MINISTRY OF HEALTH OF UKRAINE

ODESSA NATIONAL MEDICAL UNIVERSITY

Department of General Practice

CONFIRMED by

Acting Vice-Rector for Scientific and Pedagogical Work

Eduard Buriachkivskyi

WORKING PROGRAM IN THE DISCIPLINE

"Express ECG analysis"

Level of higher education: second (master's degree)

Field of knowledge 22 "Healthcare"

Specialty: 222 "Medicine"

Educational and professional program: Medicine

2023

The work program is compiled on the basis of the educational and professional program "Medicine" for the training of specialists of the second (master's) level of higher education in the specialty 222 "Medicine" in the field of knowledge 22 "Health care", approved by the Academic Council of ONMedU (protocol No 8 of June 29, 2023).

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The work program was approved at the meeting of the Department of General Practice
Minutes N _1_ dated 08/29/2023

Head of the Department _____ Olena Voloshyna

Approved by the guarantor of
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Approved by the subject cyclic methodical commission for therapeutic disciplines ONMedU
Minutes No 1 dated 08/30/2023

Head of the subject cyclical methodical commission for therapeutic disciplines of ONMedU

_____ Olena Voloshyna

Revised and approved at the meeting of the department of general practice
Minutes No. ___ dated "___" _____ 20__

Head of the Department_____ Olena Voloshyna

Revised and approved at the meeting of the department of general practice
Minutes No. ___ dated "___" _____ 20__

Head of the Department _____ Olena Voloshyna

1. Description of the discipline:

Name of indicators	Branch of knowledge, specialty, specialization, level of higher education	Characteristics of the discipline
Total number: Credits of ECTS: 3.0 Hours: 90 Content modules: 3	Field of knowledge 22 "Health care" Specialty 222 "Medicine" Level of higher education Second (master's)	*Full-time(day) education* *Elective course*
		Year of education: 6
		Semesters XI - XII
		Lectures (0 hours)
		Seminars (0 hours)
		Practical (30 hours)
		Laboratory (0 hours)
		Independent work (60 hours)
		incl. individual tasks (0 hours)
		Final control form – credit

2. The purpose and tasks of the discipline, competencies, program learning outcomes.

Purpose: deepening, expanding and specifying by a higher education student knowledge and formation of elements of professional competencies in the field of functional diagnostics, namely electrocardiography, in particular improving knowledge about the structural features and functioning of the cardiac conduction system, studying electrocardiographic changes in certain diseases of the heart and blood vessels and the possibility of their practical interpretation and differential diagnostic signs.

Task:
1. Expansion of knowledge regarding clinical anatomy of the heart, physiology, biochemistry and pathophysiology of cardiac contraction.
2. Improvement of skills and abilities in recording and interpreting ECG.
3. Expansion of knowledge on the basic principles of the formation of electrocardiographic leads, elements of normal ECG.
4. Improving skills in ECG diagnosis of heart rhythm and conduction disorders.
5. Expansion of knowledge on the peculiarities of diagnosing heart rhythm and conduction disorders in certain clinical situations.

The process of studying the discipline is aimed at the formation of elements of the following competencies:

General competencies:
GC 1. Ability to abstract thinking, analysis, and synthesis.
GC 3. Ability to apply knowledge in practical situations
GC 4. Knowledge and understanding of the subject area and understanding of professional activity
GC 5. Ability to adapt and act in a new situation.
GC 6. Ability to make reasonable decisions
GC 7. Ability to work in a team
GC 8. Ability to interpersonal interaction
GC 11. Ability to search, process and analyze information from various sources
GC 12. Determination and persistence in relation to assigned tasks and assumed responsibilities
GC 13. Awareness of equal opportunities and gender issues.
GC 16. Ability to evaluate and ensure the quality of the work performed

Special competencies are:

SC1 – Ability to collect medical information about the patient and analyze clinical data.

SC2 – Ability to determine the list of laboratory and instrumental studies and evaluate their results.

SC3 – Ability to establish a preliminary and clinical diagnosis of the disease.

SC6 – Ability to determine the principles and nature of treatment and prevention of diseases.

SC7 – Ability to diagnose emergency conditions.

SC8 – Ability to determine tactics and provide emergency medical help.

SC16 – Ability to maintain medical documentation, including electronic forms.

SC26 – The ability to determine the management tactics of persons subject to dispensary supervision.

Program learning outcomes are:

PLO 1 - Have a thorough knowledge of the structure of professional activity. Be able to carry out professional activities that require updating and integration of knowledge. Be responsible for professional development, ability for further professional training with a high level of autonomy.

PLO 2 - Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient to solve professional problems in the field of health care.

