

**Odesa National Medical University**  
**Medical faculty**  
**Microbiology, Virology and Immunology Department**

**Syllabus of course**  
**Microbiology, Virology and Immunology**

<b>Volum:</b>	8,5 credits into ECTS, 255 hours
<b>Semester, Year</b>	IV-V semester, 2-3 cours
<b>Days, Time, Place:</b>	According the Schedule
<b>Преподаватель (-и)</b>	Hruzewskiy O.A., Head of Department, MD, PhD, associate professor; Golovatiuk O.L., MD, PhD, associate professor; Koltsova I.G., MD, PhD, associate professor; Venger A.M., PhD, associate professor; Hrydina T.L., PhD, associate professor; Borovik A.P., MD, PhD, senior lecturer of the department; Avratinskiy O.Y. MD, PhD, assistant of department; Denisko T.V., assistant of department; Dubina A.V., assistant of department; Kaglyak M.D., assistant of department; Kobylnik S.M., assistant of department; Kurtova M.M., MD, PhD, assistant of department; Nikolayeva O.V., PhD, assistant of department; Radkevich K.V., assistant of department; Tabulina A.M., , assistant of department; Tarasov Y.V., assistant of department; Shevchuk H.Y., PhD, assistant of department
<b>Phone</b>	(480) 753-0981
<b>E-mail:</b>	<a href="mailto:onmedumicrobio@onmedu.edu.ua">onmedumicrobio@onmedu.edu.ua</a> ; <a href="mailto:materials@microbiologydepart.com">materials@microbiologydepart.com</a>
<b>Workplace</b>	Microbiology, Virology and Immunology Department, 1 Knyazeska str., app. 1-6
<b>Consultations</b>	<i>Face-to-face consultations: Thursday, 14.30-16.00</i>

### COMMUNICATION

Communication with students will be carried out using E-mail, telephone, in classrooms.

### ANNOTATION OF THE COURSE

**The subject of study of the discipline** "Microbiology, Virology and Immunology" is the properties of pathogenic representatives of the world of microbes, their interaction with the human body, mechanisms of development of infectious diseases, methods of their diagnosis, specific prevention and treatment.

**Prerequisites:** The basis for mastering the discipline is knowledge, skills and abilities acquired in the process of studying medical biology, medical and biological

physics, biological and bioorganic chemistry, human anatomy, histology, cytology and embryology, Latin, history of medicine, philosophy and integrates with these disciplines.

**Post-requisites:** Lays the foundations for students to study general hygiene, epidemiology, pathological physiology, pathological anatomy, immunology and allergology, infectious diseases, internal diseases, surgical diseases and childhood diseases and other clinical disciplines, provides for the integration of teaching with these disciplines and the use of knowledge in microbiology, virology and immunology in the process of further education and professional activity.

**Purpose of the course.** Lays the foundations for the study of the physiological role of microbes in the human body and the prevention of violations of these functions in the process of drug interventions.

**Discipline objectives:**

- to interpret the biological properties of pathogenic and non-pathogenic microorganisms, viruses and the patterns of their interaction with the macroorganism, with the human microbiota and the external environment;
- to determine the methods of microbiological and virological diagnostics, etiotropic therapy and specific prevention of infectious diseases.
- explain the structure of the immune system of the human body;
- to interpret the main mechanisms of the formation of the body's immune response;
- to determine the main types of pathological reactions of the immune system and the relationship with the occurrence of the most common human diseases.

**Expected results**

As a result of studying the discipline the student have *to know*:

- algorithm for carrying out serological reactions in infectious diseases;
- algorithm for conducting microbiological research of biological fluids and secretions;
- an algorithm for conducting chemical, organoleptic, bacteriological types of research on the quality of food and water.

As a result of studying the discipline the student have *be able to*:

- evaluate the results of laboratory and instrumental studies;
- provide for the negative consequences of exposure to hazardous factors on the human body;
- to master modern methods of microbiological research in infectious diseases;
- to analyze the principles of obtaining vaccine preparations, methods of their standardization and control, practical use;
- to master the principles of production of immune sera, methods of their standardization, control, practical value;
- to interpret the development of medicine in a historical retrospective;
- to interpret the main historical and medical events;
- to demonstrate possession of moral and ethical principles of attitude towards a living person, her body as an object of anatomical and clinical research.

