative agent of tularemia: biological properties. Epidemiology, pathogenesis, immunity, methods of microbiological diagnosis, treatment and specific prevention of tularemia 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 video), the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

pr.tr.37 "Microbiology of brucellosis and anthrax." (full-time course)

The causative agent of anthrax: morphological, biological and pathogenic properties of the pathogen, medical ecology, pathogenicity to humans and animals. Ways of transmission of anthrax and pathogenesis and clinical features of the main forms of the disease in humans from the standpoint of evidence-based medicine. Laboratory diagnosis of various clinical forms of anthrax. Ascoli test to detect anthrax antigen. Specific prevention, anthrax therapy. Genus Brucella: classification; biological properties; pathogenicity factors. Ways of human infection with brucellosis. Pathogenesis and immunity in brucellosis from the standpoint of evidence-based medicine. Methods of microbiological diagnosis, drugs for specific prevention and treatment of brucellosis. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching video), the method of demonstrations with further discussion; solving a practice-oriented task. In addition, when studying the topic is provided; mastering practical skills of conducting and interpreting the results of microbiological diagnostics (demonstration, including Ascoli test) of diseases.

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

pr.tr.38 "Microbiology of spirochetosis." (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 syphilis; action of antibiotics; diagnostic approaches in different periods of the disease from the standpoint of evidence-based medicine. Pathogens of leptospirosis: biological and antigenic properties, medical geography, prevalence. Features of pathogenesis, microbiological diagnostics, specific prevention of leptospirosis from the standpoint of evidence-based medicine. Borrelia: classification, properties. Pathogenesis and clinical features of typhoid fever from the standpoint of evidence-based medicine. Laboratory diagnosis, specific prevention of borreliosis. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

pr.tr.39 "Microbiology of rickettsiosis." (full-time course)

Features of morphology, biology and taxonomy of rickettsiae, their antigenic properties. Diseases caused by rickettsiae. Pathogens of rickettsiosis: biological properties, ecology, resistance to environmental factors, hosts and vectors, antigenic structure, toxin formation, pathogenicity to humans. Classification of rickettsiosis according to a complex of ecological and antigenic properties and features of the clinical course of the disease in humans. Epidemiological characteristics of rickettsiosis. Ecological feature of Ku fever. Fundamentals of pathogenesis of rickettsiosis from the standpoint of evidence-based medicine. Immunity. Methods of microbiological diagnosis of rickettsiosis. Serological markers of rickettsiosis from the standpoint of evidence-based medicine. General issues of chemoprophylaxis and chemotherapy of rickettsiosis. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparates. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

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

Morphology, biology and taxonomy of chlamydia. The life cycle of chlamydia. Cultivation and antigenic properties of chlamydia. Resistance of chlamydia to environmental factors. Pathogenicity factors. Epidemiological characteristics of chlamydiosis: reservoir and source of infection. Features of the pathogenesis of chlamydial infection: acute, persistent or latent; features of immunity. The effect of urogenital chlamydial infection in pregnant women on reproductive health from the standpoint of evidence-based medicine. Methods of microbiological diagnosis of chlamydiosis. Recommendations for transportation and storage of specimens used to diagnose urogenital chlamydial infection. Serological markers are characteristic of the acute and chronic phases of chlamydial infection. Prevention of recurrence, reinfection and complications of chamidiosis. Prevention and treatment of chlamydia. Determination of sensitivity of chlamydia to antibiotics. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching video), the method of demonstrations with further discussion; study of treatment-and-prophylactic and diagnostic immunobiological preparatess. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis (demonstration) of diseases.

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

General characteristics of the family Mycoplasmatacea. Mycoplasmas: classification, morphological and tinctorial properties; features of the structure of the bacterial cell; polymorphism; excellent, unique to prokaryotes features of mycoplasmas. Cultivation, antigenic properties and pathogenicity of mycoplasmas, resistance to environmental factors. Epidemiological characteristics of mycoplasmosis. Fundamentals of pathogenesis of mycoplasmosis; mechanisms of influence of mycoplasmas on protective systems of the host from the standpoint of evidence-based medicine. Non-gonococcal urethritis (NGU) and prostatitis of mycoplasmal etiology; inflammatory diseases of the pelvic organs: features of pathogenesis. Pathology of pregnancy and fetus and mycoplasma infection; intrauterine mycoplasmosis. Infertility in men caused by ureaplasmas. Methods of microbiological diagnosis of mycoplasmosis. Principles of serological diagnosis of mycoplasmosis: aggregate-hemagglutination reaction; ELISA. PCR. Prevention, treatment of mycoplasmosis. Determination of sensitivity of chlamydia to antibiotics. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. When studying the topic, it is assumed to solve a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis of mycoplasmosis.