PLO 3 - Specialized conceptual knowledge that includes scientific achievements in the field of health care and is the basis for research, critical reflection on problems in the field of medicine and related interdisciplinary problems.

PLO 4 - Identify and identify leading clinical symptoms and syndromes (list 1); According to standard methods, using preliminary data of the patient's history, examination data of the patient, knowledge about the person, his organs and systems, to establish a preliminary clinical diagnosis of the disease (according to list 2).

PLO 5 - Collect complaints, history of life and disease, assess the patient's psychomotor and physical development, the state of organs and body systems, evaluate information on the diagnosis (list 4) based on the results of laboratory and instrumental studies, taking into account the patient's age.

PLO 6 - Establish the final clinical diagnosis by making an informed decision and analyzing the obtained subjective and objective data of clinical, additional examination, differential diagnosis, observing the relevant ethical and legal standards, under the supervision of the doctor-manager in a health care institution (list 2).

PLO 7 - Prescribe and analyze additional (mandatory and optional) examination methods (laboratory, functional and / or instrumental) (list 4), patients with diseases of organs and body systems for differential diagnosis of diseases (list 2).

PLO 8 - Determine the main clinical syndrome or symptom that causes the severity of the victim/victim's condition (according to list 3) by making an informed decision on a person's condition under any circumstances (in a health care institution, outside it), including in an emergency and hostilities, in the field, in conditions of lack of information and limited time.

PRN10. Determine the necessary mode of work, rest and nutrition on the basis of the final clinical diagnosis, observing the relevant ethical and legal standards, by making an informed decision according to existing algorithms and standard schemes

PLO 14 - Determine tactics and provide emergency medical care in emergency conditions (list 3) in a limited time in accordance with existing clinical protocols and standards of treatment.

PLO 16. To form rational medical routes of patients; organize interaction with colleagues in their own and other institutions, organizations and institutions; apply tools for promoting medical services in the market, based on an analysis of the needs of the population, in the conditions of functioning of a health care institution, its division, in a competitive environment.

PLO 17 - Perform medical manipulations (according to list 5) in a medical institution, at home or at work on the basis of a preliminary clinical diagnosis and / or indicators of the patient's condition by making an informed decision, observing relevant ethical and legal standards.

PLO 21 - Find the necessary information in professional literature and databases of other sources, analyze, evaluate and apply this information.
PLO 30 - Determine the tactics of conducting persons subject to dispensary supervision

As a result of studying the discipline, the student has to
Know:
- the structure of the cardiac conduction system, electrophysiological bases of the electrocardiographic method
- principles of ECG recording and interpretation
- basic principles of the formation of electrocardiographic leads
- elements of a normal ECG
- indications for the application of functional diagnostic methods.

Be able:
- analyze a normal electrocardiogram, calculate and evaluate heart rate values. Know positional and idiopathic electrocardiogram changes in adults
- carry out ECG diagnostics of hypertrophy and overload of various parts of the heart
- carry out ECG diagnostics of conduction disorders. AV blockade
- carry out ECG diagnostics with blockade of the legs of the bundle of His and branches of the left leg
- carry out ECG diagnostics and differential diagnosis of paroxysmal tachycardias
- carry out ECG diagnostics and differential diagnosis of extrasystolic rhythm disturbances
- carry out ECG diagnostics and differential diagnosis of atrial fibrillation and flutter
- carry out ECG-diagnosis of chronic coronary heart disease
- carry out ECG diagnosis of myocardial infarction of various localization.

3. The content of the educational discipline
Content module 1.
ECG analysis.

Topic 1. ECG recording methodology. Electrocardiographic equipment.

Topic 2. Anatomical and physiological bases of electrocardiography**.** The principle of the ECG method. Fundamentals of electrophysiology of the heart: rest potential, action potential, refractory period absolute, relative, effective, functional. The structure of the cardiac conduction system.

Topic 3. Analysis of normal ECG. Methods for determining the position of the electrical axis of the heart. Standard and additional electrocardiographic leads. Calculation and evaluation of heart rate values.

Topic 4. Standard and additional electrocardiographic leads. Additional leads by Neb, diagnostic value.

Topic 5. ECG - diagnosis of hypertrophy and overload of various parts of the heart. ECG – signs of atrial hypertrophy.   Signs of left ventricular hypertrophy of the heart and its systolic and diastolic overload. Signs of right ventricular hypertrophy, diagnostic significance.

Topic 6. Syndrome of early ventricular repolarization. ECG criteria, diagnostic value.

Topic 7. Functional ECG tests. Standardized and non-standardized tests with physical activity. Daily ECG monitoring.

Content module 2.
ECG - diagnosis and differential diagnosis of heart rhythm and conduction disorders.

