



**S Y L L A B U S**

**IN**

**CLINICAL LABORATORY, BIOCHEMISTRY AND**

**IMMUNOLOGY**

Specialty “NURSING”

Educational and qualification degree "**Bachelor**"

Professional qualification: "Nurse"

Professional field "Healthcare"

From of education: Full-time

Approved by the Department Council on 14.04.2025 Protocol № 05

Confirmed by the Faculty Council on 08.10.2025 Protocol № 06

**Plovdiv, 2025**



**MEDICAL UNIVERSITY – PLOVDIV**  
**FACULTY OF PUBLIC HEALTH**

**„CLINICAL LABORATORY, BIOCHEMISTRY  
AND IMMUNOLOGY “**

**Faculty**

Faculty of Medicine

**Department**

Department of Clinical Laboratory

**Professional field**

7.1 Medicine

**Specialty**

„Nursing”

**DESCRIPTION**

**1. Name of the course**

Clinical Laboratory, Biochemistry and Immunology

**2. Course code**

**3. Course type: Mandatory / Elective / Facultative**

Mandatory

**4. Course Level (CSL)**

Bachelor's Degree

**5. Year of study**

1<sup>st</sup> year

**6. Semester/trimester**

2<sup>nd</sup> semester

**7. Number of ECTS credits**

1.5

**8. Lecturer's name**

Habilitated lecturer from the Department of Clinical Laboratory

**9. Learning outcomes for the course – acquired knowledge, skills, competencies  
(objectives)**

Students successfully completed this course:

**1. Will know:**

- basic biochemical processes in the human body and changes in the metabolism in health and pathology
- basic rules and requirements for specimen collection for clinical-laboratory analysis
- place and role of the nurse in the pre-analytical phase
- basic rules and requirements for preparation of the patient for clinical-laboratory analysis

## **2. Will be able to:**

- collect biological samples for clinical-laboratory analysis correctly

## **3. Will acquire the following competencies:**

- role and obligations of the nurse in the different phases of clinical laboratory analysis
- storage and transport of the specimen for clinical-laboratory analysis
- influence of different factors on the clinical laboratory result
- basic knowledge for interpretation of the results and clinical significance of different laboratory parameters

## **10. Teaching Methodology:**

In-class: lectures (10 academic hours) and exercises – seminars, independent work (5 academic hours)  
Monitoring of the students' extracurricular activities.

## **11. Prerequisites (knowledge and skills from previous training) and requirements for other (concurrent) courses**

Must have undergone training in the disciplines of biology, physics and chemistry

## **12. Recommended elective program components**

All components of the course are mandatory.

## **13. Course content**

The aim of the discipline is to provide basic knowledge about clinical laboratory parameters and the requirements for their analysis, to create skills for correct and complete interpretation of clinical laboratory results.

The training course gives theoretical knowledge about biochemical processes and metabolism in the body, about the role of the nurse in the clinical-laboratory diagnostic process; patient preparation, rules for specimen collection, storage and transport to the laboratory, factors influencing the laboratory result.

## **13.B. Thematic content of the course and Conspectus**

### **LECTURES**

**1. LECTURE** The role of clinical laboratory in the field of medicine. Subject and tasks of clinical laboratory. Lab structure (units, sections) and working process. Basic methods in clinical laboratory. Phases of clinical-laboratory analysis. Reference ranges of the laboratory results. – **2 hours**

**2. LECTURE** Hemoglobin in blood – structure, synthesis and breakdown. CBC, RBC count, erythrocyte indices, DBC and ESR. Common data for the parameters. Reference ranges. Informative content. Hemostasis – definition, components, phases. Basic clinical laboratory parameters for evaluation of hemostasis. Reference ranges, informative content. Clinical significance. – **2 hours**

**3. LECTURE** Metabolism in the human organism – basic terminology. Chemical composition, structure and metabolism of proteins. Total serum protein. Major protein fractions in electrophoreses. Individual proteins, proteins of the acute phase. Informative content. Non-protein nitrogen compounds: urea, creatinine, uric acid – metabolism. Informative content. – **2 hours**

**4. LECTURE** Carbohydrate metabolism. Informative content of blood glucose testing. Lipid metabolism. Lipoprotein fractions, cholesterol and triglycerides. Informative content. Serum bilirubin and fractions – metabolism. Informative content. – **2 hours**

**5. LECTURE** Enzymes. Classification and functions. Secretory and cell enzymes. ASAT, ALAT, LDH, alkaline phosphatase, creatinephosphokinase, amylase and cholinesterase. – common data for the parameters. Clinical significance. Water electrolyte balance. Electrolytes, trace elements - metabolism. Informative content. – **2 hours**

