Syllabus on the discipline « Microbiology, virology and immunology»

1. General information	
Faculty	Medical
Educational program *(field, specialty, level of higher education, form of education)*	22 Healthcare, 222 Medicine, second (Master's) level of higher education, full-time
Academic year	2023-2024
Discipline name, code *(electronic identification at the Danylo Halytskyi Lviv National Medical Univesity website)*	Microbiology, virology and immunology; OK 14 http://new.meduniv.lviv.ua/kafedry/kafedra-mikrobiologiyi/
Department (*name, address, phone, e-mail*)	Department of Microbiology 79005, Lviv, 12 Zelena street
Chair of the Department *(e-mail)*	Prof. O.Korniychuk, MD
Educational year (*year of the discipline study*)	II-III year
Semester (*semester of the discipline study*)	IV-V Semester
Type of the discipline/module *(mandatory / optional)*	Mandatory
Teaching staff *(names, surnames, scientific degrees and titles, of the teaching staff, e-mails)*	Prof. O.Korniychuk – o_korniychyk@ukr.net assoc. prof., PhD S.Pavliy – microvirus60@ukr.net assoc. prof. PhD M.Panas – panas.marta@gmail.com assoc. prof. PhD I.Tymchuk – ira.tymch@gmail.com ass. A. Hural – adriana.hural43@gmail.com ass. Y. Konechnyi – yulian.konechnyi@gmail.com
Erasmus yes/no (*availability of discipline for students within the program Erasmus+)*	-
Person, responsible for syllabus (*the person to whom comments on the syllabus should be given, e-mail*)	assoc. prof. PhD M.Panas assoc. prof. PhD S.Pavliy
Number of ECTS credits	8,5 credits ECTS
Number of hours *(lectures / practical classes / self- reliance work)*	255 hours Lecture – 20 hours Practical class – 107 hours Self-education work – 128 hours
Language	English
Information on the consultations	Consultations are held in accordance with the schedule approved by the Chair of the department
Address, telephone and rules of operation of the clinical base, office… *(if necessary)*	-

2. Short resume of the discipline

Microbiology, virology and immunology study the origin, evolution and properties of pathogenic microorganisms, the role of normal microflora of the human body, patterns of interaction of microorganisms with macroorganisms, immune system and mechanisms of anti-infective immunity, diagnostic methods, principles of treatment and specific prevention of infectious diseases. The study of this discipline is necessary to understand the role of microorganisms in the pathogenesis of infectious and a number of somatic diseases, the importance of microbiological methods in the diagnosis of these diseases, the basics of asepsis and antiseptics.

In order to integrate into the world educational and scientific space, the main directions of development of modern diagnostics, treatment and prevention of diseases caused by microorganisms were taken into account and educational material from leading international textbooks on microbiology was introduced.

3. Objective and tasks of the discipline

1. Objective

- The purpose of studying the discipline "Microbiology, Virology and Immunology" - training a specialist capable of solving complex problems and problems of microbiological diagnosis, etiotropic treatment and specific prevention of diseases caused by microorganisms, both in the learning process and in the professional activity of the doctor.

Microbiology, virology and immunology are the basis for the study of epidemiology, infectious diseases, clinical immunology and allergology, pharmacology, general hygiene, internal medicine, surgery and pediatrics and other clinical disciplines, which integrates teaching with these disciplines and application of knowledge in microbiology, virology and immunology in the process of further study and in professional activities.

2. Tasks of the discipline

- **The main tasks** of studying the discipline "Microbiology, virology, immunology" are:

• to interpret the biological properties of pathogenic and non-pathogenic microorganisms, patterns of their interaction with macroorganism and the external environment;
• to define methods of microbiological and virological diagnostics, etiotropic therapy and specific prevention of infectious diseases, as well as non-infectious diseases of microbial genesis;
• explain the role and functions of the immune system of the human body;
• to interpret the basic mechanisms of the formation of the immune response of the human body;
• identify the main types of pathological response of the immune system and the relationship with the emergence of the most common human diseases.

