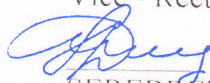


National Pirogov Memorial Medical University, Vinnytsya

“APPROVED”

Vice - Rector of HEI for Academic Affairs


Prof. Oksana
SREBRENNIKOVA

.. 01 .. *септ* 20*22* year

“AGREED”

Head of microbiology department


prof. Valentin
KOVALCHUK

.. 19 .. *септ* 20*22* year

SYLLABUS
of academic discipline

“ Microbiology with the basic of immunology ”

Specialty	226 “Pharmacia, industrial pharmacia”
Educational level	Master of Pharmacia
Educational programme	EPP «Pharmacia», 2022
Academic year	2022-2023
Department	<i>Microbiology</i>
Lecturer (if lectures are given)	Associate-professor of HEI Olena RYMSHA
Contact information	<i>Microbiology Department, microbiology@vnmnu.edu.ua, National Pirogov Memorial Medical University, Vinnytsya, Pirogov's st, 56, (0432)570379</i>
Syllabus compiler	Associate-professor of HEI Nadiia FOMINA

Status and structure of the discipline

Discipline status	Compulsory
Discipline code in EPP/discipline place in EPP	CC 14, discipline of general training
Course / semester	<i>2nd year (IV semesters) 3rd year (V semester)</i>
The amount of discipline (the total number of hours / number of credits ECTS)	150 hours / 5 credits ECTS
Number of content modules	3 modules
The structure of the discipline	Lectures - 18 hours Practical classes 72 hours Independent work 60 hours
Language of study	English
Form of study	Full-time (<i>or remote full-time by order</i>)

1. Description of the discipline

Short annotation of the course, relevance.

The subject area of the discipline is general and special medical microbiology. The main focus of the program is to acquire knowledge of the basic medical discipline "Microbiology, Virology and Immunology", the study of which is necessary for the successful mastering of a number of clinical disciplines. The subject area of the program is general and special medical microbiology, the program focuses on obtaining basic knowledge about the causative agents of infectious diseases and microbial complications, methods of their microbiological diagnosis, the principles of postinfectious immunity formation, prevention and treatment of such diseases. As a result of studying this discipline the student receives knowledge about the origin, evolution and properties of pathogenic microorganisms, the basics of the doctrine of the physiological role of microbes in the human body and drug influence on their biological functions, patterns of interaction of microorganisms with human body, modern methods of laboratory diagnostics of infectious diseases, principles of their specific prevention, basic knowledge about asepsis, antiseptics and chemotherapy of microbial diseases.

The program includes modern educational material on laboratory diagnostics methods, treatment and prevention of diseases caused by microorganisms.

Prerequisites. For successful mastering of discipline, the student needs the knowledge received in the course of studying of the following general disciplines:

Latin language and medical terminology; medical biology; medical and biological physics; biological and bioorganic chemistry; human anatomy; histology, cytology and embryology; normal physiology.

The purpose of the course and its significance for professional activities. The purpose of the discipline is to form a basic knowledge of the biological factors nature of human diseases and the mechanisms of their interaction with the macroorganism, the human population as a whole and the external environment; to master the basic principles of personal and epidemiological safety in contact with an infectious patient or material, to acquire the ability to determine the necessary list of laboratory tests for infectious human diseases diagnosis and evaluate their results.

Postrequisites. In the process of studying the discipline, a student acquires knowledge, which is necessary for successful mastering of professional training disciplines, namely: pharmacology, general hygiene, epidemiology, pathological physiology, pathological anatomy, clinical immunology, immunopathology and allergology, infectious diseases, including pediatric infectious diseases, oncology internal medicine, surgery, pediatrics and other clinical disciplines,

which involves the integration of teaching with these disciplines and the application of acquired knowledge, skills and abilities in the process of further education and professional activities.

