



KHARKIV NATIONAL MEDICAL UNIVERSITY

SYLLABUS OF THE EDUCATIONAL COMPONENT MICROBIOLOGY, VIROSOLOGY AND IMMUNOLOGY

Specialty: **222 "Medicine"**

Educational and professional program: **Medicine**

Component code in the educational program: **MC 17**

Level of higher education: **second (master's)**

Form of education: **full-time**

Year of study: **2**

Semester(s): **IV (spring)**

Type of educational component: **normative**

Academic year: **2025-2026**

Volume: **4.5 ECTS credits (135 hours)**

Classes: **lectures, practical classes**

Final control: **credit (CEA)**

Prerequisites: **medical biology, medical and biological chemistry**

Department: **Department of Microbiology, Virology and Immunology named after Prof. D.P. Grinyov**, Nauky Ave., 4, main building, 2nd floor, left side

Head of the educational component: Prof. **Maryna Mishyna**

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Educational component page in the KhNMU Distance Learning System (Moodle):

<https://distance.kntmu.edu.ua/course/view.php?id=460>

DESCRIPTION OF THE EDUCATIONAL COMPONENT

Microbiology, virology and immunology studies the properties of pathogenic representatives of the microbial world, their interaction with the human body, the mechanisms of the development of infectious diseases, methods of their diagnosis, specific prevention and treatment, the origin, evolution and properties of microorganisms pathogenic to humans, the role of the normal microflora of the human body, the patterns of interaction of microorganisms with a macroorganism, the immune system and mechanisms of anti-infectious immunity, diagnostic methods, principles of treatment and specific prevention of infectious diseases.

COURSE AIM: students will form an idea of the normal and pathogenic flora of the human body, acquire theoretical knowledge of the basics of immunology and practical skills in the basics of microbiology, virology, and immunology.

LEARNING OUTCOMES:

- Knowledge of the use of serological reactions in infectious diseases;
- Knowledge of microbiological examination of biological fluids and secretions;
- Ability to evaluate the results of laboratory and instrumental studies according to list 4;
- Ability to predict the negative consequences of the impact of dangerous factors on the human body;
- Mastery of modern methods of microbiological research in infectious diseases;
- Knowledge of the principles of the use of immunobiological drugs.

CONTENT OF THE EDUCATIONAL COMPONENT

List of lectures (20 hours):

1. Microbiology as a science. Relationship with other medical disciplines. Morphology and physiology of bacteria. Chemical composition and metabolism of microorganisms. Evolution and classification of microorganisms.
2. Microbial antagonism. The study of chemotherapeutic drugs. Antibiotics. Genetics of bacteria and viruses.
3. The doctrine of infection.
4. The doctrine of immunity. Nonspecific protection factors.



5. Microbiological foundations of immunoprophylaxis and immunotherapy of infectious diseases.
6. General characteristics of viruses. SARS viruses. Orthomyxoviruses. Human influenza viruses.

Coronaviruses. Adenoviruses.

7. Picornaviruses. Polioviruses.
8. Herpesviruses. Oncogenic viruses. Features of antitumor immunity.
9. Hepatitis viruses.
10. Retroviruses. HIV.

List of practical classes (60 hours):

1. Rules of work in the bacteriological laboratory. Immersion microscope. Cocci. Simple staining methods.
2. Rod-shaped bacteria. Complex methods of staining microorganisms. Gram staining.
3. Vibrios. Spirochetes. Flagella in bacteria. Study of motility.
4. Spores, sporulation. Methods of staining spores. Capsules in bacteria and methods of their detection.
5. Morphology of rickettsiae, chlamydia, mycoplasmas, fungi.
6. Nutrition of bacteria. Simple nutrient media. Inoculation on MPA and MPB. Sterilization methods.
7. Isolation of pure cultures of aerobes. Elective nutrient media.
8. Study of colonies. Pigments of bacteria.
9. Identification of the isolated pure culture. Bacterial enzymes. Differential diagnostic nutrient media.
10. Bacterial respiration. Isolation of pure cultures of anaerobes.
11. Morphology of human viruses and bacteriophages. Cultivation of viruses, rickettsiae and chlamydia.
12. Conclusion No. 1 Morphology and physiology of microorganisms.
13. The study of infection. Infection of experimental animals.
14. The doctrine of immunity. Agglutination and precipitation reactions.
15. The doctrine of immunity. Complement binding reaction. Lysis reaction.
16. The doctrine of immunity. Serological reactions with a label.
17. Immune sera. Neutralization reaction. Titration of antitoxic serum.
18. Vaccines. The study of phagocytosis.
19. Antibiotics. Genetics of microorganisms.
20. Conclusion No. 2 Infection, immunity. Antibiotics. Genetics.
21. Basic properties of viruses and modern methods of diagnosing viral diseases. Laboratory diagnostics of influenza, COVID-19 and other acute respiratory viral infections.
22. Laboratory diagnostics of enterovirus infections.
23. Laboratory diagnostics of rabies.
24. Laboratory diagnostics of herpesvirus infections.
25. Rubella virus. Paramyxoviruses. Laboratory diagnostics of measles.
26. Paramyxoviruses. Laboratory diagnostics of mumps and parainfluenza.
27. Laboratory diagnostics of viral hepatitis.
28. Oncogenic viruses. Features of antitumor immunity.
29. Retroviruses. Human immunodeficiency virus (HIV).
30. Conclusion No. 3 General and special virology.