**DESCRIPTION OF THE COURSE**

***Forms and methods of teaching***

The course will be presented in the form of lectures (30 hours) and practical lessons (120 hours), organization of students' independent work (105 hours).

In practical classes, the methods of educational and cognitive activity will be used: a research method for studying microorganisms - causative agents of human infectious diseases. The format of practical training includes: - checking the knowledge of the prepared material (entrance testing, survey); - receiving tasks for the next lesson and clarifying the key questions that need to be worked out.

***The content of the discipline.***

**PART 1**

**SENSE SECTION 1. GENERAL MICROBIOLOGY**

Theme 1. Organization and equipment of microbiological laboratory. Microscopic examination of microorganisms. Types of microscopy.

Theme 2. Methods of microscopic examination. Main bacterial shapes. Simple and complex staining. Gram staining.

Theme 3. Structure of a bacterial cell.

Theme 4. Morphology and cell structure of spirochaeta, actinomycetes, fungi and protozoa.

Theme 5. Physiology of bacteria. Nutrient media. Methods of sterilization. Disinfection.

Theme 6. Culture methods. Isolation of pure culture of aerobic and anaerobic bacteria.

Theme 7. Cultural properties of bacteria.

Theme 8. Biochemical properties of microorganisms. Identification of pure cultures of bacteria.

Theme 9. Bacteriophages. Microbial genetics.

Theme 10. Molecular genetic methods in microbiological diagnostic.

Theme 11. Microbiological bases of antimicrobial chemotherapy and antiseptics. Antibiotics.

Theme 12. Drilling of the algorithm of application general diagnostic methods in microbiology (themes 1-11)

**SENSE SECTION 2. INFECTION. IMMUNITY**

Theme 13. Infection.

Theme 14. Biological method of research.

Theme 15. Immunity. Types of immunity. Antigens. Antibodies.

Theme 16. Cellular and humoral factors of nonspecific defense. Phagocytic activity determination. Lysozyme determination.

Theme 17. Antigen-antibody reactions (serological tests): agglutination test (AT), precipitation test (PT).

Theme 18. Neutralization test (NT). Serological tests with the use of labels: immunofluorescence test (IFT), enzyme immunoassay (EIA) (or enzyme-linked immunosorbent assay – ELISA), radioimmunoassay (RIA).

Theme 19. Immune lysis test, complement fixation test (CFT). Complement system. Determination of complement titer.

Theme 20. Serological method of diagnostics. Serological tests for detection of antigens and antibodies. Serological tests for express-diagnostics. Diagnostic antigens. Diagnostic antisera.

Theme 21. Allergy.

Theme 22. Immunoprophylaxis. Immunotherapy.

Theme 23. Human immune system. Humoral and cellular immune response. Biology of immune response. Theories of immunogenesis.

Theme 24. Methods of immune status examination. Immunodeficiencies.

Theme 25. Drilling of the algorithm of using general methods of examination in immunology (themes 13-24).

### **SENSE SECTION 3. SPECIAL MICROBIOLOGY. PATHOGENIC PROCARIOTS AND EUCARIOTS**

Theme 26. Methods of laboratory diagnostics of the infections. Meningococci and gonococci.

Theme 27. Staphylococci and streptococci.

Theme 28. Clostridia of wound anaerobic infection. Tetanus. Botulism. Anaerobic non clostridial infections.

Theme 29. Pathogenic spirochaetae.

Theme 30. Vibrios. Campylobacter. Helicobacter.

Theme 31. Brucellae. Francisella tularensis..

Theme 32. Yersinia. Bacillus anthracis.

Theme 33. Corynebacteria.

Theme 34. Mycobacteria. Actinomycetes.

Theme 35. Drilling of the algorithm for laboratory diagnostics of coccal, clostridial, spirochaetal, zoonotic corynebacterial, mycobacterial, actinomycetal and nocardial infections (themes 26-34).

### **PART 2**

### **SENSE SECTION 4. SPECIAL MICROBIOLOGY. PATHOGENIC PROCARIOTS AND EUCARIOTS.**

Theme 36. Esherichia.

Theme 37. Shigella.

Theme 38. Salmonella of enteric typhus and paratyphoids.

