Syllabus on the discipline « Microbiological aspects of periodontal diseases »

1. General information	
Faculty	**Dentistry**
Educational program *(field, specialty, level of higher education, form of education)*	22 Healthcare, 221 Dentistry, second (Master's) level of higher education, full-time
Academic year	**2nd academic year, 2023-2024**
Discipline name, code *(electronic identification at the Danylo Halytskyi Lviv National Medical University website)*	**Microbiological aspects of periodontal diseases** **http://new.meduniv.lviv.ua/kafedry/kafedra- mikrobiologiyi/**
Department (*name, address, phone, e-mail*)	**Department of Microbiology, Lviv, Zelena street, 12, tel. number +38(032)276-28-36, kaf_microbiology@meduniv.lviv.ua**
Chair of the Department *(e-mail)*	**Prof. O.Korniychuk, MD o_korniychuk@ukr.net**
Educational year (*year of the discipline study*)	**2nd academic year**
Semester (*semester of the discipline study*)	**IV Semester**
Type of the discipline/module *(mandatory / optional)*	**Optional**
Teaching staff *(names, surnames, scientific degrees and titles, of the teaching staff, e- mails)*	**prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko**
Erasmus yes/no (*availability of discipline for students within the program Erasmus+)*	**No**
Person, responsible for syllabus (*the person to whom comments on the syllabus should be given, e-mail*)	**O.Korniychuk., o_korniychuk@ukr.net M. Panas., panas.marta@gmail.com Y. Konechnyi., yuliankonechnyi@gmail.com A. Hural., adriana.hural43@gmail.com** B.
Number of ECTS credits	**3,0**
Number of hours *(lectures / practical classes / self- reliance work)*	**Total - 90 hours, practical classes - 30 hours self work of students - 60 hours**
Language	**Ukrainian**
Information on the consultations	**-**
Address, telephone and rules of operation of the clinical base,	**absent**

office… *(if necessary)*	

2. A brief summary of the course

The study of microbiological aspects of periodontal diseases is necessary to understand the role microorganisms in the pathogenesis of dental diseases, the importance of microbiological methods in diagnostics, the acquired knowledge is used in the study of the problems of treatment and prevention of dental and related diseases. The applied value of this discipline consists in the development of methods of microbiological diagnosis, microbiological basis of asepsis and antiseptics. Taking into account the specifics of the faculty, special attention is paid to the importance of microflora in the development of periodontal diseases and general pathological processes of stomatogenic and odontogenic origin.

3. Purpose, goals, competencies of the course

1. The goal is to study the microbiological aspects of periodontal diseases.
2. Learning goals - the main tasks of studying the discipline are knowledge about the biological properties of microorganisms from the standpoint of their interaction with the cells of the mucous membrane of the oral cavity; morpho-physiological bases of the functioning of non-specific factors of protection and the immune system, explanation of the mechanisms of the immune response and immunopathological reactions that are important in the development of periodontal diseases and other pathological conditions of the oral cavity. Mastering the basic methods of microbiological diagnostics, interpreting the principles of etiotropic therapy and specific prevention of periodontal diseases.
3. – General competences (GC):
1) GC 1. Ability to abstract thinking, analysis and synthesis.
2) GC 2. Knowledge and understanding of the subject area and understanding of professional activity.
3) GC 4. Ability to communicate in the state language both orally and in writing.
4) GC 6. Skills of using information and communication technologies.
5) GC 7. Ability to search, process and analyze information from various sources.
6) GC 8. Ability to adapt and act in a new situation.
7) GC 9. The ability to identify, pose and solve problems.
8) GC 10. The ability to be critical and self-critical.
9) GC 11. Ability to work in a team.
10) GC 13. The ability to act socially responsibly and consciously.
- Special competences (professional, subject; PC-professional competence):
1) PC 2. Ability to interpret the results of laboratory and instrumental research.
2) PC 3. Ability to diagnose: determine preliminary, clinical, final, accompanying diagnosis, emergency conditions.
3) PC 4. Ability to plan and conduct events with
4) prevention of diseases of organs and tissues of the oral cavity and maxillofacial region.
5) PC 5. Ability to design the process of providing medical care: determine the approaches, plan, types and principles of treatment of diseases of the organs and tissues of the oral cavity and maxillofacial area.

