

STATE UNIVERSITY  
"UZHGOROD NATIONAL UNIVERSITY"  
MEDICAL FACULTY 2  
Department of Internal Medicine



"APPROVED"  
Dean of the Medical Faculty 2  
Vasyl KALIY  
28.05.2025

**SYLLABUS**

**EC 5. Laboratory diagnostics in clinical medical practice**

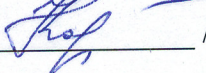
Educational level	<b>Second (Master)</b>
Direction of training	<b>22 "Health" / I "Health and Social Welfare"</b>
Specialty	<b>222 "Medicine" / I2 "Medicine"</b>
Educational program	<b>"General Medicine"</b>
Discipline status	<b>Elective</b>
The language of instruction	<b>English</b>

Syllabus of the educational discipline «EC 5. Elective course for the 4th year students “Laboratory diagnostics in clinical medical practice” » for higher educational applicants in direction of training 22 «Health care» Specialty 222 «Medicine» educational discipline «Medical Care».

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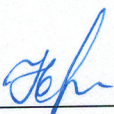
The syllabus was discussed and approved at the meeting of the Department  
of Internal Medicine

Minutes № 11 of " 28 " May 2025

Head of the Department  /Marianna TOVT-KORSHYNSKA/

Approved by the Scientific-Methodical Commission of the Medical Faculty 2

Minutes № 9 of "28" May 2025

Head of the Scientific-Methodical Commission  /Nataliia MALETS/

## DESCRIPTION OF THE EDUCATIONAL SUBJECT

Name of indicators	Distribution of academic hours according to the curriculum	
	Full-time study	Extramural form of study
ECTS credits – 1	Year of training:	
Total number of hours – 30	4	-
Number of modules – 1	Semester:	
Weekly academic hours for full-time study:  class-room academic hours – 2  student's self-study hours – 10	7	-
	Lectures:	
	6	-
	Practical classes (seminars):	
	-	-
Type of final control: credit	Laboratory classes:	
	14	-
Form of final control: complex	Self-study	
	10	-

## 2. THE PURPOSE OF DISCIPLINE

The purpose and objectives of discipline «Laboratory diagnostics in clinical medical practice» is the achievement of the main goals determined in the educational and professional program of the specialist's training on the "Medicine".

According to educational discipline, study of discipline leads to competence formation in educational applicants:

GC 1. Ability to abstract thinking, analyzing and synthesizing information.

GC 2. Ability to learn and master modern fields of knowledge.

GC 3. Ability to apply knowledge in practical situations.

GC 4. Knowledge and understanding of the subject area and understanding of professional activity.

PC 1. The ability to establish a preliminary clinical diagnosis of the disease.

PC 2. Skills in collecting information about patients.

PC 3. Ability to evaluate the results of laboratory and instrumental studies.

PC 19. Ability to process state, social, economic and medical information

The work program of the elective course "Laboratory diagnostics in clinical medical practice" is designed to prepare medical students for the 4th year of study.

The main aim of the cycle is the further improvement of theoretical knowledge, practical skills and knowledge of the clinical interpretation of the results of studies of the differential diagnosis of diseases that are accompanied by disturbances of blood. The objectives of the course are to familiarize students with the interpretation of changes in the general analysis of blood, urine, biochemical and serological studies of blood serum, as well as the development of interest in further independent study of this discipline, new methods of laboratory diagnostics.

The discipline program includes leading sections and topics related to laboratory research in clinical medicine.

Practical classes are conducted in the learning process to complete this program. At the end of the course a credit is taken.