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

pr.tr.42 "Microbiology of opportunistic and deep mycoses." (full-time course)

Opportunistic mycoses: definition, causes. Stages of the life cycle of yeasts and molds. Aspergillosis, basidiomycosis, hyalogiophomycosis, zygomycosis, candidiasis, cryptococcosis, Marneff's penicillosis, pneumocystosis: characteristics of pathogens, their systematic position, ecology and biology, microbiological aspects of disease pathogenesis from the standpoint of evidence-based medicine. Pathogens of deep mycoses (blastomycosis, histoplasmosis, cryptococcosis): characteristics of pathogens, systematic situation, ecology and biology, microbiological aspects of the pathogenesis of diseases from the standpoint of evidence-based medicine. Methods of microbiological diagnosis of opportunistic mycoses (demonstration of research results). Criteria for the diagnosis of candidiasis from the standpoint of evidence-based medicine. Antifungal drugs: classification, mechanisms of action; methods for determining the sensitivity of pure culture to antifungal preparates (demonstration). Mechanisms of formation of resistance to antifungal preparates. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves solving a practice-oriented task.

pr.tr.43 "Microbiology of dermatomycoses." (full-time course)

Characteristics of dermatomycoses, pathogenicity for humans. Classification of dermatomycoses by pathogen, by type of tissue damage. Epidermomycosis (actually dermatomycosis); onychomycosis (tineaun guium), trichomycosis. Ecology and natural foci of dermatomycetes: anthropophilic, zoophilic, geophilic dermatomycoses. Classification of superficial mycoses by their localization on the body: inea capitis, tinea corporis, tinea barbae, tinea manuum, tinea pedis, tinea cruris. Trichomycosis and features of the hair shaft: ectotrix, endotrix, favus or scab. Microbiological features of the pathogenesis of dermatomycoses from the standpoint of evidence-based medicine. Microbiological diagnosis of dermatomycoses. Antifungal preparates: classification, mechanisms of action; methods for determining the sensitivity of pure fungal culture to antifungal drugs. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching video), the method of demonstrations with further discussion. When studying the topic, it is assumed to solve a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis of dermatomycoses.

Topic 13. Pathogenic protozoa - pathogens of parasitic invasions.

pr.tr.44 "Pathogenic protozoa. Microbiology of protozoonoses." (full-time course)

Protozoa - general characteristics, structure of protozoa, life cycles, pathogenic factors. Features of parasitological diagnostics. The simplest - human pathogens. Dysenteric amoeba (Entamoeba histolytica) is the causative agent of amoebiasis. Ecology and biology, microbiological aspects of pathogenesis, laboratory diagnosis of amebiasis from the standpoint of evidence-based medicine. Trichomonas vaginalis is the causative agent of trichomoniasis. Ecology, biology, microbiological aspects of pathogenesis, laboratory diagnosis of trichomoniasis from the standpoint of evidence-based medicine. Toxoplasma gondii is the causative agent of toxoplasmosis from the standpoint of evidence-based medicine. Pathogenesis, laboratory tests for toxoplasmosis. Features of toxoplasmosis in pregnant women from the standpoint of evidence-based medicine. Algorithm of examination of pregnant women for toxoplasmosis: screening , diagnostic studies. Diagnosis of congenital toxoplasmosis. Antiprotozoal drugs. Public and personal prevention of parasitic infestations. The study of the topic involves theoretical work in the classroom, the use of virtual simulation (watching video), the method of demonstrations with further discussion. When studying the topic, it is assumed to solve a practice-oriented task; mastering practical skills of conducting and interpreting the results of microbiological diagnosis of parasitic infestations.

pr.tr.45 "Final control on the content module "Special Microbiology"." (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. Pathogens of respiratory viral infections. Ortho- and paramyxoviruses. Adenoviruses. Coronaviruses." (full-time course)

Definition of virology. The importance of medical virology in the activities of the doctor. Principles of structural organization, classification and biological properties of viruses. Methods of cultivation, indication, identification of viruses. Principles of laboratory diagnosis of viral diseases. Features of antiviral immunity. Antiviral chemotherapeutic preparates, classification. Interferons and their inducers, the mechanism of their antiviral action. Human influenza and parainfluenza viruses: virion structure, genome, culture, antigenic structure, sensitivity to physical and chemical factors. Types of antigenic variability of influenza virus, mechanisms. Adenoviruses: importance in human pathology and the development of nasopharyngeal carcinoma. Measles virus: biological properties, pathogenesis of the disease, immunity, specific prevention. Features of structure and sensitivity of coronaviruses to physical and chemical factors. Factors in the development and spread of diseases caused by coronavirus SARS-CoV and SARS-CoV-2 (the causative agent of coronavirus infection COVID-19), pathogenesis. Coronavirus infection COVID-19: epidemic situation in the world. Methods of microbiological diagnosis. Specific disease prevention. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

pr.tr.46 "Structure, classification and features of virus activity. Methods of laboratory diagnosis of viral infections and their features. Features of antiviral immunity." (full-time course)