Theme 39. Salmonella – causative agents of acute gastroenterocolitis.

Theme 40. Rickettsia.

Theme 41. Chlamydia. Mycoplasmas.

Theme 42. Medical mycology.

Theme 43. Medical protozoology.

Theme 44. Drilling of the algorithm of laboratory diagnosis of intestinal, intracellular, fungal and protozoan infections (themes 36-43).

### **SENSE SECTION 5. GENERAL AND SPECIAL VIROLOGY**

Theme 45. Morphology and ultrastructure of viruses. Cultivation of viruses in chicken embryos and in laboratory animals.

Theme 46. Cell cultures in virology. Methods of cultivation of viruses in cell cultures. Indication of viral reproduction.

Theme 47. Methods of diagnostics of viral infections. Features of infection and immunity during viral diseases. Prions.

Theme 48. Ortho- and paramyxoviruses..

Theme 49. Picornaviruses.

Theme 50. Rhabdoviruses. Arboviruses.

Theme 51. Herpesviruses. Adenoviruses. Papillomaviruses. Polyomaviruses. Parvoviruses. Oncoviruses. Poxviruses.

Theme 52. Causative agents of viral hepatitis.

Theme 53. Retroviruses. HIV.

Theme 54. Drilling algorithm of the laboratory diagnosis of viral infections (themes 46-53).

## **SENSE SECTION 6. CLINICAL AND ECOLOGICAL MICROBIOLOGY**

Theme 55. Microflora of the human organism and its age peculiarities.

Theme 56. Bases of clinical microbiology.

Theme 57. Opportunistic infections. Hospital infections.

Theme 58. Bases of sanitary microbiology. Sanitary microbiology and virology of water, soil, air.

Theme 59. Control of practical habits and skills.

Theme 60. FINAL TEST CONTROL.

### ***List of recommended literature***

#### ***Main:***

1. Gaidash L.S., Flegontova V.V. Microbiology, virology and immunology. – Lugansk-2004 vol. 1 – 3.

#### ***Additional:***

1. Anantharyan R. Jayaram Paniker C. K. Textbook of Microbiology. 9-th Edition.- Orient Longman, 2012.

2. Warren Levinson, Medical Microbiology Immunology: Examination & Board Review . -Eighth edition / Lange Medical Book/McGraw-Hill Medical Publishing Division/ - 2004/ -649 p

3. Arora, D.R. Textbook of Microbiology.-CRS publishers and Distributors, 2001

4. Chan E.C.S., Pelczar Michael J., Krieg Noel R. Microbiology. Concepts and Applications.- McGraw-Hill, Inc.,1993

5. Chakraborty P. A Textbook of Microbiology.- New central book agency(P) LTD., 2001

6. Chopra H.L. Prof. Textbook of Medical Microbiology,1995

7. Greenwood David, Peutherer John, Slack Richard. Medical Microbiology.- Churchill Livingstone, 1997

8. Gupte, Satish M.D. The Short Textbook of Medical Microbiology. Fifth Edition.- Jaypee Brothers, Medical Publishers, New Delhi (India),1993

9. Jawetz, Melnick and Adelberg's Medical Microbiology. 21st Edition/ Edited by Brooks G.F., Butel J.S., Morse S.A.-Librairie du Liban, Lebanon, Appleton and Lange, California,1998

10. Kabajashi George S., Murray Patrick R., Pfaller Michael A., Rosenthal Ken S. Medical Microbiology.- Mosby,1998

11. Krivoshein Yu., Pyatkin K. Microbiology. Second Printing.- Mir Publishers, Moscow, 1987

12. Mackie and McCartney. Practical Medical Microbiology. 14th Edition/ Edited by Colle J.G., Fraser A.G., Marmion B.P., Sinmons A.- New York, Edinburgh, London, Madrid, Melbourne, Tokyo, 1996