### **PRACTICALS (SEMINARS)**

**1. EXERCISES** Specimen collection for clinical laboratory analysis. Basic rules and requirements for collection, storage and transport of venous blood, capillary blood, urine, CSF, other body fluids and stool to the laboratory. Preparation of the patient for specimen collection. Factors influencing the laboratory result. Basic groups of biological factors. – **3 hours**

**2. EXERCISES** Effects of the medical procedures and medication on the laboratory results. Endogenous and exogenous interference on the laboratory result. Sources of errors in different phases of clinical-laboratory analysis. Sources of errors in specimen collection – blood, urine, CSF, ets. – **2 hours**

### **CONSPECTUS IN CLINICAL LABORATORY, BIOCHEMISTRY AND IMMUNOLOGY SPECIALTY „NURSING”**

1. Subject and tasks of clinical laboratory. Basic methods in clinical laboratory.
2. Phases of clinical-laboratory analysis. Specimens for clinical-laboratory analysis. Closed systems for blood sampling. Basic rules and requirements for specimen collection. Reference ranges of the laboratory results.
3. Factors influencing the laboratory result. Basic groups of biological factors. Effects of the medical procedures and medication on the laboratory results. Endogenous and exogenous interference on the laboratory result.

4. Sources of errors in different phases of clinical-laboratory analysis. Rules and procedure for collection of venous and capillary blood, storage and transport to the laboratory. Sources of errors.
5. Venous or capillary blood for testing – advantages and disadvantages. Evacuated tubes – standard order of draw. Serum or plasma. Rules and requirements for specimen collection.
6. Urine for clinical laboratory investigation – clean catch, random urine, diuresis. Basic rules and requirements for collection, storage and transport to the laboratory. Sources of errors.
7. Basic rules and requirements for collection, storage and transport of CSF, other body fluids and stool to the laboratory. Sources of errors.
8. Hemoglobin in blood – structure, function, disorders of hemoglobin synthesis. Reference ranges. Different types of hemoglobin, abnormal hemoglobin. Informative content and clinical significance.
9. CBC. Hematocrit. RBC count. Erythrocyte indices. Informative content.
10. DBC and ESR. Common data for the parameters. Reference ranges. Informative content
11. Hemostasis – definition, components, phases. Basic clinical laboratory parameters for evaluation of haemostasis. Reference ranges, informative content. Clinical significance.
12. Enzymes. Classification and functions. Secretory and cell enzymes. ASAT, ALAT, LDH – common data for the parameters. Clinical significance.
13. Enzymes. Classification and functions. Alkaline phosphatase, creatinephosphokinase, amylase and cholinesterase – common data for the parameters. Clinical significance.
14. Structure and metabolism of proteins. Total serum protein. Major protein fractions in electrophoreses. Individual proteins, proteins of the acute phase. Informative content.
15. Non-protein nitrogen compounds: urea, creatinine, uric acid – metabolism. Informative content.
16. Carbohydrate metabolism. Glucose in the blood - indications for investigation, informative content. Clinical significance.
17. Two-hour postprandial test and glucose tolerance test (GTT), requirements and indications for the tests, sources of errors, reference ranges, informative content. Glycated hemoglobin – indications for investigation. Clinical significance.
18. Lipid metabolism. Lipoprotein fractions, cholesterol and triglycerides. Informative content.
19. Serum bilirubin and fractions – metabolism. Informative content.
20. Water electrolyte balance. Electrolytes – K<sup>+</sup>, Na<sup>+</sup>, Cl<sup>-</sup> Functions. Informative content and clinical significance.
21. Trace elements. Serum iron – metabolism. TIBC, transferrin and ferritin. Common data. Clinical significance.

### **13.C. Technical support for training**

Multimedia projector, laptop, projection screen.

Classroom classes are held in modern auditoriums or halls, equipped with multimedia equipment and with Internet access.

For independent work, students can use a library, a computer room with free access. Students have the opportunity to receive consultations by meeting in person with the lecturers during the hours designated for consultations.

### **14. Bibliography (main titles)**

In addition to the provided lecture material, it is recommended to use the following resources:

### **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

### **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. Laposata's Laboratory Medicine: Diagnosis of Disease in the Clinical Laboratory, 3e  
<https://accessmedicine.mhmedical.com/book.aspx?bookid=2503>

### **15. Planned learning activities and teaching methods**

The course includes lectures, exercises and seminars, as well as control over the students' extracurricular activities /self-study, assignments for independent work/

**Teaching methods** - lecture presentation; discussions; debate on course topics

### **16. Evaluation methods and criteria**

The course ends with a written exam on two questions from the conspectus with a duration two academic hours.

The final grade is formed as the average score of the two exam questions.

### **17. Language of teaching**

English

### **18. Internships/practicums**

Not included

### **19. Prepared the description**

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