Medical virology: definition, tasks, significance in the practical activity of a doctor. Features of the organization and activity of virological laboratories. Achievements of medical virology in the fight against infectious diseases. Principles of structural organization, classification and biological properties of viruses. Virion and its components. Reproduction of viruses in the process of their interaction with the cell. The main stages of interaction of viruses with cells in productive infection. Persistence of the virus in cells. Virus interference, defective interfering particles. Satellite viruses. Modern methods of laboratory diagnosis of viral diseases. Methods of cultivation, indication and identification of viruses. Features of antiviral immunity. Antiviral chemotherapeutic preparates, classifications, mechanism of antiviral action. Immunopathology in viral infections. Mechanisms of avoidance of immune response by viruses. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching a video), the method of demonstrations with further discussion. When studying the topic, an individual practical task is envisaged; mastering practical skills of conducting and interpreting the results of virological, serological and molecular genetic diagnostics (demonstration tests) of viral infections.

pr.tr.47 "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; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis of influenza.

pr.tr.48 "Paramyxoviruses. Pathogens of measles, mumps, parainfluenza, RS infection. Methods of laboratory diagnosis of diseases." (full-time course)

Family Paramyxoviridae: general characteristics and classification, virion structure, antigens, cultivation, sensitivity to physical and chemical factors. Human parainfluenza viruses (types 1 - 5), mumps, MS infections: role in human pathology, epidemiology, pathogenesis of the disease, immunity from the standpoint of evidence-based medicine. Microbiological diagnosis and specific prevention of parainfluenza, mumps and RS infection. Measles virus: taxonomic position, biological properties of the pathogen; epidemiology, pathogenesis of the disease, immunity, microbiological diagnosis and specific prevention of the disease from the standpoint of evidence-based medicine. Sclerosing panencephalitis (SSPE): features of pathogenesis and diagnosis from the standpoint of evidence-based medicine. The procedure for epidemiological surveillance of measles. 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. In addition, the study of the topic involves solving a practice-oriented case; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis (ELISA, CFT) of infectious diseases.

pr.tr.49 "Togaviruses, the causative agent of rubella. Respiratory adenoviruses. Bocaviruses." (full-time course)

Rubella virus: characteristics, antigenic structure. Rubella: epidemiology, pathogenesis and teratogenic effects from the standpoint of evidence-based medicine. Principles of microbiological diagnostics, methods of rubella prevention. Prevention of congenital rubella syndrome. Adenoviruses: antigens, serotypes. Diseases caused by adenoviruses. Persistence, oncogenicity. Oncogenic properties of adenoviruses associated with the properties of E1A and E1Bz position of evidence-based medicine. Principles of prevention and laboratory diagnosis of adenoviral infection. Bocavirus infection: etiology, pathogenesis and algorithm of etiological diagnosis of bocavirus infection from the standpoint of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis of infectious diseases.

pr.tr.50 "Coronaviruses. Diseases are caused by the coronavirus SARS-CoV and SARS-CoV-2." (full-time course)

Features of structure and sensitivity of coronaviruses to physical and chemical factors. Life cycle of coronaviruses. Resistance of coronaviruses. Factors of development and spread of diseases caused by coronavirus SARS-CoV and SARS-CoV-2 (causative agent of coronavirus infection COVID-19), pathogenesis of diseases. Epidemiological features of infections caused by coronaviruses. Coronavirus infection COVID-19: epidemiology, sources and routes of transmission, pathogenesis of infection from the standpoint of evidence-based medicine, the epidemic situation in the world and in Ukraine. Principles of diagnosis of coronavirus infection COVID-19. General and specific laboratory diagnostics of COVID-19. Rules for taking material for testing on COVID-19, the principle of conducting and interpreting PCR results. Principle of conducting, interpretation of the results of enzyme-linked immunosorbent assay (ELISA) and rapid test of immunochromatographic analysis, importance in the diagnosis of coronavirus infection COVID-19. Diagnosis (PCR, ELISA, rapid test) and the feasibility of using COVID-19 in different periods of coronavirus infection. Specific and nonspecific prevention of coronavirus infection. International medical and social rules. 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 discussion.