4. Course prerequisites

Information about the disciplines, basic knowledge and learning outcomes required is indicated to the student (enrolled) for successful study and mastery of competencies in this discipline:
1. Medical biology with parasitology
2. Histology, cytology and embryology
3. Biochemistry
4. Normal physiology
5. Human anatomy
6. Pathomorphology
7. Pathophysiology
8. Pharmacology
9. Propaedeutics of therapeutic dentistry

5. Program learning outcomes		
List of learning outcomes		
Result code training	Content of the training result	Reference to the competency matrix code
The code is created at filling out the syllabus (category: Kn - nowledge, SK - skills, C-competence, AR – autonomy and responsibility)	*Learning outcomes determine that the student must know, understand and be able to perform after completing the study of the discipline. The learning outcomes follow from the set learning goals.* *To enroll in a discipline, it is necessary to confirm the achievement of each learning outcome.*	Code symbol of Program learning outcome in the Higher Education Standard
Kn-1; Sk-1; C-1; AR-1	To collect information about the general condition of the patient, evaluate the psychomotor and physical development of the patient, the condition of the organs of the maxillofacial area, based on the results of laboratory and instrumental studies, evaluate information regarding the diagnosis (according to list 5)	*PLO-2*
Kn-1; Sk-1; Kn-2; C-1; AR-1	To assign and analyze additional (mandatory and optional) examination methods (laboratory, x-ray, functional and/or instrumental) according to list 5, of patients with diseases of organs and tissues of the oral cavity and maxillofacial region for differential diagnosis of diseases (according to list 2)	*PLO-3*
Sk-1; C-1; C-2; AR-2	To plan and implement dental disease prevention measures among the population to prevent the spread of dental diseases.	*PLO-6*
Kn-1; Sk-1; C-1; AR-1	To determine the approach, plan, type and principle of treatment of dental disease (according to list 2) by adopting a well-founded solutions based on existing algorithms and standard schemes.	*PLO-8*
Kn-2; C-1	To follow a healthy lifestyle, use self-regulation and self-control techniques.	*PLO-17*
Kn-1; Sk-1; AR-1	To organize the necessary level of individual security (own and the persons they care about) in the event of the occurrence of typical dangerous situations in the individual field of activity.	*PLO-20*

6. Format and scope of the course		
Course format (indicate full-time or part-time)	**full-time**	
Type of lessons	Quantity of hours	Number of groups
lectures		
practical	**30**	1
seminars		
self educational works	**60**	1

7. Topics and content of the course

Class type code	Topic	Learning content	Learning result code	Teacher
P-1 (*practical class 1*)	Microbial colonization of the oral cavity	*The method "Dialogue technologies" for the purpose of staging and solving educational tasks* regarding the concept about colonization resistance and its role in infectious pathology. Dysbacteriosis. *A case method to understand the real the life situation, the description of which at the same time reflects not only any practical problem, but also actualizes a certain body of knowledge which must be learned when solving the data problems* Probiotics, prebiotics - drugs to restore normal microflora human body *The method of "Brainstorming" for the active searching for an answer to the educational question.* Dynamics of normal microflora in human ontogenesis. Pathogenic role normal microflora and mechanisms of acquisition they have pathogenic properties. Biocorrection of dysbiosis oral cavity.	Kn-1 Sk-1 C-2 AR-1	prof. V.Danileychenko, MD assoc. prof. PhD O. Nemchenko

P-2	Changes in the microflora of the oral cavity during pathological processes	*The method of "learning in team" and the method of Learning in cooperation for the formation of the ability to independent, active professional activity, skills of interaction with the modern dynamic world* Microflora of the oral cavity as an indicator of human health. Quantitative and qualitative changes of microbiota in pathological conditions. Morphophysiological features of gram-positive and gram-negative bacteria. Properties of microorganisms by which their species affiliation is determined. Methods of determining the type of microorganisms. *Method of"Demonstration", which allows you to combine verbal and non-verbal practical knowledge during application instructions* The role of microorganisms in the infectious process. Pathogenicity of microbes, definition. Pathogenicity as a consequence of the evolution of parasitism. Obligatory pathogenic, conditionally pathogenic, non-pathogenic microorganisms.	Kn-1 Sk-1	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko
P-3	Dental plaque as a microbiological factor in periodontal diseases.	*The "Demonstration" method, which allows you to combine verbal and non-verbal practical knowledge during application of instructions* Definition and mechanisms of formation dental plaque Character of microbial populations (biofilms). Colonial organization and intercellular communication in microorganisms. Formation of the bacterial community of the oral cavity. *The "Educational Training" method, which maximizes the formation of practical skills the future specialist with the maximum bringing the educational session closer to real situations.* Dynamics of dental plaque formation. Mechanisms of dental plaque formation. The process of plaque formation. Localization of dental plaque. Features of microflora	Kn-1 Sk-1 C-1 AR-1	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko

P-4	Microbiological methods of oral cavity research.	*The "Demonstration" method, which allows you to combine verbal and non-verbal practical knowledge during application of instructions* Methods of studying the morphology of microorganisms (microscopy). Light microscopy using immersion lenses. Dark-field, phase-contrast, luminescence and other microscopy methods. Electron microscopy. (translucent, bitmap). Methods of microscopy in the diagnosis of infectious diseases. Nutrient media for the cultivation of microorganisms. Requirements to nutrient media. Classification of nutrient media. Production and main components (peptone, agar-agar, gelatin, curdled serum, etc.). Types of nutrient media. Methods of studying the enzymatic activity of bacteria and using them to identify bacteria. Modern methods of accelerated identification of bacteria using automated indicators of enzymatic activity.	C-2	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko
P-5	Factors of specific and non-specific protection of the oral cavity.	*The "Dialogue Technologies" method, which is related to the creation communicative environment, setting and solving educational tasks.* Factors of non-specific protection of the body against microorganisms. Non-specific factors of oral cavity protection. Barrier and antimicrobial properties of the skin and mucous membrane. *The "Case study" method for understanding a real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* Normal microflora. Reactivity of cells and tissues. Physico-chemical factors, function of excretory organs and systems. The killing system of the human body: natural killers, large granular lymphocytes (LGL), K-cells, LAK cells (leukin-activated killers), their role in immunological surveillance of genetically (pathologically) altered cells of the human body	Kn-1 Sk-1 C-1 AR-1	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko

P-6	Opportunistic diseases of the oral cavity	*The "Case study" method for understanding a real life situation,description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* Spread of opportunistic infections. Exogenous opportunistic infections (legionellosis, pseudotuberculosis, listeriosis, seraciosis). Endogenous opportunistic infections, the role of representatives of the body's resident microflora in their occurrence. Microbiological diagnosis. Criteria for the etiological role of conditional pathogenic microbes isolated from the pathological focus.	Kn-1 Sk-1 C-1 AR-1	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko
P-7	Periodontal disease. Periodontal pathogenic microorganisms	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* The role of microorganisms in the etiology and pathogenesis of diseases of the teeth (pulpitis, periodontitis), periodontium, mucous membrane of the oral cavity, hard and soft tissues of the maxillofacial apparatus (abscesses, phlegmons, cysts, etc.). Damage to the mucous membrane of the oral cavity in various bacterial and viral infections. Fungal stomatitis. Methods of microbiological diagnosis of infectious pathology of the oral cavity.	Sk-1 C-1	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko
P-8	Modern methods of rapid diagnosis of infectious diseases of the oral cavity.	*The "Demonstration" method, which allows you to combine verbal and non-verbal practical knowledge during application of instructions* Principles and use of immunofluorescence reactions (IFA), enzyme-linked immunosorbent assay and radioimmunoassay. Polymerase chain reaction. Immunofluorescent analysis. Western blot (immunoblot) test	C-1	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko
P-9	Retroviruses. Human immunodeficiency virus. Hepatitis viruses and herpesviruses. Prevention and treatment.	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* Retroviruses (Retroviridae family) General characteristics. Classification. Representatives of the subfamilies Oncovirinae, Lentivirinae. Human immunodeficiency virus (HIV). Morphology and chemical composition. Features of the genome. Variability, its mechanisms. Types of HIV. Origin and	Kn-1 Sk-1 C-2	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko

		evolution. Cultivation, stages of interaction with sensitive cells. Sensitivity to physical and chemical factors Hepatitis B virus (family Hepadnaviridae). Study history. The structure of the virion. Antigens: HBs - surface antigen of Dane's particles. Internal antigens: HBc, HBe, their characteristics. Sensitivity to physical and chemical factors. Peculiarities of the pathogenesis of Herpesviruses (Herpesviridae family). General characteristics and classification. The structure of the virion. Antigens. Cultivation. Sensitivity to physical and chemical factors.		
P -10	Antibiotics and chemotherapeutic drugs. Requirements for antimicrobial drugs in dental practice	*The "Demonstration" method, which allows you to combine verbal and non-verbal practical knowledge during application of instructions* and bacteriostatic effect of antibiotics. Units of measurement of antimicrobial Classification of antibiotics by origin, chemical composition, mechanism and spectrum of antimicrobial action. Natural, semi-synthetic and synthetic antibiotics. The mechanism of action of antibiotics on a microbial cell. Antibiotics are inhibitors of cell wall peptidoglycan synthesis, protein and nucleic acid synthesis, as well as those that disrupt the function of the cytoplasmic membrane of bacteria and fungi. *The "Educational Training" method, which maximally contributes to the formation of practical skills of the future specialist by maximally approximating the educational session to real situations.* Bactericidal activity of antibiotics. Methods of determining the sensitivity of bacteria to antibiotics. Concept of minimum inhibitory concentration. Antibiotic chart. Complications of antibiotic therapy.	C-2 AR-2	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko

P-10	Antibiotics and chemotherapeutic drugs. Requirements for antimicrobial drugs in dental practice	*The "Demonstration" method, which allows you to combine verbal and non-verbal practical knowledge during application of instructions* and bacteriostatic effect of antibiotics. Units of measurement of antimicrobial Classification of antibiotics by origin, chemical composition, mechanism and spectrum of antimicrobial action. Natural, semi-synthetic and synthetic antibiotics. The mechanism of action of antibiotics on a microbial cell. Antibiotics are inhibitors of cell wall peptidoglycan synthesis, protein and nucleic acid synthesis, as well as those that disrupt the function of the cytoplasmic membrane of bacteria and fungi. *The "Educational Training" method, which maximally contributes to the formation of practical skills of the future specialist by maximally approximating the educational session to real situations.* Bactericidal activity of antibiotics. Methods of determining the sensitivity of bacteria to antibiotics. Concept of minimum inhibitory concentration. Antibiotic chart. Complications of antibiotic therapy.	C-2 AR-2	prof. V. Danileychenko, MD assoc. prof. PhD O. Nemchenko
SEW-1 *(Self education al work)*	The main biotopes of the human body. Characteristics of microbiocenosis of the oral cavity of healthy individuals	*"Method of projects", which is oriented towards independent activity.* Microbiocenoses of healthy and pathologically altered biotopes of the oral cavity. Dysbacteriosis (dysmicrobiocenosis). *"Brainstorming" method for actively searching for an answer to educational question.* Consequences of development. Classification by causative agent and localization. Methods of diagnosis and (rehabilitation).	Kn-1 Sk-1	
SEW -2	Age-related changes in the	*"Method of projects", which is oriented towards independent activity.*	Kn-1 Sk-1	

	microflora of the oral cavity	*A case method to understand a real life situation, the description of which at the same time reflects not only any practical problem, but also actualizes a certain set of knowledge, which must be learned when solving the data problems.* Microbiocenosis of the oral cavity in different age periods. Change in quantitative and qualitative indicators. Unstable microflora of the oral cavity. The condition of the mucous membrane of the oral cavity, structural features (mucous folds, gingival pockets, exfoliated epithelium). The body's natural resistance.		
SEW -3	The immune system of the human body. Cellular and humoral factors. Oral immunoglobulins.	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge . which must be mastered when solving the data problems*. Central organs of the immune system: thymus gland, bone marrow. Peripheral organs of the immune system: spleen, lymph nodes and lymphoid clusters associated with the mucous membrane. Immunocompetent cells. T-lymphocytes, ontogenesis. Subpopulations of T lymphocytes: Th0, Th1, Th2, their comparative characteristics. Surface markers and receptors of these cells: CD4+ - lymphocytes (helpers), CD8+ - lymphocytes (cytotoxic, effector), their functions. B-lymphocytes, ontogenesis. Subpopulations of B lymphocytes. Surface markers and receptors. Cooperation between immunocompetent cells in the process of forming an immune response. The concept of immunomodulators. Immunostimulants and immunosuppressors.	Kn-2 Sk-1	
SEW -4	Immunopathological processes in the oral cavity. Evaluation of the immune status of the oral cavity	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge. "Method of projects", which is oriented towards independent activity.* Immunodeficiency states. Classification of	Kn-2 Sk-1	

		congenital and acquired immunodeficiency states, primary and secondary. Autoimmune processes. Autoimmune diseases associated with the violation of histo-hematological barriers for extra-barrier organs, when cross-reacting antigens enter, when immunological tolerance breaks down in connection with disorders of the body's immune system function in lymphoproliferative diseases and defects of the immune system. Principles and perspectives of therapy of autoimmune diseases		
SEW -5	Allergy in Dental Practice. Allergodiagnosis methods	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* *"Method of projects", which is oriented towards independent activity.* Gell and Coombs' classification of allergic reactions. Allergic reactions of humoral (immediate) type - HIT. Reagin type of HIT. Mechanism of development. Clinical manifestations: anaphylactic shock, urticaria, Quincke's edema. Atopy: bronchial asthma, pollinosis. Cytotoxic type of HIT. Mechanism of development, clinical detection. Methods of prevention. Immunocomplex type of HIT. Mechanism of development. Clinical detection. Diagnostic tests for detecting humoral allergy. Allergic reactions of cellular (delayed) type - CDT. Mechanism of development, clinical forms of detection: infectious, contact allergy. Methods of detecting CDT, skin allergy tests. Clinical detection. Immunodiagnosis. Manifestations of allergic reactions in the oral cavity.	Kn-2 Sk-1 C-1	
SEW -6	Pathogenic cocci of the oral cavity. Pathogenic enterobacteria of the oral cavity	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* *Method of "Brain attack" for actively searching for an answer to the educational questions.* The genus Staphylococcus (Staphylococcus).	Kn-1 Sk-1 C-1	