2. Learning outcomes. After successful study of the discipline the applicant will be able to:

1. Interpret the manifestations of the interaction of microorganisms with the macroorganism, the manifestations of the biological properties of pathogenic and opportunistic microorganisms;
2. To choose adequate and informative methods of microbiological and virological diagnostics (according to list 4), etiotropic therapy and prevention of infectious diseases (according to list 2) .
3. Correctly choose the standard method of taking biological material depending on the location of the entrance gate of infection, store and send infectious material for laboratory testing (according to list 4)
4. Conduct microbiological examination of biological fluids and secretions (microscopic, cultural, serological).
5. Apply antimicrobial measures and adhere to the anti-epidemic regime in the study of infectious material
6. Assess information about the diagnosis (according to list 4), using information about the patient, his organs and systems, based on the results of laboratory and instrumental studies; Analyze the results of laboratory microbiological studies, interpret their diagnostic value.
7. To interpret the main mechanisms of the immune response towards infections and after the introduction of immunobiological drugs; to evaluate postinfectious immunity effectiveness.
8. Justify measures for the prevention of infectious diseases, based on the peculiarities of their epidemiology;
9. Choose appropriate non-specific preventive measures to prevent infection with pathogens of infectious diseases transmitted in different ways.
10. Conduct microbiological research of biological fluids and secretions:
 - work with the immersion system of the microscope; prepare smears from cultures of microorganisms and pathological material; stain -smears by Gram, Ziehl-Neelsen, Burri-Gins methods;
 - isolate pure cultures of aerobic and anaerobic bacteria; identify the pure culture according to its morphological, cultural biochemical, and antigenic properties;
 - determine the sensitivity of microbes to antiseptics, disinfectants, antibiotics, interpret the obtained results.
 - make and explain results of the main serological tests: agglutination, precipitation and complement fixation;
 - interpret the results of immunochemical diagnostic reactions: RIF, ELISA;
 - determine the CPE of the virus in preparations of infected cell cultures;
 - analyze the diagnostic value of molecular genetic methods for diagnosing infectious diseases;
 - carry out and evaluate the results of sanitary-bacteriological examination of environmental objects (water, air, food, medical and diagnostic equipment).

3. Content and logistic of the discipline

Module Morphology, physiology microorganisms.	1 of IV semester 56 hours / 1,9 credits	Lectures № 1-4 Practical classes №№ 1-15
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Infection. Immunity		Topics for self- study №№ 1-10
Module 2 Special, clinical, ecological microbiology	IV semester 52 hours/1,7 credits	Lectures № 6, 7 Practical classes №№ 16-28 Topics for self- study №№ 11-21
Module 3 General and special virology	V semester 42 hours/1,4 credits	Lectures № 8, 9 Practical classes №№ 29-36 Topics for self- study №№ 22-34

The course includes 57 topics, which are divided into 3 thematic modules.

Module 1. Morphology and physiology of microorganisms. Infection. Immunity.

Topic 1. Subject and tasks of medical microbiology.

Topic 2. Stages of development of microbiology.

Topic 3. Organization of a bacteriological laboratory. Dyes and simple methods of staining microorganisms. Microscopy.

Topic 4. Gram staining of bacteria.

Topic 5. Morphology and structure of prokaryotes and eukaryotes.

Topic 6. Bacterial metabolism. Nutrient media for the cultivation of microorganisms.

Topic 7. Growth and reproduction of microorganisms. Isolation of pure cultures of bacteria.

Topic 8. Evolution of microorganisms. Systematics, classification and nomenclature of microorganisms.

Topic 9. Genetics of microorganisms.

Topic 10. Antiseptics and asepsis. Methods and tools.

Topic 11. Chemotherapeutic drugs. Antibiotics.

Topic 12. Infectious process, its types, conditions of origin and development.

Topic 13. The main stages of development of immunology.

Topic 14. Organs of the immune system. Factors of nonspecific protection of the organism against pathogenic microorganisms.

Topic 15. Characteristics of antigens.

Topic 16. Antibodies as a product of humoral immune response.

Topic 17. Immune response reactions. Allergy

Topic 18. Serological reactions. Serological diagnosis, serological identification. Serological reactions in bacteriology.

Topic 19. Principles of using microbial antigens as prophylactic drugs. Serums and immunoglobulins.

