

**MEDICAL UNIVERSITY- PLOVDIV**  
**FACULTY OF MEDICINE**  
**DEPARTMENT OF CLINICAL LABORATORY**

**ACADEMIC STANDARD**  
**FOR**  
**THE DISCIPLINE “CLINICAL LABORATORY”**

**1. Purpose of the education**

The main objective of clinical laboratory discipline is to organize and implement optimal clinical laboratory training, which will provide necessary medical students training in the discipline for a complete, successful and effective work in the medical profession.

The objective is consistent with:

- The mission and concept of MU - Plovdiv
- The volume and credit rating of the discipline (ECTS system) as outlined in the curriculum
- The qualification characteristic of the specialty
- Master's degree

The objective is in accordance with the place of discipline in the specialty of importance and chronology in the curriculum. As a fundamental discipline, it predominantly serves the next stages of training.

**2. Education content**

The topics and the hours for lectures and practical exercises are posted on the website of the university. Learning content is organized chronologically in such a way that each consecutive lection and related practical classes use previously studied subject matter and concepts. Thus, avoidance of unnecessary overlap or the existence of "white spots" between "linked" curriculum discipline unnecessary overlap between "related" disciplines is avoided.

**3. Prerequisites**

The student must have a basic knowledge of biology, chemistry and educational programs in high schools to begin and successfully complete training in a clinical laboratory.

**4. Academic resources**

The academic staff of the Department of Clinical Laboratory includes 1 professor, and 7 assistant professors. All lecturers have acquired a specialty in a clinical laboratory. The lectures are delivered by professor or associate professors with a PhD or Doctor of Medical Sciences degree in the corresponding doctoral program. Up to 30% of lectures are awarded to assistant professors with PhD degree in the relevant doctoral program. Practical classes are held by assistant professors with a Master's degree in medicine, and are appointed after a selection exam.

**5. Material resources**

The Department of Clinical Laboratory at the Medical University - Plovdiv has 3

(three) administrative offices, 4 (four) classrooms and 2 (two) training laboratories. The administrative offices are:

- One for Head of Department with an area of 12.7 m<sup>2</sup>
- One for Assistant Professors with an area of 16 m<sup>2</sup> and 4 workplaces
- One for PhD students with an area of 15 m<sup>2</sup> and 3 workplaces

The classrooms and training laboratories have a total area of 178.5 m<sup>2</sup>:

- Classroom №1 – 31 m<sup>2</sup> with 12 workplaces for students
- Classroom №2 – 30 m<sup>2</sup> with 12 workplaces for students
- Classroom №3 – 30 m<sup>2</sup> with 12 workplaces for students
- Classroom №4 – 30 m<sup>2</sup> with 20 workplaces for students
- Classroom №5 – 30 m<sup>2</sup> with 24 workplaces for students
- Training laboratory 1 – 30 m<sup>2</sup> with 8 workplaces for students
- Training laboratory 2 – 30 m<sup>2</sup> with 8 workplaces for students

The Department of Clinical Laboratory has 4 “Leica” light microscopes for training purposes of students, PhD students and postgraduate students. In addition to general equipment (laboratory scales, refrigerators, thermostats, centrifuges, etc.). The Department uses the modern equipment at the Clinical Laboratory of the University Hospital “St. George”:

- Atomic Absorption Spectrometer (Thermo Scientific, UK)
- Immunological Analyzers Access 2 (Beckman Coulter, USA) and Architect plus i2000SR (Abbott, USA)
- Clinical-chemical analyzers "Olympus AU480" (Beckman Coulter, USA) and "Konelab Prime60i" (Thermo Scientific, USA)
- Sysmex CS-2500 coagulometer (Beckman Coulter, USA)
- Advia 2120 Hematology System (Siemens, Germany)

## **6. Lectures**

The lectures are delivered as multimedia presentations and provided to the students in advance. The extent and format of the lectures are chosen by the lecturer.

