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MEDICAL UNIVERSITY OF PLOVDIV  
FACULTY OF PHARMACY  
DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

ACADEMIC STANDARD  
OF  
MICROBIOLOGY  
FOR  
MEDICAL STUDENTS

MEDICAL UNIVERSITY - PLOVDIV

FACULTY OF PHARMACY

DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

**1. Purpose of Microbiology course**

The main objective of the course in Microbiology for medical students is to obtain a thorough knowledge of the morphological and biological characteristics of microorganisms, the patterns of development of the infectious process, the specific and non-specific immune protection of the organism, the diagnosis of infectious diseases and the prevention and control of infections.

The objective is consistent with:

- the volume and credit rating of the discipline (ECTS system), evident from the syllabus available on the website of MU - Plovdiv;
- the qualification characteristics of the specialty;
- educational degree (Master);

The objective is consistent with the position of Microbiology discipline in the specialty Medicine in its importance and chronology in the curriculum. As a fundamental discipline, it predominantly serves the next stages of training.

Priority goals of the University are: Development of students' personal qualities, encouragement of their initiative, creation of habits of permanent self-education and ability to learn on their own, acquisition of "transferable" knowledge, key competences and skills.

This is introduced in the content of the course in Microbiology.

**2. Course content of the course Microbiology**

The topics and hours of lectures and practical classes in microbiology are listed on the website of MU - Plovdiv:

<http://mu-plovdiv.bg/en/faculties/faculty-of-pharmacy/departments/department-of-microbiology-and-immunology/> and in Annex 1.

The content is arranged chronologically so that each subsequent lecture and related practicals use already learned material and concepts. The unnecessary overlap or the existence of "white spots" between "curriculum-related" disciplines is avoided.

The main objectives of the microbiology curriculum are:

- Introduction to the morphology, physiology and pathogenic factors of microorganisms that play a role in human pathology;
- Studying the patterns of emergence and course of the infectious process, the pathogenesis of infectious diseases and the various forms of infection;
- Studying the mechanisms for protection of macroorganisms - natural resistance and adaptive immunity, as well as the principles of immunoprophylaxis and immunotherapy of infectious diseases;

- Antimicrobial chemotherapy – knowledge about the mechanisms of action of main groups and representatives antimicrobial agents, as well as the mechanisms for the development of bacterial resistance;
- The principles and basic methods of sterilization and disinfection;
- Mastering the microbiological diagnostics of infectious diseases; the structure and role of the microbiological laboratory for the etiological diagnosis of infectious diseases; skills for proper clinical interpretation and analysis of laboratory results;
- Studying the methods for microbiological, immunological and molecular biological diagnostics of infectious diseases, as well as the correct interpretation of the obtained results;
- Studying the composition and role of the normal microflora of the human body;
- Exploring the role of the external environment in the spread of infectious agents and the methods and means of microbiological control of the environment.

### **3. Prerequisites**

The medical student must have a basic knowledge of biology and chemistry from first-year medical university degree programs in order to begin and successfully complete their microbiology training.

### **4. Academic resources**

The academic staff of the Department of Microbiology and Immunology includes 4 habilitated teachers, 3 non-habilitated teachers with educational and scientific degree "PhD" in the relevant scientific specialty microbiology and 11 non-habilitated teachers. Out of all teachers 8 have acquired a specialty in Microbiology, 1 in Immunology, and 1 - in Virology. One teacher is enrolled and provides training in the field of microbiology and one in immunology. Two of the habilitated professors also have a second Master's Degree in Health Management.

The lectures are leaded by a habilitated lecturer (professor or associate professor) with an educational and scientific degree "Ph.D." under the relevant doctoral program. Up to 30% of the lectures are assigned to non-habilitated teachers who hold a Ph.D.

Practical classes are conducted by habilitated and non-habilitated teachers (assistant or chief assistant). Non-habilitated teachers hold a Master's Degree in Medicine and are elected by a competition.