1.3 Competencies and learning outcomes, the formation of which contributes to the discipline
According to the requirements of the Higher Education Standard, the discipline ensures that students acquire the following competencies:
- integral:
The ability to solve complex problems, including those of a research and innovation nature in the field of medicine. Ability to continue learning with a high degree of autonomy.
- *general:*
GC- 1. Ability to abstract thinking, analysis and synthesis.
GC - 2. Ability to learn and master modern knowledge.
GC - 3. Ability to apply knowledge in practical situations.
GC - 4. Knowledge and understanding of the subject field and understanding of professional activity.
GC - 5. Ability to adapt and act in a new situation. ZK - 6. Ability to make informed decisions.
GC - 7. Ability to work in a team.
GC – 8. Ability to interpersonal interaction.
GC -10. Ability to use information and communication technologies. ZK-11. Ability to search, process and analyze information from various sources.
GC - 12. Determination and persistence in relation to assigned tasks and assumed responsibilities.
GC - 13. - Awareness of equal opportunities and gender issues.
GC - 14. - The ability to realize one's rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine.
GC - 15. - The ability to preserve and multiply the moral, cultural, scientific values of the achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society,

technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle.
- *Special (professional, subject):*
SC - 2. Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results.
SC - 3. Ability to establish a preliminary and clinical diagnosis of the disease.
SC - 6. Ability to determine the principles and nature of treatment and prevention of diseases.
SC -10. Ability to perform medical manipulations.
SC - 14. Ability to plan and carry out preventive and anti-epidemic measures regarding infectious diseases.
SC - 23. Ability to develop and implement scientific and applied projects in the field of health care.
SC - 24. Compliance with ethical principles when working with patients and laboratory animals.
SC - 25. Observance of professional and academic integrity, bear responsibility for the reliability of the obtained scientific results.

4. Prerequisites of the discipline

1. Medical biology with parasitology
2. Histology, cytology and embryology
3. Biophysics
4. Biochemistry
5. Normal physiology
6. Pathological physiology
7. Pathological anatomy

5. Program results of study Learning outcomes:

Integrative final program learning outcomes, the formation of which is facilitated by the educational discipline:

Learning outcomes for a discipline are a set of knowledge, abilities, skills, and other forms of competence acquired by a person in the process of learning in accordance with the standard of higher education, which can be identified, quantified and measured.
PLO - 1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.
PLO - 2. Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.
PLO - 3. Specialized conceptual knowledge, which includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems.
PLO -19. Plan and implement a system of anti-epidemic and preventive measures regarding the occurrence and spread of diseases among the population.
PLO - 21. Search for the necessary information in the professional literature and databases of other sources, analyze, evaluate and apply this information.
PLO - 24. To organize the necessary level of individual safety (own and the persons he cares about) in case of typical dangerous situations in the individual field of activity.
PLO- 27. Communicate freely in the state language and in English, both orally and in writing to discuss professional activities, research and projects

List of the results of study

Learning outcomes:

Code of the result of study	Content of the result of study	Link to the code in the matrix of competencies program learning outcomes PLO
Kn -1	Ability to analyze the biological properties of pathogenic and non-pathogenic microorganisms, patterns of their interaction with the macroorganism and the environment.	PLO-1, -2 PLO; PLO -3, - PLO -21, PLO-27