Module 2. Special, clinical and ecological microbiology.

Topic 1. Pathogenic cocci.

Topic 2. Enterobacteriaceae (family Enterobacteriaceae). Escherichia.

Topic 3. Shigella.

Topic 4. Salmonella.

Topic 5. Conditionally pathogenic enterobacteria.

Topic 6. Vibrions (family Vibrionaceae).

Topic 7. Corynebacteriaceae (family Corynebacteriaceae).

Topic 8. Mycobacteria (family Mycobacteriaceae)

Topic 9. The causative agent of whooping cough.

Topic 10. Gram-negative non-fermenting bacteria.

Topic 11. Pathogens of anaerobic infections.

Topic 12. Pathogens of zoonotic infections.

Topic 13. Spirochetes.

Topic 14. Pathogenic spirals.

Topic 15. Rickettsia, chlamydia, mycoplasma.
 Topic 16. Pathogenic fungi and ktiomycetes.
 Topic 17. Pathogenic protozoa.
 Topic 18. Ecological microbiology.
 Topic 19. Clinical microbiology.
 Topic 20. Fundamentals of sanitary microbiology and virology. Sanitary microbiology of water, soil and air.
 Topic 21. Sanitary microbiology of pharmacies and pharmaceutical industries.
 Topic 22. Phytopathogenic microorganisms.
 Topic 23. Microbiological control of drugs in the conditions of sanitary production and pharmaceutical enterprises.

Module 3. General and special virology.

Topic 1. Morphology and ultrastructure of viruses. Cultivation of viruses in chicken embryos and laboratory animals. Serological reactions used in virology.
 Topic 2. Cell cultures in virology. Methods of culturing viruses in cell cultures. Indication of viral reproduction.
 Topic 3. Genetics of viruses. Bacteriophages, practical use.
 Topic 4. Orthomyxoviruses.
 Topic 5. Paramyxoviruses.
 Topic 6. Picornaviruses
 Topic 7. Retroviruses. HIV
 Topic 8. Other RNA genomic viruses.
 Topic 9. Poxviruses, papovaviruses, parvoviruses.
 Topic 10. Herpesviruses.
 Topic 11. Adenoviruses.
 Topic 12. Pathogens of viral hepatitis.
 Topic 13. Ecological group of arboviruses.
 Topic 14. Oncogenic viruses.
 Topic 15. Prions.

Types of education according to the curriculum are: a) lectures, b) practical classes, c) independent work of students, d) consultations.

The lecture course discovers the problematic issues of the relevant sections of microbiology.

Practical classes provide a theoretical justification of the main issues of the topic and the acquisition of the following practical skills:

- 1) research of bacterial morphology, cultural properties, making of simple serological reactions, studying of sensitivity of bacteria to chemotherapeutic agents and their evaluation independently or on the basis of experiments recorded in videos, movies presented in computer programs and other educational technologies;
- 2) solving of clinical situational tasks and tests in laboratory diagnostics of infectious diseases, assessment of immunity status assay, sanitary-microbiological assessment of the environment state, etc.), which have experimental, clinical-diagnostic or sanitary-hygienic meaning.

In practical classes, students write down protocols of their research in workbooks, make a summary on the topic and solve clinically-oriented situational tasks and tests.

The student's independent work involves preparation for practical classes and development of practical skills, study of topics for independent extracurricular work, preparation of presentations, tables, processing of scientific literature and writing reviews of the provided topics for individual work. Control of mastering the topics of independent extracurricular work is carried out at intermediate control classes and final control of the discipline.

Thematic plans of lectures, calendar plans of practical classes, thematic plan of independent extracurricular work, volume and directions of individual work are published on the site of the department.

The route for obtaining materials: Microbiology department / for students / Full-time education / Pharmacia and industrial pharmacia / 2 (3) course / Educational materials / or through the link <https://www.vnmdu.edu.ua/> microbiology department #. Access to the materials is carried out through the student's corporate account s000XXX@vnmdu.edu.ua.

