Federal State Budgetary Educational Institution of Higher Education Ural State Medical University
Ministry of Healthcare of the Russian Federation

Department of Medical Microbiology and Clinical Laboratory Diagnostics

УТВЕРЖДАЮ
Проректор по образовательной деятельности
А.А. Ушаков
«12» июня 2025 г.

COURSE OUTLINE

Microbiology, Virology, Immunology (Including the Oral Cavity Microbiology)

Major: Dentistry
Qualification: Dentist

Yekaterinburg
2025

The course outline is structured according to the requirements of the approved federal educational standard and professional standard.

Prepared by:

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The course outline is approved by the department council and university education council.

1. **Goals Of The Course**

To equip students with a systematic scientific worldview regarding the diversity of microbes, their role in fundamental biological processes and in human pathology. This aims to develop general professional competencies focused on preserving and improving public health by ensuring the appropriate quality of medical care and clinical examination (dispensary observation).

2. **Objectives Of The Course**

- To provide students with knowledge of key theoretical concepts in microbiology and virology.
- To familiarize students with safety regulations when working in microbiological laboratories with microbial cultures, reagents, equipment, and laboratory animals.
- To acquaint students with the etiology and pathogenesis of the most prevalent infectious diseases.
- To familiarize students with the fundamental principles and methods of laboratory diagnostics and prevention of infectious diseases.
- To acquaint students with the principles and methods of disinfection and sterilization, the main disinfectants, and the rules for their use.
- To familiarize students with the main antibacterial, antifungal, and antiviral drugs and the rules for their application.
- To foster a motivated attitude in students towards morbidity prevention, health education work, and the implementation of preventive and anti-epidemic measures.

3. **Course In The Mandatory Part Of The Curriculum**

The discipline "Microbiology, Virology, Immunology (Including the Oral Cavity Microbiology)" is studied in the 3rd and 4th semesters (Mandatory part of the curriculum) and is aimed at forming fundamental scientific knowledge, skills, and abilities. Mastery of the discipline is based on knowledge and skills acquired from studying prerequisite courses: History of Medicine; Latin; Physics, Mathematics; Medical Informatics; Chemistry; Biology; Anatomy; Histology, Embryology, Cytology; Biochemistry. "Microbiology, Virology, Immunology (including Oral Microbiology)" serves as an essential foundation for the successful study of the following disciplines: Pharmacology; Pathological Anatomy, Clinical Pathological Anatomy; Pathophysiology; Hygiene; Infectious Diseases and Epidemiology; Dermatovenerology; Otorhinolaryngology; Ophthalmology; Obstetrics; Pediatrics; Phthisiatry; Specialized Surgery; Public Health and Healthcare; Cariology.

4. **Requirements For Learning Outcomes Based On The Federal State Educational Standard**

The process of studying the discipline is aimed at teaching and forming the following competencies in the graduate, necessary for performing professional functions and actions according to the professional standard:

a) **Universal Competencies** – Not specified for this discipline.
b) **General Professional Competencies:**

Category (Group) of General Professional Competencies	**Code and Name of General Professional Competency**	**Index of Labor Function and Its Content**	**Code and Name of Indicator of Achievement of General Professional Competency**
Base of fundamental and natural scientific knowledge	OPK-9. Able to assess morphofunctional states and pathological processes in the human body to solve professional problems.	A/01.7 – Conducting a patient examination to establish a diagnosis	IOPK 9.1. Able to analyze the structure, topography, and development of cells, tissues, organs, and organ systems in interaction with their function in health and disease, as well as the anatomical, physiological, age-related, gender-specific, and individual characteristics of the structure and development of healthy and diseased organisms. IOPK 9.2. Able to evaluate morphofunctional and physiological parameters based on the results of a patient's physical examination. IOPK 9.3. Able to evaluate morphofunctional and physiological parameters based on the results of a patient's laboratory and instrumental examination. IOPK 9.4. Able to substantiate morphofunctional characteristics, physiological states, and pathological processes in the human body to solve professional problems.

c) **Professional Competencies** – Not specified for this discipline.