Kn -2	The ability to interpret the basic mechanisms of formation of the immune response of the human body.	PLO-1, PLO-2;PLO-3, PLO-21, PLO-27
Kn -3	The ability to identify the main types of pathological reactions of the immune system and their relationship to the most common human diseases.	PLO-1, PLO-2;PLO-3, PLO-21, PLO-27
S-ll	Be able to study morpho-textural,culture, biochemical, antigenic properties of bacteria, morphological and antigenic properties of viruses, virulence factors of microorganisms.	PLO-1, PLO-2 ;PLO-3, PLO-27?
S-2	Interpret the main mechanisms of of the formation of the immune response of the body of the human body. Be able to determine the indicators of immune status of the human body	PLO-1, PLO-2;PLO-3, PLO-27
S-3	Identify the main types of pathological reactions of the immune system system and their relationship to the occurrence of the most common human diseases. To carry out the setting serological reactions, record them and interpret the results.	PLO-1, PLO-2;PLO-3, PLO -24. PLO-27
C-1	Ability to determine the methods of microbiological and virological diagnostics	PLO-1, PLO-2;PLO-3, PLO -24. PLO-27
C-2	Ability to determine the means of etiotropic therapy and specific prevention of infectious diseases, as well as non-communicable diseases of microbial genesis.	PLO-1, PLO-2;PLO-3, PLO-19. PLO -24. PLO-27
Ab-1	Ability to process state, social and medical information	PLO-1, PLO-2;PLO-3, PLO-27
6. Discipline format and scope		
Discipline format *(full-time / part-time)*	Full-time 8.5 ECTS credits, 255 hours are allocated for the study of the discipline Content modules: 1. Introduction to microbiology. 2. Morphology and structure of prokaryotes and parasitic unicellular eukaryotes. Staining of microorganisms. Microscopy. 3. Bacterial physiology. 4. Genetics of microorganisms. 5. Microbiological basis of antimicrobial chemotherapy. 6. Infection. 7. The body's immune system. Reactions of nonspecific protection against infectious agents. 8. Antigens, antibodies. Fundamentals of transplant immunology. 9. Immune reactions. Immunopathology. Immunoprophylaxis and immunotherapy. 10. General virology. 11. Special virology. 12. Pathogenic prokaryotes and eukaryotes. 13. Fundamentals of clinical microbiology. 14. Fundamentals of microecology. Sanitary microbiology and virology.	
Type of classes	Number of hours	Number of groups
lectures	20 hours	35

practical classes	107 hours			35
self-reliance	128 hours			35
7. Topics and scope of the discipline				
Code of the class type	Topic	Scope of study	Code of the result of study	Teaching staff
L-1	Bacterial morphology. Genetics of bacteria and viruses. Basis of biotechnology and gene engeeniring.	Methods of educational and cognitive activity: explanatory-illustrative method, method of problem statement. This is done using multimedia presentations. The focus is on preparing for the Step-1 licensing exam. Lectures include the study of the principles of taxonomy, genetics, morphology, physiology, pathogenicity factors and antigenic structure of pathogenic microbes; causes of resistance of microorganisms to antimicrobials; basics of biotechnology. The factors and mechanisms of nonspecific and specific immune response of the human body to the invasion of foreign agents, the immune status of the human body, as well as immunopathology are studied. study of pathogenesis, features of infectious process, main clinical manifestations, features of immunity, methods of diagnosis, principles of treatment and prevention of infectious and a number of somatic diseases is carried out. Sanitary and clinical microbiology are studied separately.	Kn-1	Prof. O.Korniychuk assoc. prof. PhD M.Panas
L-2	. Infection and the infectious process. Features of the COVID-19 pandemic		Kn -1	
L-3	Immune system of organism. Non-specific resistance factors. Antigens and antibodies. Patterns of immune response. Immunopathological reactions. The main mechanisms of formation of the immune response in COVID-19.		Kn -2; Kn -3	
L-4	Immunoprevention and immunotherapy. Antimicrobial drugs.		C-2	
L-5	. General virology. Morphology and ultrastructure of viruses. Non-canonical viruses. Prions. Cultivation of viruses. Enteroviruses. Hepatitis A, E viruses.		Kn -1; Ab-1 Ab-1	
L-6	The causative agents of respiratory viral infections. Orthomyxoviruses.Paramyxoviruses. Coronaviruses SARS-CoV-2. COVID19 pandemic. Adenoviruses		Kn -1	assoc. prof. PhD S.Pavliy
L-7	Hepatitis B, C, D viruses. Herpesviruses. Retroviruses. HIV. Viral oncogenesis.		Kn -1; C-1; C-2	
L-8	Pathogenic enterobacteria (Escherichia coli, Salmonella, Shigella). Pathogens of cholera cholera.		Kn -1; C-1; C-2	
L-9	The causative agents of		Kn -1; C-1;	