Topic 15. Microbiology of enteroviruses infections.

pr.tr.51 "Picornaviruses. Laboratory diagnosis of enterovirus infections: polio, Coxsackie, ECHO. Rotaviruses." (full-time course)

General characteristics and classification of the family Picornaviridae. Genus of Enterovirus. Classification: polio viruses, Coxsackie, ECHO, enteroviruses 68 - 72 types. Rotaviruses. The role of enteroviruses in human pathology. Characteristics of polio, Coxsackie- and ECHO-viruses. Features of the structure of rotaviruses. Biological properties, sensitivity to physical and chemical factors of the environment; epidemiology and microbiological features of the pathogenesis of diseases from the standpoint of evidence-based medicine. Laboratory diagnosis, specific prevention of polio, Coxsackie-, ECHO-, rotavirus-infections. The problem of polio eradication around the world. 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. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis of infectious diseases.

Topic 16. Microbiology of viral hepatitis.

lect.9 "Hepatitis viruses. Biological properties. Methods of laboratory diagnostics." (full-time course)

Viruses of parenteral and enteral hepatitis: classification, systematic position, features of antigenic structure, replication in the cell of the human body. Approaches to specific prevention of hepatitis A and B. Laboratory diagnosis of viral hepatitis: diagnostic value of markers of pathogens. HBV / HDV co-infection. HBV / Tuberculosis. Prevention of hepatitis B and C transmission in medical institutions. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

pr.tr.52 "Pathogens of hepatitis A, E, F. Laboratory diagnosis of hepatitis." (full-time course)

Classification of viral hepatitis. Biological and antigenic properties of viruses - pathogens of enteric hepatitis (HAV, HEV), sensitivity to physical and chemical factors of the environment; natural reservoirs of viruses, epidemiology and microbiological features of the pathogenesis of diseases from the standpoint of evidence-based medicine. Features of hepatitis E in pregnant women. Laboratory diagnosis of enteral viral hepatitis: diagnostic value of markers of pathogens. Viral hepatitis F: systematic situation, features of antigenic structure, biological properties of the pathogen, epidemiology, pathogenesis, principles of microbiological diagnosis 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. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis (ELISA) of enteral hepatitis.

pr.tr.53 "Pathogens of parenteral viral hepatitis. Laboratory diagnosis of parenteral viral hepatitis." (full-time course)

Classification of viral hepatitis. Systematic status, biological and antigenic properties of parenteral hepatitis pathogens (HCV, HGV, HDV, HBV, TTV, SENV), sensitivity to physical and chemical environmental factors. Epidemiology of viral hepatitis in the world: current status, trends. Global strategy on viral hepatitis and global recommendations for elimination. Epidemiology and microbiological features of the pathogenesis of parenteral hepatitis; pathogenesis of HBV / HDV co-infection from the standpoint of evidence-based medicine. Laboratory diagnosis of parenteral viral hepatitis. Vaccination against HBV, prevention of mother-to-child transmission. Calendar of vaccinations against HBV, accelerated vaccination. Serological testing before and after HBV vaccination. Tactics in the absence of a response to vaccination. Blood safety measures. Measures to ensure the safety of invasive procedures. Actions in case of a situation associated with a high risk of HCV and HBV infection in the performance of professional duties and accidental contact with blood. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of PCR and serological diagnosis of parenteral hepatitis.

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

lect.10 "Retroviruses. HIV infection. Viral carcinogenesis." (full-time course)

Retroviruses: general characteristics, classification. Representatives of the subfamilies Oncovirinae, Lentivirinae. Human immunodeficiency virus (HIV): morphology, antigenic structure, genome features, virus variability, types of HIV, origin and evolution, stages of interaction with sensitive cells; sensitivity to physical and chemical factors. Pathogenesis of HIV infections, stages. Pathogenesis of HIV / HBV co-infection. Methods and criteria for diagnosis of HIV infection, treatment and prospects for specific prevention. Pre-contact and post-contact prevention of HIV infection. Principles of antiretroviral therapy. Vaccination of HIV-infected people. AIDS-associated pathology: etiology, pathogenesis, features of microbiological diagnosis. Human T-cell leukemia virus: systematic position, biological and antigenic properties; features of epidemiology and pathogenesis, principles of diagnosis and prevention of the disease. Oncogenic viruses: general characteristics, classification. Viral-genetic theory of tumors L.A. Zilber. Modern theories of carcinogenesis. Pathogenesis of human diseases. Diagnostic methods. Prevention. Teaching is carried out in the form of a multimedia interactive lecture (in the presence of quarantine - in the on-line mode).

