

MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY

Faculty of pharmacy

Department of occupational pathology, clinical laboratory and functional
diagnostics

Syllabus of elective educational discipline

Laboratory diagnostics

Volume	Total hours/credits ECTS 90/3.0 (practical classes 30 hours, IWS 60 hours)
Semester, year of study	VII semester IV year of education
Days, time, place	According to the approved schedule of classes. Forms of education: full-time.
Teacher(s)	assistant Dobrovolskaya O.O.
Contact phone number	(048)704 78 79
E-mail	prof.cl.lab@onmedu.ua
Workplace	Department of occupational pathology, clinical laboratory and functional diagnostics; educational and production laboratory of molecular pathology of ONMedU
Consultations	Help by phone: Oparina Tamara Pavlivna, head teacher of the department 0674849012 Face-to-face consultations: from 2:00 p.m. to 5:00 p.m. every Thursday, from 9:00 a.m. to 2:00 p.m. every Saturday Online consultations: from 4:00 p.m. to 6:00 p.m. every Thursday, from 9:00 a.m. to 2:00 p.m. every Saturday.

COMMUNICATION

Communication will be carried out through face-to-face meetings, with distance learning using the Internet, Telegram, WhatsApp, and the Microsoft Teams platform.

Language of study: English.

COURSE ABSTRACT

The subject of study of the elective academic discipline is theoretical knowledge and practical skills and abilities in matters of organization of laboratory research in

the field of health care; diagnosis and control of the treatment of the most typical diseases.

Prerequisites and post-requisites of the discipline (the place of the discipline in the educational program):

Prerequisites: Ukrainian language (for professional fields), foreign language (for professional fields), medical biology, medical chemistry, biological and bioorganic chemistry, medical and biological physics, pathophysiology, pathomorphology, organization and economics of health care, internal medicine, physiology, dermatology, clinical pharmacy, toxicology.

Postrequisites: clinical pharmacy, pharmacotherapy with pharmacokinetics, medicinal toxicology, toxicological and forensic chemistry, laboratory diagnostics, biophysics, medical chemistry, morphological disciplines.

The purpose is familiarizing students of the Faculty of Pharmacy with modern methods of clinical diagnosis of diseases using various research objects: whole blood, blood serum and plasma, urine, sputum and other biological materials, as well as providing students with practical skills necessary for independent conduct of individual research.

The tasks of the discipline: the formation of clear ideas of applicants of high education about the principles and methods of determining the main clinical indicators, the meaning of indicators in the norm and in pathology, about the influence of drugs on the indicators of clinical and laboratory examination and the use of the acquired knowledge in the process of further education and professional activity.

Expected learning outcomes: As a result of studying the academic discipline, the applicant *should know*:

- Classification and systematic approaches to modern laboratory methods of research and the possibility of their use in the practical activity of a doctor;
- Principles of interpretation of the results of the clinical and laboratory examination of the patient;
- Patterns of changes in clinical and laboratory indicators under the influence of various drugs to control the effect of drugs;

be able: - conducting the most common clinical and laboratory analyzes of patients; - build diagnostic search algorithms depending on the purpose of the study, the patient's condition and the capabilities of the laboratory;

- to provide an assessment of the received research results;
- identify signs of errors in laboratory diagnostics.

DESCRIPTION OF THE EDUCATIONAL DISCIPLINE

The course will be taught in the form of practical classes (30 hours) and organization of independent work (60 hours).

Teaching methods: verbal, explanatory and demonstrative, visual, working with a book, video method, working in groups, discussions, solving situational tasks, etc.

Practical classes are conducted on the basis of the department and the educational and production laboratory of molecular pathology of the Odesa National Medical University. The method of organizing classes on laboratory diagnostics requires the following:

- master knowledge of laboratory examination; skills of cooperation with structural divisions of laboratory diagnostics, communication with employees of clinical laboratories;
- to form an understanding of responsibility for the level of training in laboratory diagnostics and the need to improve knowledge and skills during training and professional activity.

For the implementation of the corresponding module specified in the first lesson, a work plan and provision of conditions for its implementation are provided. It includes: studies that need to be mastered; algorithms (protocols) of examinations, establishing a diagnosis.