	diphtheria, pertussis and tuberculosis.		C-2. Ab-1	
L-10	Pathogens of purulent and inflammatory processes processes. Fundamentals of clinical microbiology. COVID-19.		Kn -1; C-1; C-2	
P-1	Organization of bacteriological laboratoriy. The microscopic method of investigation. Simple methods of staining.	Teaching methods: verbal; visual; practical, explanatory-illustrative method, methods of stimulation and motivation of educational and cognitive activity, interactive methods: "Brainstorming", "Method of competitive groups", "Method of cases". Educational videos and multimedia presentations are used to implement these methods. Practical classes include: 1. Preparation by students of smears-preparations from cultures of microorganisms grown on liquid and solid nutrient media. Students perform self-seeding of the studied material on nutrient media, isolation of pure cultures of bacteria, study of morphological, tinctorial, cultural and biochemical properties of bacteria, as well as their pathogenic factors. Carrying out the autopsy of an animal that has died from an experimental infection.	Kn-1; C-1	Prof. O.Korniychuk assoc. prof., PhD S.Pavliy assoc. prof. PhD M.Panas assoc. prof. PhD I.Tymchuk ass. A. Hural ass. Y. Konechnyi
P-2	Microscopic method of investigation. Ultrastructure of bacterial cell. Complex methods of staining. Gram`s, Ziehl-Neelsen's staining.		Kn-1; C-1	
P-3	Microscopic methods of investigation. Negative staining. Ultrastructure of bacterial cell.		Kn-1; C-1	
P-4	Nutrient media for cultivation of microorganisms. Sterilization. Isolation of pure culture of bacteria .		Kn-1; C-1	
P-5	Grows and multiplication of microorganisms. Isolation of pure culture of bacteria.		Kn-1; C-1	
P-6	Grows and multiplication of microorganisms. Isolation of pure culture of bacteria. Enzymes of bacteria. Isolation of pure culture of anaerobes.		Kn-1; C-1	
P-7	Isolation of pure culture of bacteria. Factors of pathogenicity of microorganisms. Biological method in microbiology.		Kn-1; C-1	
P-8	Genetics of bacteria. Bacteriophages.		Kn-1; C-1	
P-9	The phenomenon of antagonism of microorganisms. Microbiological basis of antimicrobial chemotherapy.		Kn-1; C-1; C-2; Ab-1	

P-10	Immunity. Types of human body resistance to infectious diseases The factors of a nonspecific resistance of an organism. Immune system of organism.	The antibioticogram is set up independently, its results are interpreted, as well as the method of serial dilutions. students self-inactivated vaccine, studying the features of means for immunoprophylaxis and immunotherapy at the present stage. 2. Implementation of infection of chicken embryos in order to model the cultivation of viruses, indication of viral reproduction in chicken embryos and cell cultures. Interpretation of serological reactions used in virology. Study of virus identification methods. caused by viruses. Development of algorithms for etiotropic therapy, non-specific and specific prevention of viral infections 3. Study of students morphological, tinctorial, cultural and biochemical properties of pathogens of bacterial infections, as well as their pathogenicity factors. principles of etytropic treatment and specific prevention. Development of an algorithm of actions in the diagnosis of nosocomial nosocomial	Kn-2; C-2	
P-11	Specific resistance of an organism. Cellular and humoral immunity. Basis of transplantology.		Kn-2; C-2	
P-12	Serological reactions.		Kn-3; C-3	
P-13	Serological reactions with labels.		Kn-3; C-3	
P-14	Estimation of immune status of the human body. Immunopathological conditions. Types of hypersensitivity. Allergodiagnosis. Immunocomplex pathology in transplantation immunity.		Kn-3; C-3	
P-15	Immunoprophylaxis and immunotherapy. Application of immunomodulators, immunostimulators, immunosuppressors. Using of immunobiologicalmedi cations for treatment and prevention of immunopathology.		C-2; Ab-1	
P-16	Morphology and ultrastructure of viruses. Methods of cultivation of viruses in the chick embryo and laboratory animals. Morphology of the human immunodeficiency virus (HIV-1, HIV-2).		Kn-1; C-1	
P-17	Cell culture in virology. Methods of cultivation of viruses in the cell cultures. Indication of viral reproduction. Biology of HIV virus, life cycle. Serological reactions in virology. Serological tests for diagnosis of HIV-infection.		Kn-1; C-1	
P-18	Virological diagnosis of Picornavirusesdiseases .		Kn-3; C-3; C-1; C-2	