5. Forms and methods of monitoring academic performance

Current control in practical studies	Methods: oral or written survey, testing, electronic survey, solving situational problems, conducting laboratory studies, interpreting them and evaluating their results (drawing up a protocol in a workbook)
Control of mastering the thematic section of the discipline at intermediate control classes	Methods: oral or written questioning, electronic testing, solving situational problems, control of practical skills
Final semester control (credit) at the end of 4 semester	According to the Regulation of the Academic process in National Pirogov Memorial Medical University (link https://www.vnmdu.edu.ua/General information)
Final control of the discipline - microbiology (<i>exam</i>)	Methods: pre-examination testing, oral questioning (according to the Regulation of the Academic process in National Pirogov Memorial Medical University (link https://www.vnmdu.edu.ua/General information)
Learning success diagnostic tools	Theoretical questions, tests, clinically-oriented situational tasks, practical tasks, practical skills demonstration

6. Assessment criteria

Knowledge assessment is carried out in accordance with the Regulations of the Academic process in National Pirogov Memorial Medical University (link <https://www.vnmdu.edu.ua/General> information)

Continuous assessment	On a four point system of traditional assessments: 5 «excellent», 4 «good», 3 «satisfactory», 2 «unsatisfactory»
Midpoint separation assessment	On a four-point system of traditional assessments
Control of practical skills	According to the four-point system of traditional assessments
Pass-fail exam (credit)	On a 200-point scale (the arithmetic average grade for the semester is converted into points) Credited: 122 to 200 points Not credited: less than 120 points (See Grading Scale)
Final control of the discipline	<i>Sum of points for pre-examination testing (12-20 points) and oral questioning (38-60 points)</i> Final exam grade: 71-80 points - "excellent" 61-70 points - "good" 50-60 points - "satisfactory"

	Less than 50 points - "unsatisfactory" / did not pass
Discipline assessments:	<p>Current academic assessment - from 72 to 122 points (conversion of the average traditional assessment of practical class on a 122-point scale): 60% of the grade for the discipline</p> <p>Final control - from 50 to 80 points: 40% of the grade for the discipline</p> <p>Individual work - from 1 to 12 points</p> <p>From 122 to 200 points in total.</p>

Discipline Score Scale: National and ECTS

The sum of grades for all types of educational activities	Score ECTS	Score on a national scale	
		For exam, course project (work), practice	for credit test
180-200	A	excellent	credited
170-179,9	B	good	
160-169,9	C		
141-159,9	D	satisfactory	
122-140,99	E	satisfactory	
61-121,99	FX	unsatisfactory with the possibility of reassembly	is not credited with the possibility of reassembling
1-60	F	unsatisfactory with a mandatory reexamination of discipline	is not credited with mandatory reexamination of discipline

Criteria for student knowledge assessment

Assessment of oral / written response during the current assessment

The grade "excellent" is given to a student who has deeply and comprehensively mastered the theoretical material, competently and logically teaches it. He is fluent in Latin terminology, clearly answers non-standard questions on the topic of the lesson, is able to link the material of the topic with previously studied sections, which indicates knowledge of the recommended literature and the ability to analyze the material studied, and clearly demonstrates the importance of theoretical knowledge for practice. Medicine

The grade "good" is given to a student who knows and has a good theoretical material, teaches it correctly, does not allow inaccuracies in the answer, is able to reveal the topic from the standpoint of its medical significance and practical application, but the answers do not go beyond the textbook, guidelines.

A grade of "satisfactory" is given to a student who knows the basic concepts and definitions of the studied topic, but admits significant inaccuracies or has difficulty in formulating the answer, does not understand the medical aspects of the topic, can not relate theoretical material to practice.

The grade "satisfactory" is given to a student who knows the basic concepts and definitions of the studied topic, but admits significant inaccuracies or has difficulty in formulating the answer, does not understand the medical aspects of the topic, can not relate theoretical material to practice.

The grade "unsatisfactory" is given to a student who does not know the theoretical foundations of the topic, makes gross mistakes in answering, does not understand the basic concepts and definitions, can not explain the importance of theoretical material for practical medicine.