13. Medical Microbiology. Edited by Greenwood D., Slack R.C.B., Peutherer J.T. 1995
14. Nester E.W., Roberts C.E., Nester M.T. Microbiology: A Human Perspective.- Wm.C.Brown Publishers, 1995
15. Topley and Wilson's Principles of Bacteriology, Virology and Immunity, 8th Edition/Vol.3/ Edited by Parker T.M., Collier L.H.- B.C. Decker Inc. Philadelphia, Hamilton.
16. Topley and Wilson's Principles of Bacteriology, Virulogy and Immunity, 8th Edtion/Vol.4/ Edited by Parker T.M, Collier L.H.- B.C. Decker Inc. Philadelphia, Hamilton
17. Talaro A., Talaro K. Foundations in Microbiology.- Wm.C. Brown Publishers,1996
18. Roitt I. Essential Immunology.-Blackwell Science,1994
19. Ron Yacov, Sigal Leonard H. Immunology and Inflammation.-McGraw-Hill Inc.,1994
20. Virella G. Microbiology and Infectious Diseases.- Mass Publishing Co. Egypt, Williams and Wilkins,1997
21. New Webster's Dictionary and thesaurus of the English Language.- Lexicon Publications, IWC. Danbury, CT, 1993.

***Informational resources***

1. Microbiology and immunology on-line <http://www.microbiologybook.org/>
2. On-line microbiology note <http://www.microbiologyinfo.com/>
3. Centers for diseases control and prevention [www.cdc.gov](http://www.cdc.gov)

**CRITERIA EVALUATION**

***Current control.***

At the current stage, students' answers to theoretical questions, the performance of practical work (research), the quality of maintaining the research protocol in accordance with the requirements, the ability to analyze and interpret research results and correctly draw informed conclusions, solving situational problems are taken into account. The assessment is carried out according to the traditional 4-point scale.

At the last lesson, in each content section, an oral survey and written test control are carried out. Tests are composed of test items from the database of the Testing Center of the Ministry of Health of Ukraine and tests developed by the department.

**Final control**

The final control is allowed for students who have successfully completed the final testing, which was carried out in the last practical lesson. The final test consists of 50 test items from the base of the Testing Center of the Ministry of Health of Ukraine and test items of examination booklets of previous years, 30 minutes will be allowed to complete it.

Final test control is assessed:

Number of correct answers	50	48-49	45-46
Traditional grade	5	4	3

The student has two more attempts to pass the FTC if there were less than 45 correct answers.

The form of the final control is an exam, which involves an oral answer to the questions of the examination card and the implementation of practical work.

***EVALUATION CRITERIA FOR STUDENT RESPONSE AT EXAM***

Holding of EXAM and estimation of student's knowledge on the EXAM

DESCRIPTION OF RESPONSE	MARK
<p>Provides a complete, detailed answer to this question, shows a set of conscious knowledge in the discipline, conclusively revealed the main provisions of questions, the answer is a clear structure, a logical sequence that reflects the essence of disclosed concepts, theories and phenomena. Knowledge on specific issues are shown on an understanding of their background in the microbiology, virology and immunology and their integration with other disciplines - from biology, human anatomy, histology, and medical chemistry, physiology, pathological anatomy, pathological physiology and pharmacology. The answer contained a literary language, using modern terminology. The student demonstrates good skills in carrying out practical tasks, correctly evaluates the results. May be admitted shortcomings in the definition of concepts student self-corrected by student during the answer.</p>	5
<p>Provide a complete, detailed answer to the questions, show ability to identify essential and nonessential features cause-effect relationships. The answer is clearly structured, logical, set out the standard language, using modern terminology. The student demonstrates sufficient skills in carrying out practical tasks, correctly evaluates the results. 2-3 errors or minor errors can be corrected with the help of teacher.</p>	4
<p>Given not enough full and detailed response. The logic and sequence of presentation has mistakes. Mistakes in the disclosure of the concepts, use of terms. The student is not able to independently identify essential and nonessential attributes and causal relationships. In response, there are no conclusions. The ability to uncover the meaning of generalized knowledge is not shown. The student demonstrates skills in carrying out practical tasks, but evaluates the results not fully and accurately. Speech requires amendment, correction.</p>	3
<p>The answer is the fragments of knowledge with substantial errors on the matter. Irrational statements. The student is not aware of the relationship under discussion on the ticket with other objects of discipline. There are no conclusions, specification, and conclusiveness of the exposition. Speech is not literate, special terminology is not used. The student demonstrates inadequate skills and knowledge, can not cope with the practical work and evaluation of the results. For more specific questions of the teacher do not lead to a correction of the student answer.</p>	2

***Selfwork of students.*** The work of students consists of independent study with a specific list of topics or topics requiring in-depth study. CP controlled in the form of tests and control works. The question is with the fact that reserved for self-study is included in the control activities. The entire volume of SR contains tasks that require systematic independent work from the student.