P-19	Virological diagnosis of Orthomyxoviruses and Paramyxoviruses diseases.Coronavirus. COVID-19	infection. Study of the normal microflora of the human body. sanitary microbiology. 4. Preparation for the licensing exam "Step-1". 5. Practice of practical skills based on the ability to identify microorganisms and analyze the results of studying their biological properties and the study of pathogenic factors. 6. The solution of situational problems that have a clinical direction, and their solution is based on knowledge and ability to interpret quantitative and qualitative data of microbiological research results.	Kn-3; C-3; C-1; C-2	
P-20	Virological diagnosis of HIV-infection and AIDS.		Kn-3; C-3; C-1; C-2	
P-21	Virological diagnosis of hepatitis.		Kn-3; C-3; C-1; C-2	
P-22	Virological diagnosis of Herpesviruses and Adenoviruses diseases.		Kn-3; C-3; C-1; C-2	
P-23	Virological diagnosis of arboviruses infections. Tick-borne encephalitis viruses. Congo-Crimean haemorrhagic fever virus.		Kn-3; C-3; C-1; C-2	
P-24	Staphylococci. Streptococci Microbiological diagnosis of staphylococcal and streptococcal infections.		Kn-3; C-3; C-1; C-2	
P-25	Meningococci and gonococci. Microbiological diagnosis of diseases caused by meningococci and gonococci		Kn-3; C-3; C-1; C-2	
P-26	.Common characteristics of family Enterobacteriaceae. Escherichia. Microbiological diagnosis of diseases caused by Escherichia coli		Kn-3; C-3; C-1; C-2	
P-27	. Salmonella. Microbiological diagnosis of typhoid, paratyphoid fevers and gastroenteritis, caused by Salmonella spp		Kn-3; C-3; C-1; C-2	
P-28	. Shigella. Microbiological diagnosis of shigellosis. Vibrio. Microbiological diagnosis of cholera.		Kn-3; C-3; C-1; C-2	
P-29	Corynebacteria and Bordetella. Microbiological diagnosis of diphtheria and pertussis Mycobacteria. Microbiological diagnosis of tuberculosis.		Kn-3; C-3; C-1; C-2	

P-30	. Causative agents of anaerobic diseases. Microbiological diagnosis of anaerobic diseases.		Kn-3; C-3; C-1; C-2	
P-31	Causative agents of zoonotic infections. Microbiological diagnosis of zoonotic infections		Kn-3; C-3; C-1; C-2	
P-32	Spirochetes. Microbiological diagnosis of spirochetosis		Kn-3; C-3; C-1; C-2	
P-33	. Rickettsia. Microbiological diagnosis of rickettsiosis Chlamydia, Mycoplasma. Microbiological diagnosis of chlamydiosis and mycoplasmosis		Kn-3; C-3; C-1; C-2	
P-34	.Pathogenic fungi and actinomycetes. Microbiological diagnosis of diseases.		Kn-3; C-3; C-1; C-2	
P-35	.Clinical microbiology.		Kn-3; C-3; C-1; C-2	
P-36	. Ecology and microecology. Sanitary microbiology		C-1; C-2 Ab-1	
SEW-1	Evolution, bacterial classification	Teaching methods: visual; practical, explanatory-illustrative method, methods of stimulation and motivation of educational-cognitive activity. Work with educational - methodical literature, illustrative material (tabular and video fund of the department); Internet - resources; filling in workbooks for independent work of students, preparation for the	Kn-1; Ab-1	Prof. O.Korniychuk assoc. prof., PhD S.Pavliy assoc. prof. PhD M.Panas assoc. prof. PhD I.Tymchuk ass. A. Hural ass. Y. Konechnyi
SEW-2	The historical development of microbiological science. Stages of development of microbiology. The contribution of Ukrainian scientists		Kn-1; Ab-1	
SEW-3	Fundamentals of biotechnology of microorganisms.		Kn-2	
SEW-4	Types of organisms resistance to microorganisms Features of the spread of the epidemic process in COVID-19.			
SEW-5	Mechanisms of humoral and cell-mediated immune responses. Cell		Kn-24	