pr.tr.54 "Retroviruses. Laboratory diagnosis of HIV-infection (AIDS) and T-cell leukemia." (full-time course)

Retroviruses: general characteristics, classification. Representatives of the subfamilies Oncovirinae, Lentivirinae. Human immunodeficiency virus (HIV): morphology, antigenic structure, genome features, virus variability, types of HIV, origin and evolution, stages of interaction with sensitive cells; sensitivity to physical and chemical factors. HIV infection, HIV / HBV co-infection: pathogenesis, methods and criteria for diagnosing HIV infection; treatment from the standpoint of evidence-based medicine, the prospects of specific prevention. Pre-contact and post-contact prevention of HIV infection. Principles of antiretroviral therapy. Vaccination of HIV-infected people. AIDS-associated pathology: etiology, pathogenesis, features of microbiological diagnosis and prevention. T-cell leukemia virus: systematic position, biological and antigenic properties; features of epidemiology and pathogenesis, principles of diagnosis and prevention of the disease from the standpoint of evidence-based medicine. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of molecular genetic (PCR) and serological (ELISA) diagnosis of HIV infection and T-cell leukemia.

pr.tr.55 "Final control on the content module "RNA-containing viruses"." (full-time course)

Testing of theoretical knowledge (computer testing) and practical skills on topics 14-17.

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, zoogeographical factors, main factors of occurrence and spread. Emergent infections in Ukraine. Approaches to ensuring biosafety in Ukraine. Naturally mediated infections in Ukraine. Genus Flavivirus - viruses of yellow fever, tick-borne encephalitis (European, Siberian and East Siberian, Omsk hemorrhagic fever (OHF), etc.), dengue, etc. Medical ecology of diseases. Biological and antigenic properties of viruses of natural-fire infections, sensitivity of viruses to physical and chemical factors of the 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 nonspecific disease prevention. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis of these infectious diseases.

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 - Crimean-Congo hemorrhagic fever viruses and Hemorrhagic fever with renal syndrome. Medical ecology of diseases. Biological and antigenic properties of viruses of natural-fire infections, sensitivity of viruses to physical and chemical factors of the 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 the Crimean-Congo hemorrhagic fever viruses and Hemorrhagic fever with renal syndrome. Principles of specific and nonspecific disease prevention. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis of these infectious diseases.

Topic 19. Microbiology of herpesviruses infections.

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

Family Herpesviridae: general characteristics and classification; virion structure, antigenic properties, cultivation, sensitivity to physical and chemical factors. Human herpes virus (herpes simplex virus) type 1 (HSV-1), human herpes virus (herpes simplex virus) type 2 (HSV-2), human herpes virus type 3 (VGL-3) or Varicella-zoster virus (VZ) : biological and antigenic properties, sensitivity to physical and chemical environmental factors, reproductive cycle. Epidemiology and microbiological features of disease pathogenesis from the standpoint of evidence-based medicine. Oncogenicity of herpesviruses from the standpoint of evidence-based medicine. Immunity. Laboratory diagnosis of herpesvirus infections, principles of prevention. The study of the topic involves theoretical and practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves mastering the practical skills of conducting and interpreting the results of virological and serological diagnosis of these infectious diseases.

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

Betaherpesvirinae: cytomegalovirus, human herpes viruses types 6 and 7 (HHV-5, HHV-6, HHV-7). Gammaherpesvirinae: Epstein-Barr virus, human herpes virus type 8 (HHV-4, HHV-8). Epidemiology and microbiological features of disease pathogenesis from the standpoint of evidence-based medicine. Carcinogenic effect from the standpoint of evidence-based medicine. Laboratory diagnosis of beta and gamma-herpesvirus infections: diagnostic value of markers of pathogens. Markers of various clinical forms of herpes infection (primary, latent, persistent, reactivated). Features of immunity, the role of factors of natural resistance 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, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves mastering the practical skills of conducting and interpreting the results of virological and serological diagnosis of these infectious diseases.

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. Smallpox: epidemiology, pathogenesis, clinical features from the standpoint of evidence-based medicine. Material for laboratory examination depending on the stage of pathogenesis. Virological diagnosis of smallpox. Serological diagnosis of smallpox. Express diagnosis of smallpox. History of the issue of specific prevention of smallpox. E. Jenner (scientific discoveries). The main biological properties of rhabdoviruses and their classification. Fixed and street rabies viruses, their distinctive properties. The pathogenesis of rabies from the standpoint of evidence-based medicine. Features 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 video), the method of demonstrations with further discussion. In addition, the study of the topic involves the implementation of a practice-oriented task; mastering practical skills of conducting and interpreting the results of virological and serological diagnosis of smallpox and rabies.

