



# **KHARKIV NATIONAL MEDICAL UNIVERSITY**

## **SYLLABUS OF THE EDUCATIONAL COMPONENT MICROBIOLOGY, VIROSOLOGY AND IMMUNOLOGY**

Specialty: **221 "Dentistry"**

Educational and professional program: **Dentistry**

Component code in the educational program: **EK 14**

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

Form of education: **full-time**

Year of study: **2**

Semester(s): **III (autumn) and IV (spring)**

Type of educational component: **normative**

Academic year: **2025-2026**

Volume: **5 ECTS credits (150 hours)**

Classes: **lectures, practical classes, consultations**

Summary control: **exam**

Prerequisites: **medical disciplines studied in the 1st year**

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.knu.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 (40 hours):**

1. Microbiology as a science. Connection with other medical disciplines. The significance of Medical Microbiology for the clinical practice of a Dentist. Morphology of microorganisms.
2. Physiology of microorganisms. Chemical composition and Metabolism in microbes.
3. Microbial antagonism. The doctrine of Chemotherapeutic Agents. Antibiotics. Genetics of bacteria and viruses. Fundamentals of Biotechnology and Genetic Engineering.
4. Infection and the Infection Process.



5. The doctrine of Immunity. Non-specific defense factors of the body against microorganisms. Defense factors in the Oral Cavity. Evolution of the immune system.
6. The Immune System of the body. Interaction between the cellular and humoral branches of the immune response. Immunodeficiency states and methods of their correction.
7. Microbiological foundations of Immunoprophylaxis and Immunotherapy of infectious diseases.
8. General characteristics of Viruses. Human Influenza viruses. Coronaviruses. Adenoviruses.
9. Picornaviruses. Polioviruses.
10. Hepatitis viruses.
11. Herpesviruses. Oncogenic viruses. Features of anti-tumor immunity.
12. Retroviruses. Human Immunodeficiency Virus (HIV). Oncogenic viruses. Features of anti-tumor immunity.
13. Pathogenic Pyogenic Cocci (Staphylococci, Streptococci, Meningococci, Gonococci).
14. Pathogenic Enterobacteriaceae (Escherichia, Salmonella, Shigella).
15. Microbiological diagnostics of Cholera.
16. Microbiological diagnostics of Diphtheria.
17. Microbiological diagnostics of Tuberculosis.
18. Microbiological diagnostics of Anaerobic infections.
19. Pathogenic Spirochetes.
20. Clinical Microbiology. Nosocomial infections.

## List of practical classes (60 hours):

1. Safety regulations in a Bacteriological Laboratory. Immersion microscope. Spherical bacteria (Cocci). Rod-shaped bacteria (Bacilli). Staining methods for microorganisms.
2. Spores and sporulation. Spore staining methods. Bacterial Capsules and their staining methods.
3. Vibrios. Spirochetes. Bacterial flagella. Study of motility. Morphology of Rickettsiae and Chlamydiae.
4. Bacterial Nutrition. Simple culture media. Inoculation on MPA and MPB. Sterilization methods.
5. Isolation of pure Aerobic cultures. Elective (Selective) culture media. Study of colonies. Bacterial pigments.
6. Identification of isolated pure cultures. Bacterial enzymes. Differential-Diagnostic culture media.
7. Bacterial Respiration. Isolation of pure Anaerobic cultures.
8. Morphology of human Viruses. Cultivation of Viruses, Rickettsiae, and Chlamydiae.
9. The doctrine of Infection. Inoculation of experimental animals.
10. The doctrine of Immunity. Serological reactions: Agglutination reaction, Precipitation reaction, Complement Fixation Test (CFT), and Lysis reaction.
11. The doctrine of Immunity. Labeled serological reactions. PCR (Polymerase Chain Reaction).
12. Factors of Innate Immunity in the oral cavity.
13. Immune sera. Neutralization reaction.
14. Vaccines. The theory of Phagocytosis.
15. Antibiotics. Microbial Genetics.
16. Conclusion № 1: General Microbiology.
17. General properties of Viruses. Virological research methods.
18. Laboratory diagnostics of Influenza, COVID-19, and Adenovirus infection.
19. Laboratory diagnostics of Enterovirus infections.
20. Laboratory diagnostics of Rabies and Vesicular Stomatitis.



21. Laboratory diagnostics of Measles, Rubella, and Mumps.
22. Laboratory diagnostics of Viral Hepatitis.
23. Laboratory diagnostics of Herpesvirus infections. Oncogenic viruses.
24. Retroviruses. Human Immunodeficiency Virus (HIV). Computer-based testing.
25. Conclusion № 2: Special Virology.
26. Microbiological diagnostics of infections caused by Pyogenic Cocci.
27. Microbiological diagnostics of Enteric (Intestinal) infections.
28. Microbiological diagnostics of bacterial Airborne (Droplet-borne) infections.
29. Microbiological diagnostics of Anaerobic infections.
30. Microbiological diagnostics of Zoonoses.
31. Microbiological diagnostics of Spirochetoses.
32. Microbiological diagnostics of Chlamydiosis. Microbiological diagnostics of Mycoses.
33. Normal Microflora and microflora in pathological processes of the Oral Cavity. Clinical Microbiology.
34. Nosocomial infections and their specifics in Dental Practice. Iatrogenic infection in dental practice. Computer-based testing.
35. Conclusion № 3: Special Microbiology.

## Topics for student independent work (40 hours)

1. History of Microbiology development and the contribution of Ukrainian scientists to the foundation of the science.
2. Structure of the bacterial cell at the Ultrastructural level. Electron Microscopy.
3. Modern methods of microorganism visualization: Confocal, Atomic Force, and Fluorescence Microscopy.
4. Bacterial Biofilms: formation mechanisms, properties, and their role in the development of infections.
5. Genetic mechanisms of microbial variability: Mutations, Recombinations, Transformation, Conjugation, and Transduction.
6. Antibiotic Resistance: mechanisms, dissemination, and prevention.
7. Modern antimicrobial agents: Bacteriophages, Antimicrobial Peptides, and Probiotics.
8. The human Microbiome: composition, functions, and impact on immunity and metabolism.
9. Microorganisms as objects of Genetic Engineering. Production of recombinant proteins and vaccines.
10. Prions as a specific form of infectious agents. Features of the pathogenesis of prion diseases.
11. RNA-genomic viruses. General characteristics.
12. DNA-genomic viruses. General characteristics.
13. Mechanisms of viral Immune Evasion from the host's immune response.
14. Human Oncogenic viruses and their role in tumor development.
15. Microbiological aspects of the formation of antibiotic-resistant Nosocomial (Hospital) strains.
16. Methods of Microbial Contamination control in dental offices.
17. Modern approaches to vaccine development: mRNA vaccines, Vector-based, and Subunit vaccines.
18. Pathogenic Protozoa.

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/instrukcyi-navchalnogo-procesu/](https://knmu.edu.ua/doc_block_type/instrukcyi-navchalnogo-procesu/)). 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://efaidnbnmnibpcjpcglclefindmkaj/https://knmu.edu.ua/wp-content/uploads/2021/05/pol\\_por-vidprac-zaniat.pdf](chrome-extension://efaidnbnmnibpcjpcglclefindmkaj/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](https://knmu.edu.ua/wp-content/uploads/2021/05/polog_apel_kontrol.pdf)).

## EDUCATIONAL COMPONENT POLICY

**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 ([https://knmu.edu.ua/wp-content/uploads/2021/05/pol\\_por-vidprac-zaniat.pdf](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](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 (tehotdelkmu@gmail.com), Moodle (al.korol@kmu.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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