Classes are held with the inclusion of:

- 1) control of the initial level of knowledge using test questions and checking workbooks;
- 2) examination of patients with diseases and conditions corresponding to the topic of the lesson, followed by a discussion of the correctness of the examination plan for establishing a diagnosis, differential diagnosis and treatment measures using the principles of evidence-based medicine and in accordance with National and European guidelines and protocols;
- 3) consideration of the need for additional laboratory methods of research, which are used in diagnosis, the consideration of which is provided by the topic of the lesson.

Independent work involves preparation for practical classes.

CONTENTS OF THE EDUCATIONAL DISCIPLINE

Content module 1. Organization of laboratory service, principles of clinical laboratory work, accuracy, reliability, sensitivity of research. Quality control of laboratory research.

Topic 1. Introduction to laboratory diagnostics as a discipline.

The subject and objectives of the course of laboratory diagnostics. Organization of work of the Clinical Diagnostic Laboratory. Requirements for work in Clinical Diagnostic Laboratory. Characteristics of the material for research, time of collection of samples, methods of obtaining material for clinical and laboratory research. Basic rules of conducting laboratory tests. Clinical and laboratory indicators as criteria of effectiveness and safety of drug therapy. The value of laboratory diagnostics in the practical activity of a pharmacist.

Content module 2. Laboratory research by types of research (general clinical, biochemical), laboratory diagnosis of emergency conditions.

Topic 2. General information about the composition of blood and hematopoiesis.

The main clinical indicators of the blood system. General information about erythropoiesis. Factors affecting erythropoiesis. Morphology and functions of erythrocytes.

Degenerative changes of erythrocytes. Reticulocytes. Hemoglobin. Normal content in the blood.

Methods of quantitative determination of hemoglobin. Oligochromemia, hyperchromemia.

Definition of color index. Determination of resistance of erythrocytes. Anemia. Hematological characteristics of the main anemic syndromes. Erythrocyte sedimentation rate (ESR). Methods of determining ESR. Changes in the rate of erythrocyte sedimentation in various diseases.

Topic 3. General information about leukopoiesis.

Factors affecting leukopoiesis. Disorders of leukopoiesis: leukemia, leukopenia, leukocytosis, agranulocytosis. Leukocyte formula. Typical changes in leukocyte formula in the most common diseases of internal organs.

Topic 4. Biochemical research of blood and their clinical significance

Indicators of protein, fat, carbohydrate metabolism. Nonspecific indicators of inflammation. Blood electrolytes. Liver and kidney tests. Research methods of hemostasis and blood coagulation. The total number of platelets and their morphology. Bleeding time. Blood clotting time.

Topic 5. Physiological features of urine formation in the human body.

Principles of collection and research. Values of the general clinical analysis of urine. General properties of urine. Physical properties of urine: normal daily diuresis, frequency of urination, relative density, color, transparency of urine. Methods of determining the reaction of urine. Methods of determining protein, sugar, ketone bodies, bilirubin and urobilin in urine. Examination of urine according to the method of Zimnitsky, its significance. Microscopic examination of urine sediment. Methods of quantitative determination of formed elements in urine sediment (Nechiporenko, Kakovsky-Addise, Ambyurzh).

Topic 6. Features of the main indicators of the clinical analysis of urine

depending on the age of the person and various physiological conditions (pregnancy, hypothermia, excessive physical and mental stress).

Clinical and diagnostic significance of changes in urinary sediment in various diseases.

Topic 7. Laboratory studies in respiratory diseases. Composition and types of sputum.

Diagnostic value of sputum in pulmonology. Macro- and microscopic study of sputum. Production of preparations for microscopic examination. Snoring in various diseases: bronchitis, bronchial asthma, inflammation of the lungs, pulmonary tuberculosis, lung cancer.

Topic 8. The technique of obtaining gastric contents for clinical analysis.

Methods of functional research of the stomach: probe and non-probe methods. The technique of obtaining duodenal contents. Study of duodenal contents. Chemical study of bile. Microscopic examination of duodenal contents.

Topic 9. Clinical examination of feces.