## **7. Practical classes**

Practical classes are held separately for each group. Methodical instructions, guides and tests are provided for the exercises. Independent or team tasks are assigned. Checking:

- Student preparation
- The results (acquired knowledge and skills) of the specific exercise.

As a methodical form, preference is given to teamwork, team discussions. Students may be assigned tasks to prepare and defend their thesis (presentation) on a topic that the teacher defines in the previous lesson. A discussion is then held with groups of students, before whom the reporting student defends his thesis. Practical exercises are illustrated with printouts from analyzers, documented data for quality control of laboratory results, blood smear from peripheral blood, training dummy for venous blood collection.

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

The lecturer is required to have developed lectures and exercises in the discipline and to provide in electronic form or in paper form his lectures, training tests or other teaching materials. A list of the main recommended literature for the discipline is presented, with each component (lectures, exercises) with priority of the available resources. Internet resources may also be

recommended from which appropriate materials can be found for student preparation.

### **Recommended books**

1. Clinical laboratory interpretation of results. ed. by T. Deneva, Plovdiv, 2021
2. Marshall, William J. et al. Clinical chemistry / William J. Marshall, Andrew Day, Marta Lapsley. - 8th ed.- Edinburgh : Elsevier, 2017.
3. Clinical chemistry: Principles, techniques, and correlations / Ed. Michael L. Bishop, Edward P. Fody, Larry E. Schoeff. - 7th ed.- Philadelphia: Wolters Kluwer / Lippincott Williams & Wilkins, 2013
4. M. Pincus. Henry's Clinical diagnosis and Management by laboratory methods, 21st ed.
5. S. K. Strasinger, M. Sch. Di Lorenzo. Urinalysis and Body Fluids. 5th ed. E. A. Davis Company- Philadelphia, 2008

### **Websites**

1. Lichtman's Atlas of Hematology 2016 , Lichtman MA, Shafer MS, Felgar RE, Wang N  
<https://accessmedicine.mhmedical.com/Book.aspx?bookid=1630>
2. Longo, Dan L. "Atlas of Hematology." Harrison's Principles of Internal Medicine, 21e Eds. Joseph Loscalzo, et al. McGraw-Hill Education, 2022,  
<https://accessmedicine.mhmedical.com/book.aspx?bookid=3095&isMissingChapter=true>
3. Laposata's Laboratory Medicine: Diagnosis of Disease in the Clinical Laboratory, 3e  
<https://accessmedicine.mhmedical.com/book.aspx?bookid=2503>

### **9. Control assignments**

Students should be load dynamically and intensively throughout the semester. It is based on the understanding that the way of acquiring knowledge and skills is an important factor for their depth, durability and applicability. Ongoing control of students' knowledge is conducted through tests at least twice a semester. Students are provided with timely information and explanations about the results of the control (at the next exercise) to assist in their further preparation. Up to 3 (three) days after the results are announced, the student has the right to get acquainted with his / her work. The results of these tests are included as a component in the final grade for the semester.

- **Poor (2)** - the student shows a paucity of knowledge that cannot serve as a basis for the next levels of study - pre-clinical and clinical.

- **Satisfactory (3)** - the student reproduces knowledge in a "ready-made scheme", missing the main points of the developed topic; the reference boundaries are partially mastered, encounters serious difficulties in attempting to interpret the results of clinical laboratory tests independently, shows gaps in the practical skills to perform basic laboratory activities, the terminology is not well and properly understood, the presentation is characterized by poor language.

- **Good (4)** - the student develops the topic descriptively, reproductively, using typical situations, shows limited autonomy in the interpretation of laboratory information, performs basic clinical laboratory activities relatively well, knows the benchmarks of clinical laboratory indicators well, in the presentation, although there is good language culture, inaccuracies in the concepts used are allowed.

- **Very good (5)** - the student develops the topic alone productive, unconventional, looking for a new reading of the data used by the scientific literature, properly select the most informative combination of indicators, knows very well the correlation between indicators, able to solve clinical laboratory diagnostic tasks with minimal gaps, uses clinical concepts adequately, has a good linguistic culture.