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. Viral-genetic theory of tumors L.A. Zilber. Modern theories of carcinogenesis. Tumor antigens. Features of antitumor immunity, causes of inefficiency. Immunodiagnosis of tumors. Prospects for immunotherapy and immunoprophylaxis of tumors. Classification position of the family Polyomaviridae, characteristics. Organization of the genome of members of the family Polyomaviridae, replication. Oncogenic properties of polyomaviruses and pathogenesis of diseases from the standpoint of evidence-based medicine. Papillomaviridae: a characteristic of the family. Genome organization and gene expression of papillomaviruses in different types of infection. Features of the epidemic process. The most common papillomaviruses and the diseases they cause. The importance of papillomaviruses in the development of cervical intraepithelial neoplasia from the standpoint of evidence-based medicine. HPVs of low and high degree of environmental 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, the use of the method of demonstrations with subsequent discussion.

Topic 22. Clinical and sanitary microbiology.

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

Sanitary microbiology: subject, objects of research, tasks. Sanitary-indicative microorganisms: characteristics of the main groups, indicators of environmental pollution. Sanitary-microbiological support as one of the functions of public health. Sanitary-microbiological research of water, air, soil, objects of external environment: the purpose, rules of sampling for research, the principle of carrying out sanitary-microbiological research. Regulatory documentation governing the sanitary-microbiological examination of environmental objects and control in the departments of hospitals. Fundamentals of sanitary-hygienic and anti-epidemic regimes in dental practice. Risks of cross-infection in hospitals. Ways of spreading the infection, examples, prevention measures. Methods of disinfection and sterilization in dental departments. Modern methods of sterilization and disinfection of tooth impressions (molds). Practical aspects of infection prevention in medicine: general preventive measures, step-by-step prevention of infection, sterilization of the instrument. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves solving a practice-oriented task; mastering practical skills of conducting and interpreting the results of sanitary-microbiological research.

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

Clinical microbiology: definition, significance in the work of a doctor. Objects of research (clinical material). Pathogenic and opportunistic microorganisms, population features, role in the development of the pathological process. Microbiocenoses of healthy and pathologically altered habitats of the human body. Dysbacteriosis: conditions of occurrence, consequences of development, classification, methods of diagnosis, treatment and prevention. Opportunistic infections: causes and features of evidence-based medicine, classification by prevalence. Exogenous opportunistic infections (legionellosis, pseudotuberculosis, listeriosis, seraciosis). Endogenous opportunistic infections, the role of representatives of the resident microflora of the body in their occurrence, microbiological diagnosis. Criteria for the etiological role of opportunistic pathogens isolated from the pathological focus. Opportunistic iatrogenic infections: etiological structure. Hospital strains of opportunistic pathogens. Opportunistic infections associated with medical intervention: pathogenesis, clinical features from the standpoint of evidence-based medicine. Microbiological bases of prevention and treatment of opportunistic infections. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves solving a practice-oriented case.

pr.tr.64 "Nosocomial infections. Definitions, basic concepts, diagnostic methods." (full-time course) Nosocomial (hospital, nosocomial) infections: classification; conditions that contribute to their occurrence and widespread in hospitals. Hospital strains and ecovars of opportunistic pathogens; causes and ways to prevent their spread. Methods of identification of hospital strains. Etiology, epidemiology, pathogenesis, clinic of nosocomial infections (ILI) from the standpoint of evidence-based medicine. The problem of "healthy" carriers of opportunistic pathogens and remediation of bacteria. Conditions for successful diagnosis of nosocomial infections. Criteria for the etiological role of microorganisms isolated in the bacteriological diagnosis of STIs. Microbiological diagnosis of bacteremia and sepsis; urinary tract and genital infections; respiratory infections; intestinal infections and food poisoning; wound infection; infections of the central nervous system. Pseudomonas aeruginosa, staphylococci: properties, pathogenicity for humans, the role of STIs in newborns and children of different ages. Principles of perioperative antibiotic prophylaxis. Scientific substantiation of anti-epidemic measures of the center of nosocomial infections. The study of the topic involves practical work in the classroom, the use of the method of demonstrations with subsequent discussion. In addition, the study of the topic involves solving a practice-oriented case; drawing up a plan for microbiological diagnosis and treatment of the patient.
pr.tr.65 "Final control on the content module "DNA-containing viruses. Clinical and sanitary microbiology "." (full-time course) Test of theoretical knowledge (computer testing) and practical skills on topics 18-22.