As a result of studying the discipline, the student must know:

1. Norms of laboratory indicators of blood and urine tests.
2. Deviation of indicators of blood and urine in diseases of internal organs.
3. Methods of performing basic laboratory tests.
4. Methods of performing rapid tests.

be able to:

1. Interpret changes in the overall blood test.
2. Determine the type of anemia or tumor diseases of the blood using data from a general blood test.
3. Interpret urine test results.
4. To evaluate the indices of carbohydrate metabolism by the results of biochemical blood tests.
5. To evaluate lipid metabolism indices on the results of biochemical blood tests.
6. To evaluate indicators of protein metabolism by the results of biochemical blood testing.
7. To evaluate pigment metabolism indices on the results of biochemical blood tests.
8. Interpret changes in quantity of serum enzymes.
9. Determine markers of necrosis of the heart muscle, left ventricular dysfunction and pulmonary embolism.
10. Evaluate the impact of drugs on laboratory blood parameters.
11. Carry out screening of autoimmune diseases through laboratory tests.

### 3. PREREQUISITES FOR STUDYING THE DISCIPLINE

Prerequisites for studying discipline «Laboratory diagnostics in clinical medical practice» are mastering the following educational subjects (ES) of the educational program (EP):

ES 12 Physiology  
ES 9 Bioorganic Chemistry  
ES 14 Biochemistry

### 4. EXPECTED RESULTS OF EDUCATION

According to the educational program «Laboratory diagnostics in clinical medical practice», study of the educational program of discipline must ensure the achievement of higher education applicants such prognostic results of education (PRE):

<b>Prognostic results of education of the discipline</b>	<b>Code PLO</b>
Collect data about patient complaints, medical history, family history, conduct and evaluate physical examination results.	PLO 1
Evaluate diagnosis information using a standard procedure based on laboratory and instrumental findings.	PLO 2
Highlight a leading clinical symptom or syndrome. Establish the most probable or syndromic diagnosis of the disease. To prescribe laboratory and / or instrumental examination of the patient. To carry out differential diagnostics of diseases. Establish a preliminary and clinical diagnosis.	PLO 3

Expected results of education that must be achieved by students after mastering the discipline «Laboratory diagnostics in clinical medical practice»:

<b>Code ERE</b>	<b>Expected results of education of the discipline</b>	<b>Code PLO</b>
ELO 1	Ability to collect data about patient complaints, medical history, family history, conduct and evaluate physical examination results	PLO 1
ELO 2	Ability to evaluate diagnosis information using a standard procedure based on laboratory and instrumental findings.	PLO 2
ELO 3	Ability to highlight a leading clinical symptom or syndrome. Establish the most probable or syndromic diagnosis of the disease. To prescribe laboratory and / or instrumental examination of the patient. To carry out differential diagnostics of diseases. Establish a preliminary and clinical diagnosis.	PLO 3
ELO 21	Ability to formulate goals and determine the structure of personal activity.	PLO 21
ELO 23	Awareness and management of the activity by civil rights, freedoms and obligations, to raise the general cultural level.	PLO 23
ELO 24	Ability to comply with ethics, bioethics and deontology requirements their professional activity.	PLO 24

## 5. ASSESSMENT TOOLS AND METHODS FOR DEMONSTRATING RESULTS OF EDUCATION:

**Assessment tools and methods for demonstrating results of education of discipline are:**

- current control;
- module control;
- final control.

### Forms of control and criteria for evaluating educational results

Forms of current control: oral answering, test control, clinical tasks, control work.

Forms of module control: tests, written control.

Forms of final control: exam/credit.

### The distribution of points that students can get

Routine testing and individual work										Total
L 1	L 2	L 3	T 1	T 2	T 3	T 4	T 5	T 6	T 7	120
5	5	5	15	15	15	15	15	15	15	
The final module control										80
Total										200

T1, T2, T... – topics.

Minimum passing point for PC is 70 points, for the FMC – 40 points.

### Assessment of individual types of educational work in the discipline

Type of educational work	Module 1	
		Max. points
Laboratory classes		120
The final module control		80
Total Points		200

### Criteria of current educational activity evaluation

The grade "*excellent*" (180-200 points) is awarded to students who actively participated in the discussion of the most complicated issues on the studied topic, gave at least 90% correct answers to standardized test tasks, completed written tasks without errors, completed practical tasks and properly presented their results.