### **5. Material resources**

The Department of Microbiology and Immunology of MU-Plovdiv has 4 teaching laboratories, equipped with microscopes with specialized observation software, multimedia presentation equipment and an interactive training system for students to illustrate the learning process. The total (laboratory) area of the department is 470.27 m<sup>2</sup>. Of these, the laboratory premises are 141m<sup>2</sup>. The department also has a collection of laboratory equipment and microscopes to assist with the study work as demonstration materials. The laboratory equipment of the department includes general equipment (laboratory scales, refrigerators, freezers, including low-temperature at 80 C°, standard incubators, CO<sup>2</sup> incubator, water baths, centrifuges (including high-speed), and specialized diagnostic equipment: nephelometer, immunofluorescent and inverted microscopes, two PCR apparatus, real-time PCR, multiplex PCR for specialized diagnosis and research in meningitis,



intestinal, respiratory infections and sepsis, ELISA apparatus, automated immunoblot, automated bacterial growth analyzer for body fluids, automatic fluorimeter for viral marker detection, MALDI-TOF system for microbial identification, museum exhibition of antique microbiological devices.

## **6. Lecture training**

The lectures are prepared and delivered in the form of multimedia presentations, which are provided to students electronically, including on the site of MU – Plovdiv, so that they can prepare for each class. The volume and format of the lectures are the choice of the leading speaker.

## **7. Laboratory practicals**

They are conducted in groups. Methodical instructions, manuals and tests are provided for the practicals.

Tests check:

- student training;
- the results (knowledge and skills gained) of the specific practical.

There is a discussion with the students.

## **8. Information resources. Basic literature. Sites.**

The lecturers are obliged to prepare lectures and practicals in the discipline and to provide their lectures, training tests and other teaching materials in electronic form.

A list of the main recommended literature for the discipline of microbiology for each of its components (lectures, practicals) with priority of the available sources (main literature) are provided. Internet resources may also be recommended to find suitable materials.

### **Student books:**

1. Levinson W, Review of Medical Microbiology and Immunology, 14<sup>th</sup> ed, 2016, McGraw-Hill Education, ISBN: 978-0-07-184574-8
2. Murray P, K. Rosenthal, M. Pfaller, Medical Microbiology, 8<sup>th</sup> ed, 2016, ELSEVIER, ISBN: 978-323-29956-5.
3. Cornaglia G, R. Coureol, J-L Herrmann, G. Kahlmeter, H. Peigue-Lafeniller, J. Vila. European Manual of Clinical Microbiology. 1-st ed. 2012, ESCMID. ISBN 978-2-87805-026-4.

### **Web sites:**

1. <https://www.ncbi.nlm.nih.gov/books/NBK7627/>
2. <http://www.textbookofbacteriology.net/>
3. The site of the Department of Microbiology and Immunology is on the web site of MU-Plovdiv: <http://mu-plovdiv.bg/en/faculties/faculty-of-pharmacy/departments/department-of-microbiology-and-immunology/>

where microscopic slides, nutrient media, some practical microbiology tests and lecture courses are available.

## **9. Control works**

Students are loaded down with the study material dynamically and intensively throughout the semester. The presumption is that the method of acquiring knowledge and skills is an important factor for their depth, durability and applicability. Teachers monitor students' progress at least twice a semester. Ongoing control is performed through tests or control assignments. Students are provided with timely information and explanations of the results of the tests to assist in their further training. Up to 3 (three) days after the announcement of the results the student has the right to get acquainted with his work.

The results of these examinations are included as a component in the final semester grade.

## **10. Independent training and extracurricular work of the student**

The independent work is guided by the teacher (assistant), who guides the student both in the literary sources and in the methods of their mastering. Sample training tests are provided, including online, for self-study and student exercises. The electronic version of microscopic slides, nutrient media and some practical microbiology tests available on the Department's website at MU-Plovdiv website are also helpful in this regard.

## **11. Collaboration between teachers and students**

This cooperation shall be expressed in:

- teacher's commitment to the student and his / her preliminary training, current difficulties in mastering the material and opportunities for individual learning program to achieve better results.
- consultation hours according to a pre-approved schedule announced in the department.
- to involve students in teams of scientific assignments, research, projects, circular activities, etc.

## **12. Exams**

1. The on-going assessments planned in the specialty curriculum shall be given for:

- The student's results in laboratory and/or seminar practicals, individual tasks, student's work with the research and project teacher, etc.;
- At least two (one in the middle and one at the end of the semester) control writing exams or student work.