	cooperation in immune response. Phenomen of immunological memory and immunologic tolerance	license exam "Step-1", solving individual situational tasks. Study of the history of microbiology. Introduction to the principles of taxonomy of microorganisms. Detailed study of the mechanisms of resistance of microorganisms to antimicrobial agents. Detailed study of serological reactions, interpretation of their results. Analysis of the results of the study of immune status, study of immunopathological conditions. Interpretation of serological reactions used in virology Study of virus identification methods. Development of schemes for the diagnosis of infections caused by viruses. Students study independently morphological, tinctorial, cultural and biochemical properties of pathogens of bacterial infections, as well as their pathogenic factors. determination of principles of etytropic treatment and specific prevention. Development of		
SEW-6	Immunopathology. Congenital and acquired immunodeficiencies. Methods of estimation of immune status of the human body. The main types of pathological reactions of the immune system in COVID-19.		Kn-3	
SEW-7	Modern methods for assessing the immune status of the human body of the human body.			
SEW-8	Features of transplantation immunity		Kn-2; Kn-3	
SEW-0	Current immunobiological preparations. Their applications. Prospects for obtaining drugs for the prevention of COVID-19.		C-2	
SEW 10	Mechanisms of bacterial resistance to antimicrobial agents		C-2	
SEW 11	The importance of genetic diagnosis for recognition of viral infection. Polymerase chain reaction (qualitative and quantitative data analysis)		S-3	
SEW-12	Viruses of especially dangerous tropical fevers (Lassa, Ebola, Marburg).		Kn-1; C-1; C-2	
SEW-13	Causative agents of viral intestinal infections. Rotavirus,		Kn-1; K-1; K-2	

	Calicivirus, Astrovirus.	algorithm of actions at diagnostics and search of ways of overcoming of intra - nosocomial infection. Development of algorithm of correction of dysbacteriosis. Study of the principles of biotherapy. Interpretation of the results of the study of the environmental microflora in sanitary microbiology.		
SEW-14	Poxviruses, Parvoviruses, Pappiloma virus, Polyoma virus		Kn-1; C-1; C-2	
SEW-15	Causative agents of slow viral infections.		Kn-1; C-1; C-2	
SEW-16	Oncogenic viruses. Fundamentals of viral carcinogenesis.		C-1; C-2	
SEW-17	Biology of HIV virus, life cycle. Serological tests for diagnosis of HIV-infection. Drugs for treatment and prevention		Kn-1; C-1; C-2	
SEW-18	Coronaviruses. Severe acute respiratory syndrome (SARS). Flaviviruses (Zika virus)		AB-1; Kn-1; C-1; C-2	
SEW-19	Basics of sanitary virology.		AB-1; C-1	
SEW-20	Non-canonical viruses, prions. Features of of microbiological diagnosis of diseases.		Kn-1; C-1; C-2	
SEW-21	Genetics of viruses. Practical use of bacteriophages.			
SEW-22	Pathogenic pus-forming cocci (staphylococci, streptococci, meningococci). gonococci).			
SEW-23	Causative agents of anaerobic clostridial diseases pathogens of anaerobic gas infection, tetanus, botulism pseudomembranous colitis).			
SEW 24	Causative agents of anaerobic non-clostridial diseases pathogens (bacteroids, porphyromonads prevoteles, leptotrichia, fusobacteria). Biological features. Their importance in			

	the formation of microbiocenoses and in the pathology of of the human body.			
SEW-25	Pathogens of naturally occurring infections (ehrlichia,anaplasma) . Biological biological features. Their importance in the in the pathology of the human body.		Kn-1; C-1; C-2	
SEW-26	Gram-negative non-fermenting bacteria. (pseudomonas, moraxella, acinetobacter, kingella).		Kn-1; C-1; C-2	
SEW-27	Pasteurella, Haemophilus, Eikenella.		Kn-1; C-1; C-2	
SEW-28	Pathogenic enterobacteriaceae (proteus, klebsiella, citrobacter, enterobacter). Significance of them as normal symbiosis of the large intestine. Significance in pathology and features of microbiological diagnostics of diseases.		Kn-1; C-1; C-2	
SEW-29	Medicine protozoology.		Kn-1; C-1; C-2	
SEW-30	Helicobacter and spirilla.		Kn-1; K-1; C-2	
SEW-31	Listeria, Legionella.		Kn-1; C-1; C-2	
SEW-32	Zoonotic infections (бруцельозу, туляремії, псевдотуберкульозу).		Kn-1; C-1; C-2	
SEW-33	The main normal symbiosis of the intestinal and genital tract of the human body. Principles of biotherapy.		Ab-1; C-2	
SEW 34	The main normosymbionts of the intestine and genital tract of the human body.		Ab-1 K-2	

	Their role in maintaining eubiosis (microecological norm). Principles of biotherapy.			