		Classification. Biological properties. Pathogenicity factors. The role of staphylococci in the development of human pathology. Staphylococcal lesions of the oral cavity. Methods of microbiological diagnosis of staphylococcal infections. The genus Streptococcus (Streptococcus). Classification, biological properties. Toxins, pathogenicity enzymes. Cariogenic streptococci. Methods of their selection and identification. Methods of microbiological diagnosis of streptococcal diseases. Oral streptococci, their role in the development of caries and other dental diseases. The genus Neisseria (Neisseria). Biological properties. Classification. Evolution of pathogenicity. Meningococci (Neisseria menigitidis). Biological properties, classification. Pathogenesis and microbiological diagnosis of meningococcal diseases and bacteremia. Classification and general characteristics of representatives of the enterobacteria family (Enterobacteriaceae). Virulence factors and their genetic determination. Pathogenic and conditionally pathogenic enterobacteria. Enterobacteria of the oral cavity.		
SEW -7	Actinomycetes, spirochetes, mycoplasmas, chlamydia and fungi of the oral cavity	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* *Method of "Brain attack" for actively searching for an answer to the educational questions* Spirochetes (treponemas, Borrelia, leptospires). Features of morphology and structure (sheath, fibrils, blepharoplast), mobility. Actinomycetes, features of morphology. Aerial and substatic mycelium, drusen. Spore formation. The structure of the fungal cell. The main forms of fungi: yeast, yeast-like fungi, filamentous fungi. Hyphae, mycelium. Dimorphism of fungi. Vegetative spores, endospores, exospores, sexual spores. Methods of studying the	Kn-1 Sk-1 C-1	

		morphology of fungi. Pathogenic fungi. Classification. Biological properties. Resistance. Pathogenicity factors, toxins. Sensitivity to antibiotics. Causes of deep mycoses: blastomycosis, histoplasmosis, cryptococcosis. Properties. Pathogenicity for humans. Microbiological diagnosis. Fungi of the genus Candida. Properties. Pathogenicity for humans. Factors causing candidiasis (dysbacteriosis, etc.). Microbiological diagnosis. Antimicrobial drugs. Actinomycetes (family Actinomycetaceae) General characteristics of the genus Actinomycetes. The causative agent of actinomycosis. Ecology. Resistance. Properties. Pathogenesis of the disease. Immunity. Microbiological diagnosis. Chemotherapeutic drugs. Prevention of actinomycosis.		
SEW -8	Purulent - inflammatory diseases in dental practice (abscesses, phlegmons, thrombophlebitis, osteomyelitis). Septic conditions, microbiological diagnosis and prevention	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* The role of microorganisms in the etiology and pathogenesis of diseases of the teeth (pulpitis, periodontitis), periodontium, mucous membrane of the oral cavity, hard and soft tissues of the maxillofacial apparatus (abscesses, phlegmons, cysts, etc.). Damage to the mucous membrane of the oral cavity in various bacterial and viral infections. Fungal stomatitis. Methods of microbiological diagnostics infectious pathology of the oral cavity.	Kn-1 Sk-1 C-1	
SEW -9	Nosocomial infections in dental institutions	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* Microorganisms that most often cause nosocomial infection (staphylococci, streptococci, proteus, escherichia, seraria, salmonella, pseudomonads, escherichia, vibrios, citrobacter, branchamelae, moraxella, listeria, mycobacteria, bacteroides, fusobacteria, peptostreptococci, clostridia,	Sk-1 C-1	