- **Excellent (6)** – the student independently, logically, with the presence of a creative element

brings out the topic, justified and originally uses and interprets the data from the scientific literature related to the subject under consideration, is familiar with innovative methods of analysis in the clinical laboratory, is thoroughly aware of the diagnostic reliability of the results, in details is familiar with the correlation between different indicators in different diseases, which allows him to select the most informative combination of indicators, the reference limits are fully absorbed, monitored with is willing to use the acquired theoretical knowledge and practical skills; accuracy and rich linguistic culture of the exhibition.

When starting classes, students should be familiar with assessment standards, procedures for ongoing supervision, and opportunities to receive feedback on their semester progress.

### **10. Self-learning and extracurricular work of the student**

The self-learning of the student is guided by the lecturer (assistant) who guides the student both in the references and in the methods of their use. They also provide training tests, incl. on-line, for independent work and student exercises.

### **11. Cooperation between lecturers and students**

- This cooperation is expressed in:
- Commitment of the teacher to the student and his / her pre-training, current difficulties in learning the material and opportunities of further achievements through individual learning program.
- Counselling hours.
- Involving students in teams for scientific tasks, research, projects, etc.

### **12. Exams**

Current assessments planned in the curriculum of the discipline are given for:

1. The results of student in seminar exercises, coursework and individual assignments, research and projects with lecturer, etc.
2. At least two (one in the middle and one at the end of the semester) control written exams.

### **13. Evaluation standards**

Successful study of the clinical laboratory discipline in the syllabus is assessed as the value of grades divided into two main elements:

- **First element** - includes the assessment of the student's academic activity throughout the semester (20%). It includes assessments of current control (written tests, tasks or presentation on a specific theme at least twice during the semester. Tests and tasks are prepared by the individual assistants for the various topics. The final semester grade is formed based on all current tests and tasks.
- **Second element** - includes the theoretical exam grade (80%). The theoretical exam is written, on two questions from the syllabus combined in exam tickets, individually drawn by each student. The time for written answers to the questions is 2 academic hours. At the discretion of the examination committee, an oral exam is held for short answers to questions on the exam topics and the syllabus.

Regulation of the examination is organized to minimize the possibility of manipulating its results. Clear assessment standards are being developed for the discipline. The levels of reproduction and use of knowledge by students are defined as information - reproductive, technological - productive, problematic - productive, innovative - creative.

#### **14. Final grade formation**

The final grade determines the extent to which the student has achieved the goal of study set at the beginning of the academic standard. It is multicomponent and includes an evaluation of:

- Current control
- Final exam - The theoretical exam is in a written form on two questions from the questionnaire of Clinical laboratory, individually selected by each student. The time for completing the written exam is two academic hours. Oral examination is held at the discretion of the examiners.

For each component involved in the final evaluation coefficient of significance (0 to 1) is determined and the total sum of the coefficients should always be 1. The final degree mark is obtained as sum of the component's marks multiplied by the coefficients of significance.

$$\text{Final grade (Q)} = 0.20 \times Q_1 + 0.80 \times Q_2$$

**Q<sub>1</sub> - current control grade**

**Q<sub>2</sub> - final exam grade**

**If the grade from the final exam is poor 2, the final grade is necessarily poor 2**

The components involved in the formation of the grade and the coefficients of relevance for each discipline are determined by the Academic Council with the adoption of this academic standard of the discipline.

#### **15. Documentation, result storage and control of the assessment procedure**

- 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 for example 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 grade for them.
- Corrections in the score under the preceding paragraph are allowed in the Student Book, the examination protocol or in the General Book only by the chief of the discipline.

The exam materials are stored, and the students are given the opportunity to get acquainted with them and the grounds for assessment according to the procedure and procedure announced in advance. The period during which students have access to the examination materials and results is no longer than three (3) business days after the exam date.

The characteristic of the discipline is provided to the student at the beginning of the course. This is in accordance with the law on higher education art. 56, paragraph 1: "Teachers are obliged to develop and publicize, in an appropriate manner and description, 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."

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