The process of studying the discipline is aimed at developing in students the ability and readiness to perform the following labor functions/actions in their professional activities (in accordance with the Professional Standard 02.005 "Dentist", approved by order of the Ministry of Labor and Social Protection of the Russian Federation dated May 10, 2016 No. 227n)

Job Function	Job Actions

A/01.7 – Conducting a patient examination to establish a diagnosis	- basic principles of diagnosing infectious diseases, medical indications for hospitalization of patients with infectious diseases.

Upon completion of the course, the student should have acquired the following knowledge, skills, and abilities:

Knowledge

- Safety regulations when working in a microbiological laboratory with infectious material, reagents, equipment, and laboratory animals.
- Classification, morphology, physiology, ecology, and genetics of microorganisms; their impact on human health; methods of microbiological diagnosis.
- Structure and function of the human immune system, its age-related characteristics, cellular and humoral factors of the body's immune system.
- Patterns of development of anti-infectious immunity, mechanisms of immune response development.
- Mechanisms of development of immunopathological reactions and immunodeficiencies.
- Main antibacterial, antifungal, and antiviral drugs.
- Types of vaccines and main antibody-based preparations used for the treatment or prevention of infectious diseases.
- Principles of sample collection and stages of microbiological testing.
- Methods for decontamination of infected material and environmental objects contaminated with pathogenic microorganisms.
- Main pathogenetic mechanisms of infectious disease development.

Abilities (Skills)

- Using educational and scientific literature, Internet information resources for professional activities.
- Preparing fixed smears from broth and agar bacterial cultures.
- Staining smears using simple and complex methods.
- Microscopy of specimens using an immersion oil system.
- Inoculating test material onto nutrient media.
- Interpreting antibiogram results.

Proficiencies (Competencies)

- Command of microbiological terminology and conceptual apparatus.
- Describing morphological, cultural, and biochemical characteristics of microorganisms.

5. Course Volume And Type Of Study Load

Type of Academic Work	Total Hours	3rd Semester	4th Semester
Classroom activities (total), including:	124	70	54
Lectures	34	16	18
Practical classes	90	34	36
Independent study (total)	65	38	27
Certification for the discipline			
Forms of certification		Credit	Exam
Hours	27		27
Total workload of the discipline	216	108	108

6. Content Outline

6.1 Contents of sections and didactic units

Didactic Unit (DU) and Codes of Competency	Main Contents of DU
DU 1. General Microbiology (OPK-9, A/01.7)	Subject of microbiology and medical microbiology study. Nomenclature and taxonomy of bacteria, fungi, and viruses. Morphology and structure of individual groups of microorganisms. Physiology of bacteria and fungi. Virus reproduction. Variability of individual groups of microorganisms. Types of symbiosis: mutualism, commensalism, parasitism. Microbiota of humans. Methods of studying the microbiota. Functions and composition of the microbiota in various human biotopes. Dysbiosis and pathogenicity of microorganisms. Role of the microbiota in infectious and non-infectious diseases. True pathogens and opportunistic microorganisms. Infections and infectious diseases. Pathogenesis of bacterial, fungal, and viral infections. Duration and forms of infectious diseases.
DU 2. Immunology (OPK-9, A/01.7)	Functioning of the human immune system. Cells and organs of the immune system. Physiological immune barriers and their protection. Innate and adaptive immunity. Mechanisms of immune response to bacterial, fungal, and viral infections. Immunopathological conditions.