Assessment of practical skills during the current assessment

The grade "excellent" is given to a student who knows the course and sequence of independent practical work to perform a practical task, finds the best options for setting up a microbiological experiment, demonstrates the correct implementation of the necessary practical skills, and correctly formulates generalizations and conclusions, draws up a protocol.

A grade of "good" is given to a student who admits inaccuracies in the performance of microbiological practice, but is able to identify errors and can demonstrate the implementation of practical skills in general, carefully draws up research results in the protocol of the practical lesson.

Assessment of "satisfactory" is given to a student who knows the basics of the practical task, but has difficulty at performing microbiological practice, can not demonstrate the correct sequence of practical skills, can not fully interpret the results of research, sloppy protocol.

The grade "unsatisfactory" is given to a student who cannot demonstrate the performance of practical skills, experiences significant difficulties in performing microbiological practice, violates the procedure for performing practical work, does not register the progress of work in the protocol.

Evaluation of testing during the current assessment

The grade "excellent" is given to the student who at carrying out test control is allowed no more than 10% of incorrect answers (volume of correct answers 90-100%). Provides correct answers to all test questions when solving clinically-oriented test tasks.

A grade of "good" is given to a student who makes no more than 20% of mistakes during the test. (volume of correct answers 80-89%). Provides correct answers to most test questions when solving clinical-oriented test tasks.

The grade "satisfactory" is given to a student who makes mistakes in no more than 40% of test tasks (the amount of correct answers is 60.5-79%). When solving clinically-oriented test tasks, it provides the correct answers to only some questions to the test.

A grade of "unsatisfactory" is given to a student who correctly solves less than 60% of the test tasks in a test survey. When solving clinical-oriented test tasks, he cannot provide the correct answers to the test questions.

Assessment of intermediate control (credit)

Intermediate control is credited if the student has mastered a certain section of the discipline in full, as evidenced by the current assessment of each practical lesson, and attended a lecture course. To assess the intermediate control, the calculation of the arithmetic average mark of the traditional assessment for the semester is performed.

Assessment of the oral answer during the final control (exam)

The grade "excellent" is given to the student competently and in a logical sequence provides answers to the questions of the exam ticket. During the answer demonstrates the ability to analyze theoretical material, makes thorough conclusions about the importance of theoretical material for practical medicine, provides clear correct answers to additional non-standard questions, can explain how laboratory diagnosis and prevention of certain infectious diseases, knows the principles of treatment and epidemiology, provides a complete description of the biological properties of the pathogen.

The grade "good" is given to a student who has a good knowledge of theoretical material and in a logical sequence provides answers to the questions of the examination ticket, but admits minor inaccuracies, which are quickly corrected when answering clarifying questions of the examiner. When answering questions on special microbiology can explain how laboratory diagnosis and prevention of a certain infectious disease, knows the principles of its treatment and features of epidemiology, provides a basic description of the biological properties of the pathogen.

A grade of "satisfactory" is given to a student who demonstrates knowledge of basic concepts and definitions when answering an exam ticket, admits significant inaccuracies or has difficulties in answering questions on special microbiology, cannot sufficiently disclose the principles of laboratory diagnosis, prevention and treatment of infectious diseases. caused by a certain pathogen, can only give some biological properties, allows inaccuracies in answering the specific questions of the examiner.

The grade "unsatisfactory" is given to a student who does not know the answer to one of the questions of the exam ticket, makes serious mistakes when answering questions on special microbiology, can not explain the basic concepts and definitions, does not know the principles of laboratory diagnosis, prevention and treatment of infectious diseases. certain pathogen, does not know the answers to additional clarifying questions of the examiner.

The calculation of individual points is carried out on the basis of the Regulation of the Academic process in National Pirogov Memorial Medical University (link <https://www.vnmu.edu.ua/General> information).