7.2 Learning activities

LA1	Preparation for practical classes
LA2	Self-study
LA3	Interpretation of the results of bacteriological, virological, serological (ELISA, CFT, PHAT, PT, etc.), molecular genetic (PCR) and microscopic diagnostic methods
LA4	Solving practice-oriented situational tasks and / or analysis of specific situations (Case-study) on the topics of practical classes
LA5	Execution of individual or group practical tasks with further discussion
LA6	Preparing for Step-1
LA7	Watching educational films
LA8	E-learning in systems (Zoom, Google Meet, MIX.sumdu.edu.ua)
LA9	Preparation for content modules within the topics of discipline content and final control (exam)
LA10	Individual research project (student research paper, article, thesis, etc.)
LA11	Work with textbooks and relevant information sources
LA12	Practice of practical skills in the training laboratory (preparation and staining of micropreparations; setting and taking into account the results of serological reactions, seeding of biological material on cultural media, setting and interpretation of tests for identification of microorganisms)

8. Teaching methods

Course involves learning through:

TM1	Interactive lectures
TM2	Case-based learning (CBL). Case study training
TM3	Team-based learning.
TM4	Research-based learning.
TM5	Demonstration method
TM6	Brain storm
TM7	Educational discussion / debate

The discipline is taught using modern teaching methods (CBL, TBL, RBL), which promote the development of professional abilities, stimulate creative and scientific activities and are aimed at training practice-oriented professionals.

The discipline provides students with the following soft skills: GC 2. Ability to learn, master modern knowledge, and apply the knowledge in practice. GC 3. Knowledge and understanding of the subject area and professional activity comprehension. GC 7. Ability to use information and communication technologies.

9. Methods and criteria for assessment

9.1. Assessment criteria

ECTS	Definition	National scale	Rating scale
A	Outstanding performance without errors	5 (Excellent)	$90 \leq RD \leq 100$
B	Above the average standard but with minor errors	4 (Good)	$82 \leq RD < 89$
C	Generally sound work with some errors	4 (Good)	$74 \leq RD < 81$
D	Fair but with significant shortcomings	3 (Satisfactory)	$64 \leq RD < 73$
E	Performance meets the minimum criteria	3 (Satisfactory)	$60 \leq RD < 63$
FX	Fail – some more work required before the credit can be awarded	2 (Fail)	$35 \leq RD < 59$
F	Fail – considerable further work is required	2 (Fail)	$0 \leq RD < 34$

9.2 Formative assessment

FA1	Peer assessment
FA2	Teacher's instructions in the process of performing practical tasks
FA3	Testing
FA4	Interviews and oral comments of the teacher on his results
FA5	Checking and evaluating written assignments

FA6	Verification of the results of practical tasks (preparation and staining of micropreparations; formulation and consideration of the results of serological reactions, inoculation of biological material on cultural media, formulation and interpretation of tests for the identification of microorganisms)
FA7	Solving situational practice-oriented tasks, cases
FA8	Defense of an individual research project (presentation at a conference, competition of scientific works)

9.3 Summative assessment

SA1	Surveys, evaluation of written works, solving practice-oriented tasks or cases, testing
SA2	Final control: practice-oriented exam (according to the regulations)
SA3	Defense of an individual research project (incentive activities, additional points)

Form of assessment:

The semester of teaching		**200 scores**
SA1. Surveys, evaluation of written works, solving practice-oriented tasks or cases, testing		**120**
		120
SA2. Final control: practice-oriented exam (according to the regulations)		**80**
		80

Form of assessment (special cases):

The semester of teaching		**200 scores**
SA1. Surveys, evaluation of written works, solving practice-oriented tasks or cases, testing		**120**
	In the case of quarantine restrictions, the survey, evaluation of written work, solving a practice-oriented task or case is carried out remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet	120
SA2. Final control: practice-oriented exam (according to the regulations)		**80**
	In case of quarantine restrictions, the exam is conducted remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet	80

When mastering the materials of the module, the student is assigned a maximum of 5 points for each practical lesson (the grade is set in the traditional 4-point grading system). At the end of the academic year, the arithmetic mean of student performance is calculated. The maximum number of points that a student can get in practical classes during the academic year is 120. The number of points of a student is calculated by the formula 120 multiplied by the arithmetic mean and divided by 5. The form of final control is an exam. A student is admitted to the exam provided that the requirements of the curriculum are met and if he / she has scored at least 72 points for the current academic activity, which corresponds to the average grade for the current success "3". The exam is

held according to the schedule at the end of the semester. Final control - the exam (the maximum number of points that a student can score during the assembly is 80) includes control and evaluation of theoretical and practical training. The discipline exam includes answers to the questions of the exam ticket and testing. Exam tickets contain 2 questions on various topics and cover sections of the discipline (27 points each), testing on the basis of questions "Step-1": (26 points). The exam is credited to the student if he passed each of the stages of the exam not less than a grade of "3" on a national scale. Incentive points are added to the assessment in the discipline of implementation of an individual research project (defense of student academic work 12 points, speech at the conference 5 points, poster presentation at the conference 4 points, abstracts 3 points). The total score in the discipline may not exceed 200 points.