		mycoplasmas, fungi of the genus Candida and etc.)		
SEW -10	Asepsis and antiseptics in the treatment of diseases of the oral cavity. Methods and means of sterilization of dental material.	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge.* Sterilization, definition. Thermal methods (in an autoclave, oven). Chemical method of sterilization (gas and solutions). Filtration and radiation methods. Control of sterilization. Disinfection, definition. Methods (physical, chemical). Disinfectants, mechanism of action. Disinfection and sterilization of dental instruments. Effect of chemical and physical environmental factors on microorganisms. Influence of temperature, reaction of environment, drying, radiation, ultrasound, atmospheric and osmotic pressure, chemical substances of different classes. The mechanism of the damaging action of the named factors.	C-2	
SEW -11	Combination of diseases of the oral cavity with viral infections. Isolation and identification of viruses. Serological diagnosis of viral infections.	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge."Method of projects" which is oriented towards independent activity* Peculiarities of serological reactions used in virology. Method of paired serums. Features of viral diagnostics. Complement binding reaction and its application in virology. Reactions used exclusively in virology - hemagglutination inhibition test and hemadsorption, virus neutralization test.	Kn-1 Sk-1 C-1	
SEW -12	Mechanisms of development of microorganisms' antibiotics resistance	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge. Method of "Brain attack" for actively searching for an answer to the educational questions* Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Natural and acquired resistance to antibiotics. Genetic and biochemical	Sk-1 C-2	

		mechanisms of antibiotic resistance. The role of plasmids and transposons in the formation of drug resistance in bacteria. Ways to prevent the formation of bacterial resistance to antibiotics. Principles of rational antibiotic therapy.		
SEW -13	Immunoprophylaxis and immunotherapy of infectious diseases	*"Case study" method for understanding of the real life situation, the description of which at the same time reflects not only some practical problem, but also actualizes a certain set of knowledge. Method of "Brain attack" for actively searching for an answer to the educational questions* Active and passive immunoprophylaxis. Drugs for active immunoprophylaxis. Modern classification of vaccines: live, inactivated, chemical, toxoid, subcomponent, genetically engineered, synthetic, antiidiotypic, DNA vaccines. Manufacturing methods, evaluation of efficiency and control. Associated vaccines. Adjuvants. Autovaccines, vaccine therapy.	Kn-1 Sk-1 C-2	
SEW -14	Preparing for the credit	*Method of "Brain attack" for actively searching for an answer to the educational questions*	Kn-1 Sk-1 C-2	

8. Results of study verification

Current control

Mastery of the topic is monitored in practical classes according to specific goals.
The control of practical skills is implemented on the basis of the manufacture and study of microscopic preparations, the determination of morpho-tinctorial, cultural, biochemical and antigenic properties of microorganisms, the study of their pathogenicity factors, the establishment of sensitivity to antimicrobial agents, the presentation and interpretation of the results of serological reactions, the interpretation of the results of microbiological research of various clinical material , as well as the study of the microflora of the external environment. The assessment is carried out by the teacher's direct control of the student's performance of the skill, as well as by using illustrated tests.
At each practical lesson, students' knowledge is evaluated according to a four-point system (—5, —4, —3, —2) according to the criteria for evaluating the student's current activity.
The calculation of the number of points for the current activity in general for the discipline is carried out on the basis of the grades received by the student on a traditional scale for each practical session during the study of the discipline, by calculating the arithmetic average (AA), rounded to two decimal places. The obtained value is converted into points on a multi-point scale as follows:

$$x = AA * 120 /5$$

The minimum number of points that a student can score for the current activity in the study of the discipline is 72 points.
The maximum number of points that a student can score for the current activity in the study of the discipline is 120 points.

Assessment of student's self work

Material for student self work, which is provided in the topic of practical classes at the same time as classroom work, is assessed during the current control of the topic in the relevant classroom.
Assessment of topics that are submitted for independent study and are not included in the topics of classroom training, is carried out during the final control (exam).

Result of study code	Code of the class	Result of study verification method	Enrollment criteria
Kn-1, Kn-2, Sk-1, C-1, C-2, AR-1, AR-2	P-1-10, SEW-1-14	For the current control of students' knowledge, test tasks have been created, which contain standard tests on the topic of the lesson (including tests with several correct answers), theoretical questions, which include questions from the lecture course and questions from independent work; case studies (with 3 questions); practical skills according to the topic of the lesson.	Excellent (– 5) – The student correctly answered 90-100% of the A format tests. Correctly, clearly, logically and completely answered all questions. May closely link theory and practice, correctly shows practical skills performance. Solves case studies of increased complexity, knows how summarize the material,