8. Results of study verification

Assimilation of the topic is controlled in practical classes in accordance with specific objectives. means, formulation and interpretation of the results of serological reactions, interpretation of the results of microbiological examination of various clinical material, as well as the study of the microflora of the environment. Assessment is carried out by the teacher's direct control of the student's performance of the skill, as well as with the use of illustrated tests.
with criteria for assessing the current activities of the student.
The calculation of the number of points for the current activity in general for the discipline is based on the student's marks on the traditional scale for each practical lesson during the study, by calculating the arithmetic mean (CA), rounded to two decimal places. The value obtained is converted into points on a multi-point scale as follows:

$$x = \frac{CA * 120}{5}$$

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 independent work

Material for independent student 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).

Current control

is carried out during the training sessions and aims to check the assimilation of educational material by students (it is necessary to describe the forms of current control during the training sessions). Forms of assessment of current educational activities should be standardized and include control of theoretical and practical training. The final grade for the current educational activity is set on a 4-point (national) scale

Result of study code	Code of the class	Result of study verification method	Enrollment criteria
Kn-1, Kn-2, Kn-3, C-1, C-2, Ab-1	P - 1- 40, SEW – 1- 27.	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; situational tasks (with 3 questions); practical skills according to the topic of the lesson. 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	**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. Freely reads the results of the works, solves case studies of high complexity, is able to generalize material, possesses research methods to the extent necessary for the activity of the doctor. Performed planned

		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 situational problem: "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.	individual work. **Good ("4")** – The student correctly answered 70-89% of the A format tests. Correctly and essentially answered the questions. Shows practical skills performance. Correctly uses theoretical knowledge in solving practical tasks. Is able to solve easy or moderate case studies. Possesses the necessary practical skills and techniques for their implementation to the extent that exceeds the required minimum. **Satisfactory ("3")** – The student correctly answered 50-69% of the A format tests. Incompletely, with additional questions, answers the questions. Can not build a clear, logical answer on his own. The student makes mistakes while answering and demonstrating practical skills. The student solves only the easiest tasks, possesses only mandatory minimum of the investigation methods. **Unsatisfactory ("2")** – The student answered less than 50% of the A format tests. Does not know the current theme material, can not construct a logical answer, does not answer any additional questions, does not understand the material. While

			answering and demonstrating practical skills makes significant, serious errors.
Final control			
General evaluation system	Participation to the classes during the semester - 100% on a 200-point scale		
Evaluation scales	traditional 4-point scale, multi-point (200-point) scale, ECTS rating scale		
Conditions for admission to the final control	The student attended all practical classes and received at least 120 points for current performance		
Type of final control	Methods of final control	Enrollment criteria	
Credit	It is necessary to enroll all topics submitted for current control. Grades from the 4-point scale are converted into points on a multi-point (200-point) scale in accordance with the Regulation "Criteria, rules and procedures for evaluating the results of students' learning activities".	*The maximum number of points is 200.* *The minimum number of points is 120*	
Criteria for assessing the exam / differentiated test			
Exam	Methods and means of standardized assessment when taking the exam Exam rules The exam consists of the following stages: Stage I - written answer to test tasks of format A (blank test control). The student responds to a test package. Each package contains 40 tests of A format with the topics of each content module. Stage II - written detailed answer to 4 theoretical questions and 2 situational problems. The student receives a block of questions - 4, which must be answered in writing, as well as a block of situational tasks - 2, which must be solved in writing. Stage III - testing of practical skills. The student demonstrates knowledge and performance of 2 practical skills.	The correct answer to each of the 40 test tasks of format A is evaluated in 1 point. Evaluation of each of the 4 theoretical questions is as follows: **5 points** - the student answers the questions correctly, clearly, logically and in detail. **4 points** - student correctly, in fact, but incompletely answers the question. **3 points** - student incompletely answers questions, makes mistakes. **0-2 points** - student answers incorrectly to questions, does not know the material, makes significant, gross mistakes. Evaluation of each of the 2 situational tasks is as follows: **5 points** - correct complete answers to the questions of the problem. **4 points** - correct incomplete answers to the question. **3 points** - answers to the	