10. Learning resources

10.1 Material and technical support

MTS1	Library funds; archive of results of microbiological researches, immunograms, antibioticograms
MTS2	Information and communication systems
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	Multimedia, video and audio, projection equipment (video cameras, projectors, screens, smart boards, etc.)
MTS6	Software (to support distance learning, Internet polls), integrated information system (SSU web system, e-learning information system)
MTS7	Microbiological equipment (bacterial loops, alcohol burner, serological plates, pipettes, etc.), cultural media, aniline dyes
MTS8	Immunobiological preparations (vaccines; agglutination, precipitation sera; immunoglobulins, etc.), cultures of microorganisms

10.2 Information and methodical support

Essential Reading	
1	General Microbiology / L. Bruslind. – 1st edition. – Corvallis, Or : Oregon State University, 2020. 206 p.
2	Medical microbiology and immunology : textbook / M. Z. Tymkiv, O. P. Korniychuk, S. Y. Pavliy et al. - Vinnytsia : Nova Knyha, 2019. 416 p.
3	USMLE Step 1: Immunology and Microbiology : Lecture Notes / Editors T. L. Alley, K.Moscatello, C. Keller. - New York : Kaplan, 2019. 511 p.
Supplemental Reading	

4	Food Microbiology Laboratory for the Food Science Student : A Practical Approach / C. Shen, Y. Zhang ; by Cangliang Shen, Yifan Zhang. - 1st ed. 2017. - Cham : Springer International Publishing, 2017. - XI, 103 p.
5	Food Hygiene and Applied Food Microbiology in an Anthropological Cross Cultural Perspective / A. Zaccheo, E. Palmaccio, M. Venable etc. ; by A. Zaccheo, E. Palmaccio, M. Venable, I. Locarnini-Sciaroni, S. Parisi. - 1st ed. 2017. - Cham : Springer International Publishing, 2017. - XI. 109 p.
6	Emerging and Re-emerging Viral Infections : Advances in Microbiology, Infectious Diseases and Public Health Volume 6 / edited by Giovanni Rezza, Giuseppe Ippolito. 1st ed. - Cham : Springer International Publishing, 2017. - VI. 148 p.
7	Advances in Soil Microbiology: Recent Trends and Future Prospects : Volume 2: Soil-Microbe-Plant Interaction / edited by T. K. Adhya, B. B. Mishra, K. Annapurna, Deepak Kumar Verma, U. Kumar. - 1st ed. 2017. - Singapore : Springer Singapore, 2017. - VII. 238 p.
8	A Modern Approach to Biofilm-Related Orthopaedic Implant Infections : Advances in Microbiology, Infectious Diseases and Public Health Volume 5 / edited by Lorenzo Drago. - 1st ed. 2017. - Cham : Springer International Publishing, 2017. - VI. 119 p.
9	A simple and short microbiology practical improves undergraduate nursing students awareness of bacterial traits and ability to avoid spreading infections / Y. Rika, O. Torahiko, S. Tomoko etc. // BMC Medical Education : Language: English / Publisher: BioMed Central. - 2019. - Vol. 19. - DOI:https://doi.org/10.1186/s12909-019-1483-4.
10	Antibiotic resistance of the nasopharynx microbiota in patients with inflammatory processes / T. Ivakhniuk, V. Holubnycha, V. Smiianov at all. // Wiadomosci Lekarskie. – 2020. – LXXIII. – № 4, P. 1415-1419.
Web-based and electronic resources	
11	Practical Medical Microbiology for Clinicians https://onlinelibrary.wiley.com/doi/book/10.1002/9781119066767
12	Microbiology and Immunology On-line https://www.microbiologybook.org/
13	Osmosis Study Video https://www.osmosis.org/
14	Lecturio course «Microbiology» https://www.lecturio.com/medical
15	Microbiology and Immunology On-line https://www.microbiologybook.org/
16	Official site of the World Health Organization https://www.who.int/

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