2. The semester exam consists of 3 components:

- anonymous entry test lasting 30 minutes; students with a minimum of 60% correct answers are admitted to the written exam
- written exam (anonymous for the above) lasting 1 hour and 30 minutes; students are allowed to pick up two exam topics and have one writing option
- oral examination (final stage of the exam), conducted according to the schedule for the day.

The final evaluation was made by a committee composed of the Examiner and two assistants. The written exam is the leading component, but the student's persistence, reflected in the current semester assessment, is also important.



### 13. Evaluation standards:

The standards for evaluating student medical achievement are carefully considered and defined so as to objectify students' evaluations, which are not crucial to the subject of the teacher.

Description of the standards for the assessment of the microbiology exam:

- Excellent (6) - for a good knowledge of information sources, thoroughly mastered essential and additional knowledge and skills, a meaningful and correct understanding of the matter, skills to solve complex cases, own thinking and reasoning of decisions;
- Very good (5) - for very well mastered essential and additional knowledge, a meaningful and correct understanding of the material, skills for applying the learned material in complex case studies;
- Good (4) - for mastering essential and additional knowledge to solve cases and tasks, but without being able to develop them into independent thinking;
- Average (3) - for mastering essential knowledge and solutions to simple tasks related to microbiological diagnostics;
- Poor (2) - Does not meet any of the requirements above;

As they begin their microbiology classes, students are introduced to the assessment norms, the procedures for on-going monitoring and the opportunities to receive feedback on their progress during the semester.

### 14. Formation of the final assessment

The final grade determines the extent to which the student has achieved the goal of the initial training. It is multi-component and includes a written final exam and at least one of the following components:

1. assessment(s) of current control (colloquium, tests);
2. oral examination;
3. assessment from the practical final exam;

Other possible components are:

4. evaluation of the laboratory practicals and/or seminars during the semester;
5. evaluation of the research and project work in collaboration with the teacher in the discipline;

For each component participating in the final evaluation a coefficient of significance (from 0 to 1) is determined, the total sum of the coefficients must always be 1. The final rating is obtained as the sum of the six-point scores from the various components, multiplied by the corresponding coefficients of significance.

$Q \text{ final grade} = K1 \text{ Q current control score} + K2 \text{ Q written exam} + K3 \text{ Q oral exam}$

$K1 = 0.20; K2 = 0.50; K3 = 0.30$

If one of the components of the final grade is poor 2, then the final grade is necessarily poor 2.

The components involved in forming the grade and the coefficients of significance for each discipline are determined by the Academic Council with the adoption of this Academic Norm of the discipline.

In the semester exam students' written papers are evaluated anonymously.

The examination materials in Microbiology are stored and the students are given the opportunity to get acquainted with them and the grounds for assessment according to the procedure announced in advance. Students have access to the exam materials and results no longer than 5 working days after the exam date.

The students are informed for the characteristics of the discipline Microbiology at the beginning of the training.

This requirement is set in accordance with the higher education law, line 56, paragraph 1, "Teachers are obliged to develop and publicize, in an appropriate manner, a description of the lecture course they provide, including the titles and sequences of the topics of the course content, reference literature, the method of forming the assessment and the form of assessment of knowledge and skills."

#### **15. Documentation, storage of results and control of evaluation activities**

- assessed students have the right and obligation to be informed of the regulations, procedures and results of assessment, to make claims and complaints in the event of non-compliance with these rules.
- the student's right within the meaning of the preceding paragraph is valid in the case of identified technical defects or errors (e.g. in calculating or drawing up the grades), as well as on serious grounds for discrepancy between the actual knowledge, skills and competences shown and the final evaluation obtained for them.
- adjustments to the grades in the preceding of the above mentioned paragraph in the student record book, exam protocol or in the general grade book are allowed only by the discipline holder.
- any disputes and claims by the students should be made in written form to the assessment team, who should provide a motivated answer by the end of the next working day.
- established and proven cases of a serious violation of the student's rights in the assessment of his / her knowledge, skills and competences are addressed by a written complaint to the Vice Rector for quality.

The academic standard for the discipline has been approved by decision of the Academic Council - Protocol No. 9 / 26.11.2015 and published on the website of the MU - Plovdiv.

*Approved:*

*Head of the Department*

*/Prof. Dr. M. Murdjeva, MD, PhD, MFM/*