DU 3. Principles of Diagnosis, Treatment and Prevention of Infectious Diseases (OPK-9, A/01.7)	Methods of direct and indirect diagnosis of infectious diseases. Microscopy and visual diagnostic methods. Molecular genetic and immunological diagnostic methods. Skin tests and IGRA-tests. Epidemiology of infectious diseases. Main infection transmission mechanisms, routes, and risk factors. New and re-emerging infections. Methods of non-specific and specific infection prevention. Immunization and vaccination of infectious diseases. Types of vaccines. Herd immunity. Investigation and registration of infectious diseases. Sanitary and epidemiological control in healthcare institutions. Certification and identification. Antiseptics and disinfectants. Antibiotic therapy and drug resistance. Organization of laboratory drug resistance control. Tolerances and resistance of microorganisms to antibiotics and disinfectants. Sensitivity of microorganisms to antibiotics. Mechanisms of antibiotic action, selection principles, dosing. Side effects of antibiotics. Ways to overcome antibiotic resistance. Principles of etiotropic, pathogenetic, and symptomatic therapy. Use of bacteriophages, antisera, serum, interferons. Drug administration principles for interferons.
DU 4. Particular Bacteriology (OPK-9, A/01.7)	Systematics and characteristics of bacteria: Acinetobacter, Actinomyces, Bacillus, Bordetella, Borrelia, Brucella, Campylobacter, Chlamydia, Clostridium, Corynebacterium, Enterococcus, Escherichia, Haemophilus, Helicobacter, Klebsiella, Lactobacillus, Listeria, Mycobacterium, Neisseria, Nocardia, Proteus, Pseudomonas, Salmonella, Shigella, Staphylococcus, Streptococcus, Treponema, Ureaplasma, Vibrio, Yersinia, and others. Mechanisms of pathogenicity, pathogenesis, disease development, laboratory diagnosis. Principles of treatment. Non-specific and specific prevention.
DU 5. Particular Virology (OPK-9, A/01.7)	Clinically significant viruses of the families Adenoviridae, Astroviridae, Caliciviridae, Coronaviridae, Flaviviridae, Hepeviridae, Herpesviridae, Hepadnaviridae, Kolmioviridae, Matonaviridae, Orthomyxoviridae, Papillomaviridae, Paramyxoviridae, Picornaviridae, Poxviridae, Reoviridae, Retroviridae, Rhabdoviridae. Classification, structure of virion. Replication cycles, environmental stability. Sources of infection, mechanisms, routes and transmission factors. Pathogenesis of diseases, main clinical manifestations, immunity. Laboratory diagnosis. Treatment principles. Nonspecific and specific prevention.
DE 6. Oral Cavity Microbiology (OPK-9, A/01.7)	Biotopes and normal resident microbiota of the oral cavity. Methods for studying the oral microbiota. Local and systemic immune mechanisms of the oral cavity. The role of the microbiota, including bacterial biofilms, in the development of caries, periodontal disease, periodontitis, and peri-implantitis. The role of the oral microbiota in the development of diseases outside the oral cavity. The role of *Candida* and *Actinomyces* in the development of oral pathology.

6. 2 Controlled Learning Elements

Didactic Unit	Knowledge	Abilities (Skills)	Proficiencies (Competencies)	Stage of Competency Acquisition
DU 1. General Microbiology	- Safety rules for working in a microbiological laboratory with infectious material, reagents, instruments, laboratory animals. - Classification, morphology, physiology, ecology, and genetics of microorganisms; their impact on human health; basic microbiological diagnostic methods. - Structure and function of the human immune system, its age-related features, cellular and humoral factors. - Patterns of immune system development, mechanisms of immune response, mechanisms of immunopathological reactions and immunodeficiencies. -Main antibacterial, antifungal, and antiviral drugs -Types of vaccines and main antibody preparations used to treat or prevent infectious diseases -Principles of sample collection and stages of microbiological testing -Methods for disinfecting infected material and environmental objects contaminated with pathogenic microorganisms -Main pathogenetic mechanisms of infectious disease development	- Use of academic and scientific literature, information resources, and internet for professional activity. - Preparation of fixed smears from pus and agar bacterial cultures. - Staining of smears by simple and complex techniques. - Microscopy of preparations using an immersion system. - Cultivation of test material on nutrient media. - Interpretation of microbiological analysis results.	- Mastery of microbiological terminology. - Description of morphological, cultural, and biochemical characteristics of microorganisms.	Basic