		Assessment of test tasks: Excellent ("5") - The student answers 90-100% of the tests correctly. Good ("4") - The student correctly answered 71-89% of the tests. Satisfactory (“3”) - The student answered 60-70% of the tests correctly Unsatisfactory (“2”) - The student answered less than 60% of the tests. Unsatisfactory (“2”) - The student answered less than 60% of the tests. Unsatisfactory ("2") - The student answered less than 60% of the tests. **Assessment of practical skill:** "5" - demonstration of skill correct, complete; "4" - demonstration of skill with 2-3 minor errors, "3" - demonstration of skill with 1 significant, gross error or more than 3 minor errors. "2" - demonstration of skill completely incorrect or with 2 or more gross errors. **Assessment of the theoretical question:** "5" - the answer is correct, complete "4" - the answer is correct, incomplete "3" - the answer with errors, incomplete "2" - the answer is not essential, illogical **Assessment of the case study** "5" - correct, complete answers to all questions "4"- correct, complete answers to two questions "3"- correct, complete answer to one question "2"- answers to all questions are incorrect or missing.	possesses research methods to the extent necessary for the doctor's activity. Good (—4) – The student answered 71-89% of the tests correctly. Answered the question correctly and essentially. Demonstrates performance of practical skills. Correctly uses theoretical knowledge when solving practical tasks. Able to solve situational problems of easy and medium complexity. Possesses the necessary practical skills and methods of their implementation in an amount that exceeds the required minimum. Satisfactory (—3) – The student answered 60-70% of the tests correctly. Incompletely, with the help of additional questions, answers the question. Cannot independently construct a clear, logical answer. During the answer and demonstration of practical skills, the student makes mistakes. The student solves only the easiest problems, possesses only the mandatory minimum of research methods. Unsatisfactory (—2) – The student answered less than 60% of the tests. Does not know the material of the current topic, cannot construct a logical answer, does not answer additional questions, does not understand the material. During the response and demonstration of practical skills, he makes significant, gross mistakes.

9. Course policy

Academic integrity.

During the scientific-pedagogical process, students (applicants) and teachers are obliged to follow the Code of Academic Ethics of the Danylo Halytsky Lviv National Medical University, as a document that defines the standards generally accepted by the world community for the implementation of educational and scientific activities by applicants of higher education and university employees and creates an environment of intolerance to violations of academic integrity and ethics of academic relationships.
https://nauka.meduniv.lviv.ua/wp-content/uploads/kodeks-akademichnoyi-etiki-2021.pdf
The organization of the educational process is carried out on the basis of the credit-transfer system with the use of rating evaluation of students' success. Inadmissible: copying and plagiarism; absences and lateness to classes; use of a mobile phone, tablet or other mobile devices during class (except for cases provided for by the curriculum and methodical recommendations of the teacher); untimely completion of tasks set by the teacher during the current, final control of knowledge, as well as independent work of students. The discovery of signs of academic dishonesty in a student's work is a reason for the teacher not to enroll it, regardless of the scale of plagiarism or deception.
https://nauka.meduniv.lviv.ua/wp-content/uploads/2019/11/plagiat_viyavlennya-ta-sanktsiyi-dlya-zdobuvachiv.pdf
Any form of violation of academic integrity will not be tolerated. In case of such events, react in accordance with the Code https://nauka.meduniv.lviv.ua/wp-content/uploads/kodeks-akademichnoyi-etiki-2021.pdf

Appeal procedure and algorithm

The applicant has the right to familiarize himself with the results of his examination (graded) written work no later than 2 working days after it was written and to receive an explanation of the received grade. In case of procedural violations, disagreement with the assessment, the applicant has the right to submit a written appeal to the head of the department, specifying the specific reasons for disagreement with the assessment. The appeal procedure and the evaluation rules and procedures are described in detail in the Regulations on Evaluation Rules and Procedures Criteria. The appeal regarding the results of the final control of the knowledge of the students of higher education is a component of the organizational support of the educational process, which is carried out to determine the objectivity of the given assessment. The main task of the appeal procedure is to overcome the elements of subjectivism during the evaluation of knowledge, to avoid misunderstandings and controversial situations, to create the most favorable conditions for the development and real provision of the legal rights and interests of the student. The head of the department together with the examiner, involving other specialists, forms a commission to consider the issue of compliance with the procedure and within three working days ensures consideration of the appeal and verbally informs the student of the results of the review. In the case of confirmation of the circumstances stated in the student's application, by order of the rector (vice-rector for scientific and pedagogical work), a new control event is held with a different composition of the commission.