Coprogram in normal conditions and with pathology of the digestive organs (gastritis, cholecystitis, pancreatitis, colitis, peptic ulcer disease of the 12th parenchyma and stomach, hepatitis). Hidden blood in the stool. Eggs of worms in feces. Standing in the stool.

Content module 3. The effect of medicines on the organs and systems of the human body

Topic 10. Medicines and blood pathology.

Basic mechanisms of drug-induced anemia. Drugs used to stimulate erythropoiesis. Appointment of iron preparations. Appointment of vitamin B₁₂ and folic acid. Drugs that most often cause suppression of leukopoiesis. Means recommended for stimulation of leukopoiesis.

Topic 11. Medicines and pathology of the urinary system.

The main mechanisms of nephrotoxicity of medicinal products. Nephrotoxicity of certain medicines. Principles of prevention of nephrotoxicity of medicines.

Topic 12. Antitussives. Mucolytics, expectorants.

Medicines that cause damage to the respiratory system.

Topic 13. Medicines that can cause diarrhea.

Antidiarrheal agents. Anthelmintic drugs.

Topic 14. Stimulants of gastric secretion.

Inhibitors of gastric secretion. Recommendations of the Maastricht Conference on the eradication of *Helicobacter pylori*.

Topic 15. Means affecting the activity of microsomal liver enzymes.

Hepatotoxicity of medicines. Hepatotoxic drugs. Medicines with a hepatoprotective effect, affecting the production of bile, its outflow and composition.

List of recommended literature

Main (basic):

1. Robinson A.T. Pathology — The Beginnings of Laboratory Medicine: First in a Series, Laboratory Medicine. 2021. Vol. 52. No 4. P. e66–e82.
2. West J., Atherton J., Costelloe S.J., Pourmahram G., Stretton A., Cornes M. Preanalytical errors in medical laboratories: a review of the available methodologies of data collection and analysis. Ann Clin Biochem. 2017. Vol.54, No 1. P. 14-19.
3. Yu H.E., Lanzoni H., Steffen T., Derr W., Cannon K., Contreras J., Olson J.E. Improving Laboratory Processes with Total Laboratory Automation. Laboratory Medicine. 2019. Vol.50, No1. P. 96–102.
4. McKenzie S.B., Bergeron J.D., Landis-Piwowar K., Williams L. Clinical Laboratory Hematology, 4-th edition, 2019. 350 p.
5. Cascio M.J., DeLoughery T.G. Anemia: Evaluation and Diagnostic Tests. Med Clin North Am. 2017. Vol.101, No 2. P. 263-284.
6. Brunzel N.A. Fundamentals of Urine & Body Fluid Analysis, 5th Edition, 2021. 448 p.
7. Gulati G. Blood cell Morphology: Grading Guide, 2nd Edition. 2017. 98 p.
8. Celkan T.T. What does a hemogram say to us? Turk Pediatri Ars. 2020. Vol. 55, No 2. P.103-116.

Additional:

1. Dusilnicka I., Krala E., Cholewinska P., Radwan-Oczko M. The Use of Saliva as a Biosample in the Light of COVID-19. Diagnostics. 2021. Vol. 11. P. 1769.
2. Tiongco R.E., Bituin A., Arceo E., Rivera N., Singian E. Salivary glucose as a on-invasive biomarker of type 2 diabetes mellitus. J Clin Exp Dent. 2018. Vol. 10, No 9. P. e902-e907.

3. Palladino M. Complete blood count alterations in COVID-19 patients: A narrative review. *Biochem Med (Zagreb)*. 2021. Vol. 31, No 3. P.030501.
4. Oyaert M., Delanghe J.. Progress in Automated Urinalysis. *Ann Lab Med*. 2019. Vol. 39, No 1. P. 15-22.
5. Wada H., Yamamoto A., Tomida M., et al. Proposal of Quick Diagnostic Criteria for Disseminated Intravascular Coagulation. *J. Clin. Med*. 2022. Vol. 11. P. 1028.
6. Ahmad S., Maqbool A., Srivastava A., Gogoi S., Siddiqui F.A., Panwar S. Urine Analysis Revisited: A Review. *Annals of International Medical and Dental Research*. 2018. Vol. 5, No 1.P. 22-32.