DU 2. Immunology	- Safety protocols for working in a microbiological laboratory with infectious materials, reagents, instruments, and laboratory animals. - Classification, morphology, physiology, ecology, and genetics of microorganisms; their impact on human health; methods of microbiological diagnostics. - Structure and function of the immune system, age-related specifics, cellular and humoral immune factors. - Laws of immune system development, immunity development mechanisms, formation of immune responses and immunopathological reactions. - The main antibacterial, antifungal, and antiviral drugs - The types of vaccines and the main antibody preparations used to treat or prevent infectious diseases - The principles of sampling and the stages of microbiological testing - Methods for disinfecting infected material and environmental objects contaminated with pathogenic microorganisms - The main pathogenetic mechanisms of infectious disease development	- Using academic and scientific literature, information resources, and the internet for professional purposes. - Preparing fixed smears from pus and agar bacterial cultures. - Staining smears using simple and complex techniques. - Microscopy of specimens using an immersion system. - Culturing test material on nutrient media. - Interpretation of antibiotic susceptibility results.	- Mastery of microbiological terminology. - Description of morphological, cultural, and biochemical features of microorganisms.	Basic

DU 3. Principles of Diagnosis, Treatment and Prevention of Infectious Diseases	- Safety regulations for working in a microbiology laboratory with infectious material, reagents, equipment, and laboratory animals - Classification, morphology, physiology, ecology, and genetics of microorganisms, their impact on human health, and microbiological diagnostic methods - Structure and functions of the human immune system, its age-related characteristics, and cellular and humoral factors of the body's immune system - Patterns of development of anti-infective immunity, mechanisms of immune response development - Mechanisms of development of immunopathological reactions and immunodeficiencies - Main antibacterial, antifungal, and antiviral drugs - Types of vaccines and main antibody preparations used to treat or prevent infectious diseases - Principles of sample collection and stages of microbiological testing - Methods of disinfection of infected material and environmental objects contaminated with pathogenic microorganisms - Main pathogenetic mechanisms of infectious disease development	- use of educational and scientific literature, as well as online information resources, for professional activities. - preparation of fixed smears from broth and agar bacterial cultures. - staining smears using simple and complex methods. - microscopy of preparations using an immersion system. - inoculation of test material onto nutrient media. - interpretation of antibiogram results.	- mastery of microbiological concepts -description of morphological, cultural, and biochemical characteristics of microorganisms	Basic

DU 4. Particular Bacteriology	- Safety regulations for working in a microbiology laboratory with infectious material, reagents, equipment, and laboratory animals - Classification, morphology, physiology, ecology, and genetics of microorganisms, their impact on human health, and microbiological diagnostic methods - Structure and functions of the human immune system, its age-related characteristics, and cellular and humoral factors of the body's immune system - Patterns of development of anti-infective immunity, mechanisms of immune response development - Mechanisms of development of immunopathological reactions and immunodeficiencies - Main antibacterial, antifungal, and antiviral drugs - Types of vaccines and main antibody preparations used to treat or prevent infectious diseases - Principles of sample collection and stages of microbiological testing - Methods of disinfection of infected material and environmental objects contaminated with pathogenic microorganisms - Main pathogenetic mechanisms of infectious disease development	- use of educational and scientific literature, and online information resources for professional activities - preparation of fixed smears from broth and agar bacterial cultures - staining of smears using simple and complex methods - microscopy of preparations using an immersion system - inoculation of test material onto nutrient media - interpretation of antibiogram results	- knowledge of microbiological concepts - description of the morphological, cultural, and biochemical characteristics of microorganisms	Basic