12 points - added to the assessment of the discipline for a student who won a prize at the interuniversity competitions in the discipline or a prize at the Ukrainian competition of student research reports or a prize at the interuniversity / international scientific conference with the published work;

11 points - are added to the assessment of the discipline for a student who won the first prize at the intra-university Olympiad in the discipline or the first place at the student scientific conference with the published work, or participated in the Ukrainian competition of student research papers;

10 points - are added to the assessment of the discipline for a student who won a prize (II-III) at the intra-university Olympiad in the discipline or at the student scientific conference with the availability of printed work; or for participation (without a prize place) in interuniversity competitions in the discipline or a prize place in an interuniversity / international scientific conference with the availability of published work.

9 points - are added to the assessment of the discipline for a student who participated (without a prize) in the intra-university Olympiad in the discipline or student scientific conference with the presence of published work

8 points - are added to the assessment of the discipline for a student who actively participated in the student scientific group, published a paper with results of scientific and practical research, but did not personally participate in the student scientific conference, prepared a poster report.

6-7 points - are added to the assessment of the discipline for a student who has made at least 20 smears or at least 3 tables, or an educational video to replenish the visual support of teaching the discipline (taking into account the volume and importance of work performed).

3-5 points are added to the assessment of the discipline for a student who has made at least 10 smears or at least 2 tables, or created a thematic illustrated presentation about specific pathogen (at least 2) to supplement the visual support of teaching the discipline (taking into account the volume and importance of work).

1. Policy of discipline / course

The student has the right to receive high-quality educational services, access to contemporary scientific and educational information, qualified tutoring during the study of discipline and mastering practical skills. The policy of the department during the providing of educational services is a student-centered, based on normative documents of the Ministry of Education and the Ministry of Health of Ukraine, the Statute of the University and the Procedure for the Providing of Educational Services regulated by the main principles of the organization of the educational process in National Pirogov Memorial Medical University and the principles of academic integrity (link <https://www.vnmu.edu.ua/General> information).

Adherence to the rules of VNMU, safety techniques in practical classes.

Observance of the rules of the VNMU regulations, safety precautions at practical classes. Instruction on biosafety, safety of handling chemical reagents and burners is conducted at the first practical lesson by the teacher. The instructed students are registered in the Safety Instruction Journal. A student who has not been instructed is not allowed to perform practical work.

Requirements for preparation for practical classes.

The student should be prepared for a practical lesson, testing tasks for the current topic should be solved in a workbook, diagrams and tables are filled.

A student should come to class on time, without delay. A student who is more than 10 minutes late is not allowed to the practical class and must work it in the prescribed manner.

In practical classes, the student must be dressed in a work uniform (medical gown, hat). Students who do not have a work uniform are not allowed to practice.

The student must follow the rules of safety in practical rooms and at the department.

When discussing theoretical issues, students should demonstrate tolerance, courtesy and respect for their colleagues and the teacher; when performing practical tasks, the workplace should be kept in order and be cleaned after performing practical work.

Usage of mobile phones and other electronic devices.

The use of mobile phones and other electronic devices in the classroom is allowed only during electronic testing or surveys.

Academic integrity. When studying the discipline, the student must be guided by the Code of Academic Integrity and Corporate Ethics of National Pirogov Memorial Medical University (link : <https://www.vnmdu.edu.ua/General> information)/ Code of Academic Integrity).. In case of violation of the norms of academic integrity during the current and final controls student receives a grade of "2" and must work it out to his teacher in the prescribed manner within two weeks after receiving an unsatisfactory assessment).

Missed classes. Missed classes are working out in the manner prescribed by Regulations of the Academic process in National Pirogov Memorial Medical University (link <https://www.vnmdu.edu.ua/General> information) at the time of work out schedule (published on the website of the department <https://www.vnmdu.edu.ua/> Department of Microbiology #) to the teacher on duty. To work out missed lesson student must provide a completed workbook protocol on the relevant topic, take a test and answer questions in writing or orally to the topic of the lesson. The reworking of missed lectures is carried out after providing a thesis of lecture material, or writing an abstract, or preparing own presentation on the topic of missed lecture.