Topics for student independent work (55 hours)

1. Subject and tasks of medical microbiology, modern methods of microbiological research
2. History and stages of development of microbiology and immunology.
3. Principles of systematics, taxonomy, nomenclature of microbes. Classification of bacteria.
4. Morphology of actinomycetes.
5. Morphology of protozoa
6. Types of microscopy used in microbiology



7. Types and types of microscopic preparations, staining methods. Dyes in microbiology.
8. Ethology of microorganisms
9. Modern methods of sterilization.
10. Bacteriophages, morphology and physiology. Practical application.
11. History of the introduction of nutrient media for cultivating bacteria, current state of the issue.
12. Modern automated methods of cultivating and identifying bacteria
13. The concept of the epidemic process
14. The concept of immunity. Immunology as a science. Stages of development of immunology
15. The doctrine of antigen, its application in microbiology.
16. The concept of antibodies, their structure, mechanism of action, application for diagnostics
17. Immune sera, their production and application
18. Serological reactions, their types and mechanisms of application.
19. Types of modern serological reactions and possibilities of their application
20. The method of flow cytometry in microbiology and immunology
21. Reactions based on nucleic acid amplification (NAAT)
22. The concept of hypersensitivity and immunological tolerance
23. Types of allergic reactions. Hypersensitivity of types I-III according to Gell and Coombs and delayed-type hypersensitivity.
24. Principles of vaccine development, their modern classification.
25. Prospects for the development of new types of vaccines
26. Chemotherapy, history of development. Modern principles of antibiotic therapy.
27. Research of microbes and diagnostics of infections by genetic methods
28. Concept of biotechnology
29. Principles of systematics, taxonomy, nomenclature of viruses. Classification of viruses
30. Methods of diagnosis of viral infections
31. Antiviral immunity
32. Treatment and prevention of viral infections
33. Orthomyxoviruses, pandemic potential, causative agents of human infections.
34. Coronaviruses, species pathogenic for humans. History of outbreaks.
35. Adenoviruses, possibilities as vectors
36. Reoviruses, role in human pathology
37. Caliciviruses, role in human pathology
38. Astroviruses, role in human pathology
39. Herpesviruses, role in human pathology.
40. Human metapneumovirus.
41. Respiratory syncytial virus
42. Viral hepatitis B, C, D, E, HAV, HCV, HDV, HEV, unclassified pathogens
43. Togaviruses (Chikungunya virus, Venezuelan, Eastern and Western equine encephalomyelitis virus)
44. Flaviviruses (tick-borne encephalitis viruses, West Nile fever, yellow fever, Dengue fever, Zika)
45. Arenaviruses (Lassa virus, Junin, Machupo)
46. Filoviruses (Marburg and Ebola viruses)
47. Bunyaviruses (Crimean-Congo hemorrhagic fever virus, GNS and hantavirus pneumonia, Rift Valley fever)
48. Oncogenic human viruses. Antitumor immunity
49. Retroviruses, role in human pathology

Student independent work (SIT) is aimed at deepening and consolidating theoretical knowledge obtained during classroom training and contributes to the formation of professional competencies. The results of SIT are subject to control and are included in the final knowledge control.



Consultations: online, with prior registration on the course page in the Distance Learning System of the course.