		problem questions are incomplete, with errors. **0-2 points** - the answer is incorrect or absent. Assessment of each of the 2 practical skills carried out as follows: **5 points** - correctly demonstrates the implementation of practical skills, correctly, clearly and logically interprets the results of serological reactions, antibioticograms, correctly and completely describes the microscopic picture, correctly takes into account the cultural and biochemical properties of microorganisms, determines the factors of pathogenicity, clearly and logically interprets the results of the accounting. Closely connects theory with practice. **4 points** - correctly uses theoretical knowledge in solving practical problems. Has the necessary practical skills and techniques to perform them in excess of the required minimum; gives correct incomplete answers to questions. **3 points** - during the demonstration of practical skills and answers the student makes mistakes. **0-2 points** - the answer is incorrect or missing.

The maximum number of points of the final control (exam) is 80.
Exam passed - the student scored 50 or more points.
Exam failed - the student scored less than 50 points.
The number of points assigned to students at the end of the discipline is calculated as the sum of points for current educational activities and points for final control (exam).

9. Policy of the discipline

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; using 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, respond in accordance with the Code
https://nauka.meduniv.lviv.ua/wp-content/uploads/kodeks-akademichnoyi-etiki-2021.pdf

The procedure and algorithm of the appeal.

The student has the right to get acquainted with the results of his examination (credit) written work no later than 2 working days after its writing and to receive an explanation of the received grade. In case of procedural violations, disagreement with the assessment, the student has the right to submit a written appeal to the head of the department, indicating 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 literature

1. Medical microbiology,virology and immunology=Медична мікробіологія, вірусологія та імунологія : a textbook for English-speaking students of higher medical schools: translation from ukr.Published / [T.V. Andrianova, V.V. Bobyr, V.V. Danyleichenko, ect.] ed. by V. P. Shyrobokov. Vinnytsia: Nova Knyha, 2019. - 744 p. : ill.
2. Medical microbiology and immunology = Медична мікробіологія та імунологія : підручник / Тимків М. З. , Корнійчук О. П., Павлій С. Й. [та ін.]. – Вінниця : Нова Книга, 2019. – 416 с.
3. Ananthanarayan and Paniker's Textbook of Microbiology.- 7th ed.-N.Y., 2005.- P. 7 – 24.
4. Fritz H. Kayser, Kurt A. Bienz, Johanenes Eckert, Rolf M. Zinkernagel Medical Microbiology. – Thieme, 2010. – P. 4 – 6, 146 - 148.

Additional literature

5. Lakshman P., Samaranayake Essential Microbiology for Dentistry. – 3ed ed. – Elevier Limitid, 2006. – P. 7 – 15.
6. Richard J. Lamont and Howard F. Wiley Oral Microbiology at a Glance, 1st ed.. – Blackwell Jenkinson, 2010.
7. Philip D. Marsh, Michael V. Martin Oral Microbiology Text and Evolve eBooks Package, 5th ed. – FRCPath FFGDPDCS (UK), 2009.
8. Jawetz Melnick & Adelbera's Medical Microbiology.- 25th ed.- Mc Graw Hill Medical, 2010. – P. 8 - 13, 39.
9. Michael J.Pelczar, JR, E.C.S. Chan, Noel R. Krieg Microbiology. – 5th ed. – Tata McGraw-Hill Publishing Company Limited, 2002.- P.50 – 99.
10. Kathleen Park Talaro, Arthur Talaro Fundations in Microbiology.- 4th ed.- Mc Graw Hill, 2002.- P. 8 – 9, 18 – 21, 70 – 79, 87 – 107.

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

Information resources

Microbiology and immunology on-line http://www.microbiologybook.org/
On-line microbiology note http://www.microbiologyinfo.com/
Centers for diseases control and prevention www.cdc.gov

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.
Responsible for the educational process at the department - Assoc. prof. Shykula R.G
Responsible for the scientific circle of the department - Assoc. prof. Y. Konechnyi
Students are allowed to practice only in a medical gown, hat and change of shoes.

Compiler of syllabus:
Pavliy S.J., Assoc. Prof., Ph.D. (Signature)

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