DU 5. Particular Virology	- Safety regulations for working in a microbiology laboratory with infectious material, reagents, equipment, and laboratory animals - Classification, morphology, physiology, ecology, and genetics of microorganisms, their impact on human health, and microbiological diagnostic methods - Structure and functions of the human immune system, its age-related characteristics, and cellular and humoral factors of the body's immune system - Patterns of development of anti-infective immunity, mechanisms of immune response development - Mechanisms of development of immunopathological reactions and immunodeficiencies - Main antibacterial, antifungal, and antiviral drugs - Types of vaccines and main antibody preparations used to treat or prevent infectious diseases - Principles of sample collection and stages of microbiological testing - Methods of disinfection of infected material and environmental objects contaminated with pathogenic microorganisms - Main pathogenetic mechanisms of infectious disease development	- use of educational and scientific literature, and online information resources for professional activities - preparation of fixed smears from broth and agar bacterial cultures - staining of smears using simple and complex methods - microscopy of preparations using an immersion system - inoculation of test material onto nutrient media - interpretation of antibiogram results	- knowledge of microbiological concepts - description of the morphological, cultural, and biochemical characteristics of microorganisms	Basic

DE 6. Oral Cavity Microbiology	- Safety regulations for working in a microbiology laboratory with infectious material, reagents, equipment, and laboratory animals - Classification, morphology, physiology, ecology, and genetics of microorganisms, their impact on human health, and microbiological diagnostic methods - Structure and functions of the human immune system, its age-related characteristics, and cellular and humoral factors of the body's immune system - Patterns of development of anti-infective immunity, mechanisms of immune response development - Mechanisms of development of immunopathological reactions and immunodeficiencies - Main antibacterial, antifungal, and antiviral drugs - Types of vaccines and main antibody preparations used to treat or prevent infectious diseases - Principles of sample collection and stages of microbiological testing - Methods of disinfection of infected material and environmental objects contaminated with pathogenic microorganisms - Main pathogenetic mechanisms of infectious disease development	- use of educational and scientific literature, and online information resources for professional activities - preparation of fixed smears from broth and agar bacterial cultures - staining of smears using simple and complex methods - microscopy of preparations using an immersion system - inoculation of test material onto nutrient media - interpretation of antibiogram results	- knowledge of microbiological concepts - description of the morphological, cultural, and biochemical characteristics of microorganisms	Basic

6.3 Discipline Sections (DU) And Types Of Classes

Didactic Unit	Lectures	Practical Classes	Laboratory Work	Independent Study	Total
DU 1. General Microbiology	6	26	0	12	38
DU 2. Immunology	4	14	0	6	24
DU 3. Principles of Diagnosis, Treatment and Prevention of Infectious Diseases	6	20	0	20	46
DU 4. Particular Bacteriology	8	14	0	6	28
DU 5. Particular Virology	6	12	0	6	24
DU 6. Oral Cavity Microbiology	4	10	0	15	29
Total	34	90	0	65	189

7. Sample Topics

7.1 Term Papers – Not included in the curriculum.
7.2 Research and Creative Projects – Not included in the curriculum.
7.3 Essays / Reports – Not included in the curriculum.

7. Learning Resources

The department has the human resources to guarantee the quality of specialist training in accordance with the requirements of the Federal State Educational Standard for Higher Education, specialty 31.05.03 Dentistry, approved by Order No. 984 of the Ministry of Science and Higher Education of the Russian Federation dated August 12, 2020, and professional standard 02.005 "Dentist", approved by Order No. 227n of the Ministry of Labor and Social Protection of the Russian Federation dated May 10, 2016. Subject to conscientious study, students will master the knowledge, skills, and abilities necessary for the qualification level required of graduates in the specialty.

The educational process is delivered by the research and teaching staff of the department, who hold higher medical or biological education, as well as academic degrees of Candidate or Doctor of Sciences (Medical/Biological), and academic titles of Associate Professor or Professor.