The grade "*good*" (148-179 points) is awarded to students who participated in the discussion of the most complicated issues on the studied topic, gave at least 74% correct answers to standardized test tasks, made some minor mistakes in answers to written tasks, completed practical tasks and properly presented their results.

The grade "*satisfactory*" (120-147 points) is awarded to students who participated in the discussion of the most complicated issues on the studied topic, gave at least 60% correct answers to standardized test tasks, made significant mistakes in answers to written tasks, completed practical tasks and properly presented their results.

The grade "*unsatisfactory*" (0-119 points) is awarded to students who did not participate in the discussion of the most complicated issues on the studied topic, gave less than 60% correct answers to standardized test tasks, made gross mistakes in answers to written tasks or did not answer them at all, did not complete practical tasks and did not properly present their results.

#### Criteria for module test evaluation

A module test is done by completing prepared tasks (test cards) with different cards having the same difficulty level. All students are allowed to complete the module test, regardless of the current assessment's results and the presence of unfulfilled missed practical classes. The period of 1.5 hours is given to complete the entire module test. It is forbidden to use any information sources while completing the module test.

The grade "*excellent*" (180-200 points) is awarded to students who gave at least 90% correct answers to standardized test tasks and completed written tasks without errors.

The grade "*good*" (148-179 points) is awarded to students who gave at least 74% of the correct answers to standardized test tasks and made some minor mistakes in the answers to written tasks.

A student who gave at least 60% of the correct answers to standardized test tasks and made significant mistakes in the answers to written tasks received the grade "*satisfactory*" (120-147 points).

The grade "*unsatisfactory*" (0-119 points) is awarded to students who gave less than 60% correct answers to standardized test tasks, made gross errors in answers to written tasks, or did not provide answers to the designed written tasks.

#### Criteria for the final semester control evaluation

The final semester rating is calculated as the arithmetic average of one module. According to the Regulation on the assessment of students' educational achievements according to the credit-module system, if the final module grade is at least 120 points, then with the consent of the student, it can be counted as the final (semester) grade for the academic discipline. Students who are not satisfied with the final positive grades given by the teacher based on the results of module tests, as well as those who received "*unsatisfactory*" grades and at the same time have no unfulfilled practical (laboratory) classes, have the right to take a credit (exam) in the discipline. Full-time students are admitted to the final (semester) control of a specific discipline in the form of a credit or exam if, based on the results of the

module tests, they scored at least 35 per cent of the possible points. Based on the results of the answers given during the exam/credit, a grade is awarded according to a 200-point scale. Regardless of whether the student takes the exam (credit) because their final module grade is unsatisfactory (70-119 points) or to increase the positive grade, the teacher gives the student a grade based solely on the level of their knowledge, demonstrated during the exam (credit), that is, based on 200 points, but the final (semester) grade cannot be lower than the final module grade.