10. Literature

Basic:

1. Medical microbiology. Handbook of Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis, and Control: 19th Edition: In 2 Volumes. Volume 1 / Michael R. Barer, Will Irving, Andrew Swann, Nelun Perera 2020, 448 pages. ISBN: 978-617-505-805-3
2. Book Medical microbiology. Handbook of microbial infections: pathogenesis, immunity, laboratory diagnosis and control. In 2 volumes. Volume 2, 2021, 386 pages. ISBN 978-617-505-806-0
3. Medical microbiology, virology and immunology. 3rd ed., updated. and added Shyrobokov V. P. 2021, 920 pages, Medicine Publishing House, ISBN 978-966-382-874-9
4. Microbiology with the basics of immunology: a textbook / V.V. Danileychenko, Y.M. Fedechko, O.P. Korniychuk, I.I. Solonynko — 3rd edition Publisher: All-Ukrainian Specialized Publishing House "Medicine", 2020, 376 pages, ISBN: 978-617-505-810-7

Links to professional periodicals:

1. https://fems-microbiology.org/about_fems/network-and-activities/journals/
2. https://elibrary.escmid.org/; https://www.escmid.org/escmid-publications/manual-of-microbiology
3. https://asm.org/a/Microcosm-Digital-Magazine
4. Microbiological journal https://microbiolj.org.ua/ua/archiv
5. The world of medicine and biology https://womab.com.ua/ua/arcive
6. Microbiology and biotechnology http://mbt.onu.edu.ua/issue/archive
7. Regulatory mechanisms in Biosystems https://medicine.dp.ua/index.php/med/issue/archive

Additional:

1. Essentials of Immunology: Functions and Disorders of the Immune System: 6th Edition / Abul K. Abbas, Andrew R. Lichtman, Shiv Pill, 328 pages, 2020, ISBN 978-617-505-808-4
2. 2. S.I. Klymniuk, I.O. Sytnyk, V.P. Shirobokov Practical microbiology: study guide; for general re.: V.P. Shirobokova, S.I. Klimnyuk - Vinnytsia: Nova Knyha, 2018. - 576 p.
3. 3. Microbiology, virology and immunology in questions and answers; in general ed.: V.P. Shirobokova, S.I. Klymnyuk - Ternopil: Ukrmedknyga, 2019. - 340 p.
4. 4. Microbiology, virology and immunology (edited by Prof. Danileichenko V.V., Korniychuk O.P.). - Vinnytsia., — Nova Knyha . – 2017.- 371 p
5. 5. V.V. Danileychenko, Y.M. Fedechko, O.P. Korniychuk, I.I. Solonynko Microbiology with the basics of immunology (textbook) — Medicine, 2019.
6. 6. Gudz S.P., Hnatush S.O., Zvir G.I. Sanitary microbiology. - Lviv: LNU named after I. Franka, 2016.
7. 7. Samaranayake L. Essential microbiology for dentistry-E-Book. Elsevier Health Sciences; 2018 March 28.
8. 8. Arora DR, Arora BB. Textbook of microbiology for dental students. CBS Publishers & Distributors Pvt Ltd; 2020 Jan 20. ISSN: 9788123916651
9. 9. Steed, P. Essential microbiology for dentistry, fifth edition. Br Dent J 227, 183 (2019). https://doi.org/10.1038/s41415-019-0655-2
10. Zhou X, Li Y, editors. Atlas of oral microbiology: From healthy microflora to disease. Springer Nature; 2021 Jan 6.

.**Information resources**

http://www.nbuv.gov.ua/e
-journals/AMI/titul.htm
https://scholar.google.com/schhp?hl=en&as_sdt=0,5

11. Equipment, material and technical and software of the discipline / course

Internet access
Panasonic multimedia interactive projector - available, put into operation in 2013.
TVs - 2 pcs .
LUMAM R-8 fluorescent microscope
MBI-6 (900213) - № 1
Autoclave
Dry oven
Refrigerators
Analytical scales
VLR-200 - №1,
Thermostat TS-80 M - № 5
Dispensers 10-1000,0 μl from 3 sq.m. 2016 - № 4,
Petri dishes, bacteriological loops, tweezers
Disks with antibiotics - №50
Measuring utensils
Nutrient media Endo, BA, MPA, MPB, YSA, Saburo.
Burners

12. Additional information

Lectures and practical classes are held at: Lviv, st. Zelena, 12.
Students are allowed to practice only in a medical gown, hat and change of shoes.

Responsible for the educational process at the department - Assoc. prof. Shykula R.G
shykula.rg@gmail.com
Responsible for the scientific circle of the department - As. Konechnyi Y.
yuliankonechnyi@gmail.com
https://new.meduniv.lviv.ua/kafedry/kafedra-mikrobiologiyi/
https://pubmed.ncbi.nlm.nih.gov/

Compilers of syllabus:
Panas M.A., Assoc. Prof., Ph.D. (Signature)

Konechnyi Y., As. Prof., Ph.D (Signature)

Hural A., Assist. Prof., (Signature)

Head of the department:
Korniychuk OP, prof., Ph.D. (Signature)