8.1 Educational Technologies

The proportion of classes conducted in interactive formats constitutes 50%. The following technologies are used in interactive classes:

- Computer simulations

- Training sessions
- Case study analyses

Digital Information and Educational Environment: Educational and methodological information is available on the educational portal: https://edu.usma.ru. All students have access to electronic educational resources (the university's electronic catalog and digital library, the "Student Consultant" Digital Library System).

8.2 Material and Technical Resources

- BIOLAM and LOMO microscopes with immersion objectives
- GK-100-3M steam sterilizer (autoclave)
- GP-80 dry-air sterilizer (oven)
- TS-1/80 and TS-1/20 dry-air thermostats (incubators)
- Refrigerators
- Computers with pre-installed software
- KONKA Q75/Q85 LED televisions

8.3 List of Licensed Software

- "Student Consultant" Digital Library System (DLS), access to collections: "Medicine. Healthcare. Higher Education (Basic Collection)", "Medicine. Healthcare. Higher Education (Premium Collection)", "Medicine (Higher Education) GEOTAR-Media. Books in English". Link: https://www.studentlibrary.ru/. License Agreement No. 87/KSL/11-2024 dated 05.02.2024. Valid from 01.01.2025 to 31.12.2025.
- "MedBaseGeotar" Reference and Information System. Link: https://mbasegeotar.ru/. License Agreement No. MB0077/S2024-11 dated 05.02.2024. Valid from 01.01.2025 to 31.12.2025.
- "BookUp" Digital Library System, access to the "Large Medical Library" collection. Link: https://www.books-up.ru/. Agreement No. BMB dated 18.04.2022. Valid until 18.04.2027.
- "Lan" Electronic Library System, access to the "Network Electronic Library" collection. Link: https://e.lanbook.com/. Agreement No. SEB 1/2022 dated 01.11.2022. Valid until 31.12.2026.
- Ural State Medical University Digital Library, institutional repository on the DSpace platform. Link: http://elib.usma.ru/. Established by Rector's Order No. 212-r dated 01.06.2022. Installation and Setup Agreement No. 670 dated 01.03.2018. Perpetual access.
- Lippincott Williams & Wilkins Archive Journals database by Ovid Technologies GmbH. Link: https://ovidsp.ovid.com/autologin.cgi. Access provided under a centralized subscription in 2022 (Ref. RCNI No. 1870 dated 22.12.2022). Perpetual access.
- The Wiley Journal Database by John Wiley & Sons, Inc. Link: https://onlinelibrary.wiley.com. Access provided under a centralized subscription in

2023 (Ref. RCNI No. 574 dated 07.04.2023). Full-text collection of 2023 journal issues. Perpetual access.

- Medical Sciences Journal Backfiles database by John Wiley & Sons, Inc. Link: https://onlinelibrary.wiley.com. Access provided under a centralized subscription in 2022 (Ref. RCNI No. 1401 dated 31.10.2022). Perpetual access.
- eBook Collections database by SAGE Publications Ltd. Link: https://sk.sagepub.com/books/discipline. Access provided under a centralized subscription in 2022 (Ref. RCNI No. 1401 dated 31.10.2022). Perpetual access.