#### Criteria for the module final semester control evaluation

- the grade "*excellent*" (180-200 points, A) is awarded to students who: have comprehensive, systematic, and deep knowledge of educational and syllabus material; are able to independently perform the tasks prescribed by the syllabus, apply the acquired knowledge and skills in non-standard situations; learned the basic and familiarized themselves with the additional literature recommended by the program; mastered the interrelationship of the main concepts of the discipline and are aware of their importance for the profession they acquire; freely express their own opinions, independently evaluate various life phenomena and facts, revealing their personal position; independently determine the individual goals of their own educational activity, revealed creative abilities and used them when studying the syllabus material, as well as demonstrated interest to scientific work.
- grade "*good*" (164-179 points, B) is awarded to students who: have comprehensive, systematic, and deep knowledge of educational and syllabus material, including applying it in practice, have sufficient systematic knowledge in accordance with the syllabus material, apply it reasonably in different situations; have the ability to independently search for information, as well as to analyze, set and solve professionally oriented problems; while answering the exam/credit questions they might have some inaccuracies, with correcting those themselves. The student should also be able to choose convincing arguments to confirm the studied material;
- the grade "*good*" (148-163 points, C) is awarded to students who: completed the work in general, but during the final control make a certain number of mistakes; are able to compare, generalize, systematize information under the guidance of a teacher, in general independently apply it in practice, control their own activities; learned the curriculum material, successfully completed the tasks prescribed by the program, familiarized themselves with the basic literature recommended by the program;
- the grade "*satisfactory*" (128-147 points, D) is awarded to students who: know the basic syllabus material to the extent necessary for further study and its use in the future profession; perform tasks well, but with a significant number of errors; familiarized themselves with the basic literature recommended by the syllabus; make mistakes when completing tasks during classes or exams but find ways to correct them under the guidance of the teacher.
- the grade "*satisfactory*" (120-127 points, E) to students who: have basic knowledge of educational and syllabus material in the amount necessary for further study and its application in the future profession, and the performance of tasks meets the minimal criteria. Knowledge is reproductive in nature.
- grade "*unsatisfactory*" (70-119 points, FX) is awarded to students who: revealed significant gaps in the knowledge of the main syllabus material and made fundamental mistakes during the completion of tasks provided by the syllabus.

- grade "*unsatisfactory*" (0-69 points, F) is awarded to students who learned the educational material only at the level of elementary recognition and reproduction of individual facts or did not learn it at all; made gross errors when completing the tasks provided by the syllabus; cannot continue their studies and are not ready for professional activity after graduating from the university without re-studying this discipline.

### Assessment criteria for module and final module control

Final module conducted in the form of credit. The maximum score is 200 points (total points for mastering current topics, module tests, presentations). Students who have scored 120 or more are considered to have passed the module and are given a rating scale ECTS ranging from A to E.

### Rating scale: national and ECTS

Total points for all kinds of educational activity	ECTS	National scale	
		For differentiated credit	For credit
180 – 200	A	Excellent	Credit
164 – 179	B	Good	
148 – 163	C		
128 – 147	D	Satisfactory	
120 – 127	E		
70 – 119	FX	Unsatisfactory	Re-taking the exam
0 – 69	F	Unsatisfactory with re-studying the course	Mandatory re-studying the course

## 6. THE PROGRAM OF THE COURSE

### 6.1 Contents of the course

#### Topic 1.

Urine examination. Changes in urine due to diseases of internal organs and systems. Complete blood count. The rate, physiological and pathological abnormalities of each indicator.

#### Topic 2.

Changes in lipid (total blood cholesterol, low-density lipoproteins, high-density lipoproteins, triglycerides, phospholipids), carbohydrate (blood glucose, glycated proteins: glycohemoglobin, fructosamine, sugar-loaded sample, galactose, D-xylose) metabolism.

Changes in protein (serum proteins, protein fractions, thymol sample) and pigment (total, free, conjugated bilirubin) metabolism.

#### Topic 3.

Enzyme studies (alanine aminotransferase ALT, aspartate aminotransferase ACAT, cholinesterase HE, alkaline phosphatase LF, gamma-glutamyltranspeptidase GGTP, lactate dehydrogenase LDH).

#### Topic 4.

Serological diagnosis of viral hepatitis:

- B (HBsAG, HBeAg, HBcAg, anti-HBc, Ig M anti-HBe, HBV DNA);

- D (IgM anti-HDV, IgG HDV, HDAg, HDV-RNA);
- C (anti-HCV core IgM, anti-HCV core IgG, HCV-RNA);
- G (HGV-RNA);
- TTV (TTV-DNA);

Diagnosis of autoimmune hepatitis (ANA antinuclear antibodies, SMA smooth muscle antibodies, ANCA cytoplasmic antibodies, microsomal anti-LKM-1, LKM-3 antibodies, antibodies to soluble hepatic anti-SLA antigen).