The procedure for admission to the discipline final control is given in the Regulation of the Academic process in National Pirogov Memorial Medical University (link <https://www.vnmdu.edu.ua/General> information). Students who do not have missed practical classes and lectures and received an average traditional grade of at least "3" are allowed to final control.

Additional points. Individual points in the discipline that student can receive for individual work, is determined by the results of his individual work according to Regulation of the Academic process in National Pirogov Memorial Medical University (link <https://www.vnmdu.edu.ua/General> information) and policy of the course.

Conflict resolution. In case of misunderstandings and complaints to the teacher because of the quality of educational services, knowledge assessment and other conflict situations, student should submit his / her claims to the teacher. If the issue is not resolved, the student has a right to apply to the head of the department according to Complaints Consideration Procedure (<https://www.vnmdu.edu.ua/> General information / Basic documents).

Politics in terms of remote learning. Distance learning regulated by the Regulations of the elements of remote learning in National Pirogov Memorial Medical University (<https://www.vnmdu.edu.ua/> General information). The main training platforms for studying are Microsoft Team and Google Meets. Practical classes and lectures, exercises and consultations

during distance learning is published on the website of the department (<https://www.vnmu.edu.ua/> Department of Microbiology / Student or <https://www.vnmu.edu.ua/Department of Microbiology / News>). Feedback from teachers is via messengers (Viber, Telegram, WhatsApp) or e-mail (at the teacher's choice) during working hours.

Educational resources.

Educational and methodological support of the discipline is published on the website of the department (<https://www.vnmu.edu.ua/> Department of Microbiology/ To students). Consultations are held twice a week according to the schedule.

Recommended reading:

1. Medical microbiology, virology and immunology= Медична мікробіологія, вірусологія та імунологія / [Andrianova T.V., Bobyr V.V., Vinograd N.A. and others.] : Edited by V.P.Shirobokov – Vinnitsya: Nova kniga, 2018. – 744 p.
2. Medical microbiology immunology=Медична мікробіологія та імунологія/ М.Тумків, О.Корничук, С.Павлій, etc. -Vinnitsya: Nova kniga, 2018. – 416 p.
3. P.R.Murray, K.S.Rosenthal, M.A.Pfaller. Medical Microbiology, 8th edition, Elsevier, 2017.- 836 p.
4. Jawetz. Medical microbiology /Jawetz, Melnick, Adelberg. – The McGraw-Hill Companies, Inc, 2011. – 919 p. – ISBN 13: 978-0-07-147666-9..
5. Review of Medical Microbiology and Immunology, 12 edition/ Warren E. Levinson / McGraw-Hill Prof Med.-Tech., 2012. – 688 p.
6. Jawetz, Melnick, & Adelberg's Medical Microbiology, 26th Edition, 2012, English. – 880 p. – ISBN-13: 978-0071790314

Electronic resources:

Microbiology and immunology on-line <http://www.microbiologybook.org/>

On-line microbiology note <http://www.microbiologyinfo.com/>

Dr. Najeeb Lectures <https://www.youtube.com/channel/UCPHpx55tgrbm8FrYYCnAHlw>

Osmosis <https://www.youtube.com/c/osmosis/>

MEDCRAM- Medical Lectures explained clearly

<https://www.youtube.com/user/MEDCRAMvideos>

PubMed : <https://pubmed.ncbi.nlm.nih.gov/>

The timetable and distribution of groups with assigned teachers are published on the web page of the department ((<https://www.vnmu.edu.ua/> Department of Microbiology / To students). Questions to the intermediate and final semester control (credit) of the discipline are published on the web page of the department (<https://www.vnmu.edu.ua/> Department of Microbiology / To students).

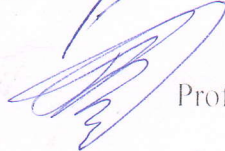
The syllabus of the discipline " Microbiology with the basic of immunology " was discussed and approved at the meeting of the department (record № 1, dated "29" august 2022)

Responsible for the academic discipline |" Microbiology with the basic of immunology"



Ass.prof.of HEI Nadiia FOMINA

Head of the microbiology department



Prof. of HEI Valentin KOVALCHUK