7. Educational, Methodological And Information Support For The Discipline

9.1 Core Reading List

9. Educational, Methodological and Information Support for the Discipline

9.1 Core Reading List

9.1.1 Electronic Educational Resources

- Litusov N.V. General Microbiology. Illustrated Textbook (Revised and Expanded). 2016, 544 p. (Disc). Access: http://elib.usma.ru/handle/usma/971
- Zornikov D.L., Litusov N.V. Fundamentals of Anti-Infectious Immunology. Electronic Textbook. – Yekaterinburg, 2016, 34 p. Access: http://elib.usma.ru/handle/usma/996
- Zornikov D.L., Litusov N.V., Novoselov A.V. Immunopathology. Electronic Textbook. – Yekaterinburg, 2017, 35 p. Access: http://elib.usma.ru/handle/usma/1045
- Litusov N.V. Research Methods in Medical Bacteriology: Textbook, Yekaterinburg: USMU. - 2021. – 232 p. Access: http://elib.usma.ru/handle/usma/4811
- Litusov N.V. Particular Bacteriology. Electronic Illustrated Textbook. 2017, 707 p. (Disc). Access: http://elib.usma.ru/handle/usma/1051
- Litusov N.V. Particular Virology. Electronic Illustrated Textbook. 2020, 323 p. Access: http://elib.usma.ru/handle/usma/2358
- Litusov N.V. Medical Mycology: Electronic Textbook, Yekaterinburg: USMU, 2022. – 53 p. Access: http://elib.usma.ru/handle/usma/5411
- Litusov, N.V. Antibacterial Vaccines, Sera, and Immunoglobulins: Electronic Textbook. Yekaterinburg: USMU, 2020. – 124 p. Access: http://elib.usma.ru/handle/usma/2357
- Medical Microbiology, Virology and Immunology: in 2 vols. Vol. 1. [Electronic resource]: Textbook / Ed. by V.V. Zverev, M.N. Boychenko. - M. : GEOTAR-Media, 2016. Access: http://www.studmedlib.ru/ru/book/ISBN9785970436417.html
- Medical Microbiology, Virology and Immunology. In 2 vols. Vol. 2. [Electronic resource]: Textbook / Ed. by V.V. Zverev, M.N. Boychenko - M. : GEOTAR-Media, 2016. Access: http://www.studmedlib.ru/ru/book/ISBN9785970436424.html

- Microbiology, Virology: A Guide to Practical Classes [Electronic resource]: Textbook / Zverev V.V. [et al.], ed. by V.V. Zverev, M.N. Boychenko - M. : GEOTAR-Media, 2015. Access: http://www.studmedlib.ru/ru/book/ISBN9785970434956.html
- Microbiology, Virology and Immunology: A Guide to Laboratory Classes [Electronic resource]: Textbook / Ed. by V.B. Sboichakov, M.M. Karapatsa. - M. : GEOTAR-Media, 2015. Access: http://www.studmedlib.ru/ru/book/ISBN9785970435755.html

9.1.2 Textbooks

- Medical Microbiology, Virology and Immunology: Textbook for Medical Students. Ed. by A.A. Vorobyov. Textbooks and Manuals for Higher School. Publisher: Meditsinskoye Informatsionnoye Agentstvo, 2012. – 702 p.
- Medical Microbiology, Virology and Immunology. In 2 vols. Vol. 1. Ed. by V.V. Zverev, M.N. Boychenko. Publisher: GEOTAR-Media, 2017– 448 p.
- Medical Microbiology, Virology and Immunology. In 2 vols. Vol. 2. Ed. by V.V. Zverev, M.N. Boychenko. Publisher: GEOTAR-Media, 2017 – 480 p.

9.1.3 Study Guides

- Microbiology, Virology and Immunology. A Guide to Laboratory Classes: Textbook / Ed. by: V. B. Sboichakov, M. M. Karapatsa. - Moscow: GEOTAR-Media, 2013. - 320 p.: ill.

9.2 Additional Literature
9.2.1 Reference Books / Manuals

- Manual of Medical Microbiology. Special Medical Microbiology and Etiological Diagnosis of Infections. Ed. by A.S. Labinskaya, N.N. Kostyukova, S.M. Ivanova / Publisher: Binom, 2012. 1151 p.

10. Course Assessment / Attestation

Intermediate assessment of students is conducted in accordance with the developed point-rating system for evaluating academic achievements in the discipline. Intermediate assessment in the 3rd semester is conducted in the form of a Pass/Fail test, and in the 4th semester - in the form of an Exam.

11. Assessment Materials Fund for the Discipline

The Fund of Assessment Tools (FAT) for conducting intermediate assessment is presented in the application.