Serological diagnosis of celiac disease (antibodies to gliadin IgG, IgA, antibodies to tissue transglutaminase tTGA).

Serological diagnosis of atrophic gastritis (serum pepsinogen-1, serum gastrin-17).

Serological diagnosis of Helicobacter bacteriasis (serum antigelicobacterial Ig G, IgA, IgM).

### Topic 5.

Serum markers of myocardial necrosis (cardiac troponin T, I, creatinine phosphokinase, CFKK fraction, lactate dehydrogenase, myoglobin).

Laboratory diagnostics of left ventricular dysfunction (circulating atrial brain natriuretic peptide and its N-terminal fragment = NT-MNUP) and pulmonary embolism (D-dimer). Coagulogram.

### Topic 6.

Estimation of acute-phase inflammation indicators (C-reactive protein, sialic acids, proinflammatory cytokines = interleukins 1, 6, tumor necrosis factor  $\alpha$ ).

Serological diagnosis of systemic lupus erythematosus (LE cells, antibodies to native helical DNA), scleroderma (oxyproline, anti-Scl-70, anticentromeric antibodies), scleroderma (oxyproline, anti-Scl-70, anti-centromeric antibodies), rheumatoid arthritis (rheumatoid factor, anti-nuclear antibodies, antiphospholipid antibodies, antibodies to vimentin), systemic vasculitis (anti-neutrophil cytoplasmic antibodies, anti-endothelial antibodies), rheumatism (antistreptolysin-O, antistreptogialuronidase, antistreptokinase, antistreptodeoxyribonuclease).

**Topic 7.** Final test for the course of "Current issues of laboratory diagnostics in clinical medical practice".

## 6.2. Structure of discipline

Titles of content modules and topics	Number of hours					
	Form of study:					
	Total	including				
		lectures	practical classes (seminars)	laboratory	individual work	self-Study
7,8 semester						
<b>Module 1</b>						
Topic 1. Urine examination. Changes in urine due to diseases of internal organs and systems. Complete blood count. The rate, physiological and pathological abnormalities of each indicator.	4	2		2		2
Topic 2. Changes in lipid, carbohydrate metabolism. Changes in protein and pigment metabolism.	3	1		2		2

Topic 3. Enzyme studies.	3	1		2		2
Topic 4. Serological diagnosis of viral autoimmune hepatitis, celiac disease and gastritis.	2			2		2
Topic 5. Serum markers of myocardial necrosis. Laboratory diagnostics of left ventricular dysfunction and pulmonary embolism. Coagulogram.	4	2		2		
Topic 6. Laboratory diagnostics in rheumatology.	2			2		2
Module test	2			2		
Total for the module	30	6		14		10

### 6.3. Topics of laboratory classes

No.	Topic name	Full-time study	Extramural form of study
1.	Urine examination. Changes in urine due to diseases of internal organs and systems. Complete blood count. The rate, physiological and pathological abnormalities of each indicator.	2	
2.	Changes in lipid, carbohydrate metabolism. Changes in protein and pigment metabolism.	2	
3.	Enzyme studies.	2	
4.	Serological diagnosis of viral autoimmune hepatitis, celiac disease and gastritis.	2	
5.	Serum markers of myocardial necrosis. Laboratory diagnostics of left ventricular dysfunction and pulmonary embolism. Coagulogram.	2	
6.	Laboratory diagnostics in rheumatology.	2	
7.	<b>Final module control</b>	2	
	<b>Total</b>	14	

### 6.5. Individual tasks

Not provided by the program

## 7. TOOLS, EQUIPMENT AND SOFTWARE THE USE OF WHICH IS PROVIDED FOR THE EDUCATIONAL SUBJECT

The educational discipline "Laboratory diagnostics in clinical medical practice" involves demonstrating to students the devices that are jointly used with the clinical diagnostic laboratory of the Central City Clinical Hospital for determining the following indicators:

- complete blood count using the automatic hematological analyzer BC-2800 (Mindray, China);
- indicators of biochemical blood analysis (activity of alanine aminotransferase (ALT) and aspartate aminotransferase (AST), total bilirubin and its fractions, total protein level and protein fractions, alkaline phosphatase (ALP) activity,  $\gamma$ -glutamyltransferase (GGT), level of uric acid and glucose, activity of  $\alpha$ -amylase), as well as indicators of lipid metabolism (total cholesterol (TC), triglycerides (TG), low-

density lipoproteins (LDL), very low-density lipoproteins (VLDL), high-density lipoproteins (HDL) using an automatic biochemical analyzer GBG ChemWell 2910 and a semi-automatic biochemical analyzer BA-88.

- Thermocycles with a real-time PCR product detection system "iQ 5", Bio-Rad, USA.
- Automatic immunoassay analyzer "STATFAX" and DRG test systems (USA) for performing Enzyme-Linked Immunosorbent Assay (ELISA) to determine levels of cytokines (IL-1 $\beta$ , IL-4, IL-6, TNF- $\alpha$ ) in blood serum and collagen IV (Coll IV) using Argutus Collagen IV kits (Germany).
- Rapid tests.

In addition, the following didactic materials are used:

- practical lesson plans,
- tasks for independent work,
- methodological guidelines/recommendations for students and teachers,
- results of laboratory and instrumental research methods,
- questions, tasks or cases for current and final assessment,
- an electronic database of test tasks, situational tasks,
- a laptop,
- the e-learning website of UzhNU e-learn.uzhnu.edu.ua.

## 8. RECOMMENDED SOURCES OF INFORMATION

### Basic literature

1. Лабораторна діагностика. Навчальний посібник за ред.: І.Г. Купновицької, А. М. Ерстенюк. - Вінниця: Нова книга, 2017р.-320с.
2. Educational and methodological manual «The value indicators of biochemical analysis of blood for clinical medicine» / Opalenyk S. M., Tovt-Korshynska M. I. Uzhhorod: SHEI "UzhNU", 2023. - 42 p.
3. Educational and methodological manual «The value of urinalysis for clinical medicine» / Opalenyk S. M., Tovt-Korshynska M. I. Uzhhorod: SHEI "UzhNU", 2023. - 29 p.

### Additional references

1. Richard, A., PINCUS MCPHERSON, and R. Matthew. Henry's Clinical Diagnosis and Management by Laboratory Methods. ELSEVIER-HEALTH SCIENCE, 2021. - 1666 p.
2. Rifai, Nader. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics-E-Book: Tietz Textbook of Clinical Chemistry and Molecular Diagnostics-E-Book. Elsevier Health Sciences, 2017. - 1819 p.
3. Ferri, Fred F. Ferri's Best Test-E-Book: A Practical Guide to Laboratory Medicine and Diagnostic Imaging E-Book. Elsevier Health Sciences, 2022. 540 p.

### Information resources on the Internet

1. <https://www.scirp.org/journal/AER/> (Journal "Advances in Enzyme Research")
2. <https://www.scirp.org/journal/IJCM/> (International Journal of Clinical Medicine)
3. <https://www.scirp.org/journal/OJBD/> (Open Journal of Blood Diseases)
4. <https://www.scirp.org/journal/WJCD/> (World Journal of Cardiovascular Diseases)

**View results  
work program of the discipline**

Syllabus re-approved till 20\_\_\_ / 20\_\_\_ y. unchanged; with changes (Addition \_\_\_).  
(should be emphasized)

Protocol № \_\_\_ dated « \_\_\_ » \_\_\_\_\_ 20 \_\_\_ y.

Head of the Internal Medicine Department \_\_\_\_\_ Tovt-Korshynska M.I.

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