## Evaluation criteria

The university uses various forms of control of classes in a particular discipline (oral, written, combined, testing, practical skills, etc.). The results of students' academic performance are presented in the form of a grade on the national scale, 200-point and ECTS scale and have standardized generalized criteria for knowledge assessment: national scale: - grade "excellent" is given to a student who worked systematically during the semester. knowledge of program material, is able to successfully perform tasks provided by the program, mastered the content of basic and additional literature, realized the relationship of individual sections of the discipline, their importance for future professions, showed creative abilities in understanding and using curriculum, showed the ability to independently updating and replenishing knowledge; level of competence - high (creative); - a grade of "good" is given to a student who has shown full knowledge of the curriculum, successfully completes the tasks provided by the program, mastered the basic literature recommended by the program, showed a sufficient level of knowledge of the discipline and is able to independently update and update during further study and professional activity; level of competence - sufficient (constructive-variable); - the grade "satisfactory" is given to the student who has shown knowledge of the basic educational program material in the volume necessary for the further training and the subsequent work on a profession, copes with performance of the tasks provided by the program, has made separate mistakes in answers on examination and at performance of examination tasks, but has the necessary knowledge to overcome mistakes under the guidance of a researcher; level of competence - average (reproductive); - the grade "unsatisfactory" is given to the student who did not show sufficient knowledge of the basic educational and program material, made fundamental mistakes in performance of the tasks provided by the program, cannot use the knowledge at the further training without the teacher's help, failed to master skills of independent work; level of competence - low (receptive-productive). 29 Final control in the form of tests is assessed on a two-point scale: - grade "credited" is given to a student who has completed the curriculum of the discipline, has no academic debt; level of competence - high (creative); - the grade "not credited" is given to a student who has not fulfilled the curriculum of the discipline, has an academic debt (average score below 3.0 and / or absences); level of competence - low (receptive-productive). The multi-point scale characterizes the actual success of each student in mastering the discipline. Conversion of the traditional grade from the discipline to 200-point is performed by the information and computer center of the university program "Contingent" by the formula: average grade point average (current / from the discipline) x 40

national grade	point
"5"	185-200
"4"	151-184
"3"	120-150

The ECTS rating scale evaluates the achievements of students in the discipline who study in one course of one specialty, according to their scores, by ranking, namely:



ECTS grade	Statistical indicators
“A”	Top 10% of students
“B”	next 25% of students
“C”	next 30% of students
“D”	next 25% of students
“E”	last 10% of students

The ECTS scale establishes the student's belonging to the group of best or worst among the reference group of classmates (faculty, specialty), ie his rating. When converting from a multi-point scale, as a rule, the limits of grades "A", "B", "C", "D", "E" do not coincide with the limits of grades "5", "4", "3" on the traditional scale. Grade "A" on the ECTS scale cannot be equal to grade "excellent", and grade "B" - grade "good" and so on. Students who receive grades "Fx" and "F" ("2") are not included in the list of ranked students. Such students automatically receive a score of "E" after re-assembly. The grade "Fx" is given to students who scored the minimum number of points for the current educational activity, but who did not pass the final 30 control. Grade "F" is given to students who have attended all classes in the discipline, but did not score an average score (3.00) for current academic activities and are not admitted to the final control. Criteria for assessing the current performance of students should be reflected by the departments in the work programs in the disciplines, indicating a clear structure of student receipt in the assessment class.

## **COURSE POLICY**

### **Deadline and retake policy:**

To prepare for the tests, a certain period is given. Control tests that are passed in violation of the deadlines without good reason are evaluated for a lower grade (-1 or 2 points). After the deadlines, it is impossible to get the maximum number of points for the test.

**Academic Integrity Policy:** Cheating during exams is prohibited (including using mobile devices).

**Attendance Policy:** Practical classes are compulsory and no points will be awarded for attending lectures. Illness is considered a good reason for absence from classes, confirmed by a certificate from a doctor (sick leave).

**Mobile devices:** the use of mobile devices during the control of students' knowledge is prohibited in the classroom.