13. Electronic information resources

1. Ministry of Health of Ukraine
http://www.moz.gov.ua/ua/portal/dn_20050719_360.html
2. European Regional Office of the World Health Organization.
[URL:www.euro.who.int](http://www.euro.who.int).
3. Official website of the WHO <https://www.who.int>
4. Website of the All-Ukrainian Association of Laboratory Diagnostics
<http://acclmu.org.ua>
5. Information and educational environment info.onmedu
<https://info.odmu.edu.ua/chair/occupational> diseases and functional diagnostics/files.

EVALUATION

Forms and methods of current control: oral control, survey, practical, test, self-control, etc.

Current assessment criteria at the practical lesson

Grade	Evaluation criteria
«5»	The applicant is fluent in the material, takes an active part in discussing and solving a situational problem, confidently demonstrates practical skills and interpretations of clinical and laboratory research data, expresses his opinion on the subject of the class.
«4»	The applicant has a good command of the material, participates in the discussion and solution of a situational clinical problem, demonstrates practical skills in the interpretation of clinical and laboratory research data with some errors, expresses his opinion on

	the subject of the class.
«3»	The applicant does not have sufficient knowledge of the material, takes part in the discussion and solution of the situational clinical problem without confidence, demonstrates practical skills during the interpretation of clinical and laboratory research data with significant errors.
«2»	The applicant does not master the material, does not take part in the discussion and solution of the situational clinical problem, does not demonstrate practical skills in the interpretation of laboratory research data.

Forms and methods of final control: credit test, issued to the applicant who has completed all sections of the educational program of the selected discipline, actively participated in practical classes, has an average current grade of at least 3.0 and has no academic debt.

Conditions for obtaining additional (bonus) points. Possibility and conditions of obtaining additional (bonus) points: not provided.

Independent work. The evaluation of the independent work of the applicants of higher education, which is provided for in the topic along with the classroom work, is carried out during the current control of the topic in the corresponding classroom session, as well as at the final control.

EDUCATIONAL DISCIPLINE POLICY

Deadlines and Rescheduling Policy:

- absences from classes due to non-respectable reasons are made up according to the schedule of the teacher on duty.
- absences due to valid reasons are worked out according to an individual schedule with the permission of the dean's office.

Academic Integrity Policy: Applicants must observe academic integrity, namely:

- independent performance of all types of work, tasks, forms of control provided for by the work program of this educational discipline;
- references to sources of information in the case of using ideas, developments, statements, information;
- compliance with the legislation on copyright and related rights;
- provision of reliable information about the results of one's own educational (scientific) activity, used research methods and sources of information.

Unacceptable in educational activities for participants of the educational process are:

- using family or official ties to obtain a positive or higher grade during any form of control of learning outcomes or academic performance;
- use of prohibited auxiliary materials or technical means (cheat sheets, notes, micro-earphones, telephones, smartphones, tablets, etc.) during control measures;
- passing procedures for control of training results by fake persons.

For violation of academic integrity, applicants of higher education may be held to the following academic responsibility:

Attendance and Tardiness Policy Uniform: medical gown, cap, protective mask, change of footwear.

Equipment: notebook, pen.

State of health: applicants, who suffering from acute infectious diseases, including respiratory diseases, are not allowed to attend classes.

The applicant who is late for class can attend it, but if the teacher has put "nb" in the journal, he must complete it in the general order. Online classes at the department are conducted using the Ms Teams distance learning system. Each applicant must connect to the webinar room in a timely manner. Online classes include on-screen and oral demonstrations of learning materials, dialogue between the teacher and applicants.

Use of mobile devices. Copying, use of various software tools, hints, use of a mobile phone, tablet or other electronic gadgets during class are not allowed. Mobile devices may be used by applicants with the permission of the teacher if they are needed for the assignment.

Behavior in the audience The behavior of applicants and teachers in the classrooms must be working and calm, strictly comply with the rules established by the Regulations on academic integrity and ethics of academic relations at Odessa National Medical University, in accordance with the Code of Academic Ethics and University Community Relations of Odessa National Medical University, Regulations on Prevention and detection of academic plagiarism in the research and educational work of applicants of higher education, scientists and teachers of Odessa National Medical University.