Teaching methods: lecture, performing exercises and practical work, solving situational tasks and cases, the standardized patient method

ASSESSMENT

Current educational activity (CEA). Assessment of the success of education seekers is carried out in accordance with the Instructions for assessing the educational activity of higher education seekers at KhNMU (https://knmu.edu.ua/doc_block_type/instrukcziyi-navchalnogo-proczesu/). The grade for a practical or final lesson is from 2 to 5 points. Submitting assignments late for unwarranted reasons entails a reduction in the grade in accordance with the percentage of lateness in time from the time of completing the assignment. Assignments are checked within 24 hours. Grades are posted in the electronic journal. Unsatisfactory grades are worked out in accordance with the Regulations on the procedure for working out academic classes by students of KhNMU (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://knmu.edu.ua/wp-content/uploads/2021/05/pol_por-vidprac-zaniat.pdf).

At the end of the semester, the semester average grade is converted into a multiple-point grade (70 – 120 points) in accordance with Table 1 of the Assessment Instructions (see above). The arithmetic average of the MPE for both semesters constitutes the **total academic performance (TAP)**.

Individual tasks (IT) Individual tasks of the student (hereinafter referred to as ITS) are not a mandatory element, but if the applicant wishes, they can be completed and are evaluated in ECTS points (no more than 10), which are added to the sum of points scored for current educational activities. At the meeting of the department, a list of individual tasks was approved (participation with reports in student conferences, specialized Olympiads, preparation of analytical reviews with presentations with plagiarism check).

Final control. The condition for admission to the exam is to score 70 points in the TAP. The grade for the exam is from 50 to 80 points.

Discipline grade (DG). $DG = TAP + ITS + exam$.

Appealing the results of the final control is carried out in accordance with the procedure established at KhNMU. (https://knmu.edu.ua/wp-content/uploads/2021/05/polog_apel_kontrol.pdf).

ПОЛІТИКИ ОСВІТНЬОГО КОМПОНЕНТА

Recommendations for coursework: actively participate in all forms of work in classes, devote 1-2 hours daily to independent work and preparation for classes, ask questions during classes, attend consultations, submit assignments on time, and perform all forms of control.

Attendance at classes. Attendance at lectures and practical classes is obligatory. The dress code for offline classes is a white medical gown. If you are more than 5 minutes late for a lecture or practical class, you may not be admitted to the class. Missed classes are made up in accordance with the Regulations on the procedure for students of KhNMU to complete academic classes (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://knmu.edu.ua/wp-content/uploads/2021/05/pol_por-vidprac-zaniat.pdf).

Academic Integrity. KhNMU has a zero tolerance policy towards academic dishonesty. Any violation of the principles of academic integrity will result in liability in accordance with the established procedure at KhNMU. (https://knmu.edu.ua/wp-content/uploads/2021/05/polog_ad-1.pdf).

The use of electronic gadgets and artificial intelligence tools is allowed only with the permission of the teacher.

Policy for individuals with special educational needs. Applicants with special educational needs should contact the teacher to develop an individual educational trajectory.

Teacher response time: 24 hours.



Technical requirements for working on the course:

- access to a computer, laptop, tablet or smartphone with a working microphone and camera
 - a corporate Google account with your own photo
 - skills in working with Google Workspace (Google Meet, Docs, Sheets, Slides, Forms) and Moodle
- Technical support: ACS (ev.shevtsov@knmu.edu.ua), Google (tehotdelknmu@gmail.com), Moodle (al.korol@knmu.edu.ua)

RECOMMENDED SOURCES

1. Murray PR. Medical microbiology / Patrick R.Murray, Ken S. Rosenthal, Michael A. Pfaller; consultant, JMI Laboratories. - 9th edition. Philadelphia: Elsevier Inc, 2020. – 872 p. ISBN 978-032-367-322-8.
2. Foundations in microbiology, 11 edition/ Kathekeen Park Talaro, Barry Chess / NY: McGraw-Hill Education.-2021. – 976 p.
3. Jawetz, Melnick, & Adelberg's Medical Microbiology, 28th Edition, 2019, English. – 827 p. – ISBN: 978-1260012026
4. Warren E. Levinson, Review of Medical Microbiology and Immunology, 14th Edition, Kindle Edition, McGraw-Hill Prof Med.- 2022. – 880 p. - – ISBN 978-0071845748

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