Topic 1. Classification of arrhythmias. ECG diagnosis and differential diagnosis of supraventicular tachycardias. Classification, mechanisms of development. Differential diagnosis.

Topic 2. Violation of automatism, dysfunction of the sinus node. Syndrome of weakness of the sinus node. ECG diagnosis and differential diagnosis of atrial fibrillation and flutter.

Topic 3. ECG diagnosis and differential diagnosis of ventricular tachycardias. Classification, mechanisms of development. Differential diagnosis. Ventricular flutter and fibrillation.

Topic 4. Classification and ECG - topical diagnosis of extrasystole rhythm disturbances. ECG - signs of atrium, nodular and ventricular.

Topic 5. Syndromes of ventricular preexcitation of the heart. ECG signs Wolf-Parkinson-White syndrome. ECG - signs of Clerk-Levy-Critesco syndrome.

Topic 6. ECG - diagnosis of blockade of the legs of the bundle of His. ECG signs of complete and incomplete blockades of the right and left legs of the bundle of His. Diagnosis of myocardial infarction against the background of complete blockade of the left leg of the bundle of His. Blockade of branches of the left leg of the bundle of His. Bifascicular blockade. Trifascicular blockade.

Topic 7. ECG - signs of left ventricular and right ventricular extrasystole. Classification of ventricular extrasystoles according to B.Lown.

Topic 8. Conduction disturbance. AV blockade. ECG signs of AV blockade of I, II, III degree.

Topic 9. ECG – diagnosis of sinoatrial and intraatrial blockades. ECG signs of sinoauricular block I, II, III degree. Syndrome of weakness of the sinus node.

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Content module 3.

ECG - diagnosis and differential diagnosis of heart disease.
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Topic 1. ECG - diagnosis of myocardial infarction. ECG signs of acute coronary syndrome. Analysis of ECG of patients with myocardial infarction of different localization.

Topic 2. ECG - diagnosis of chronic coronary heart disease.

Topic 3. ECG criteria for pulmonary embolism.

Topic 4. ECG – diagnosis of chronic pulmonary heart.

Topic 5. ECG for violations of electrolyte metabolism.

Topic 6. Features of ECG in childhood.

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4. The structure of the educational discipline
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Title of content modules and topics	Number of hours					
	Just	Including				
		L	C	See	Lab	CPC
Content module 1. **ECG analysis.**						
Topic 1. ECG recording methodology. Electrocardiographic equipment.	2	0	0	2	0	0
Topic 2. Anatomical and physiological bases of electrocardiography.	6	0	0	0	0	6
Topic 3. Analysis of normal ECG. Methods for determining the position of the electrical axis of the heart.	4	0	0	2	0	2
Topic 4. Standard and additional electrocardiographic leads.	6	0	0	0	0	6
Topic 5. ECG - diagnosis of hypertrophy and heart chambers overload.	2	0	0	2	0	0
Topic 6. Syndrome of early ventricular repolarization.	6	0	0	0	0	6
Topic 7. Functional ECG tests.	6	0	0	2	0	4
Total by content module 1	32	0	0	8		24

Content module 2. **ECG - diagnosis and differential diagnosis of heart rhythm and conduction disorders.**						
Topic 8. Classification of arrhythmias. ECG diagnosis and differential diagnosis of supraventicular tachycardias.	2	0	0	2	0	0
Topic 9. Violation of automatism, dysfunction of the sinus node. Syndrome of weakness of the sinus node.	6	0	0	0	0	6
Topic 10. ECG diagnosis and differential diagnosis of atrial fibrillation and flutter.	6	0	0	2	0	4
Topic 11. ECG diagnosis and differential diagnosis of ventricular tachycardias. Ventricular fibrillation.	2	0	0	2	0	0
Topic 12. Syndromes of ventricular preexcitation of the heart.	6	0	0	0	0	6
Topic 13. Classification and ECG - topical diagnosis of extrasystole rhythm disturbances.	4	0	0	4	0	0
Topic 14. ECG - signs of left ventricular and right ventricular extrasystole. Classification of ventricular extrasystoles according to B.Lown.	4	0	0	0	0	4
Topic 15. Conduction disorders. AV blockade.	2	0	0	2	0	0
Topic 16. ECG – diagnosis of sinoatrial and intraatrial blockades.	4	0	0	0	0	4
Topic 17. ECG - diagnosis of bundle brunch block(bundle of His).	2	0	0	2	0	0
Total by content module 2	38	0	0	14	0	24
Content module 3. **ECG - diagnosis and differential diagnosis of heart disease.**						
Topic 18. ECG - diagnosis of myocardial infarction. ECG - diagnosis of acute coronary syndrome. Analysis of ECG patients with myocardial infarction of different localization.	6	0	0	6	0	0
Topic 19. ECG - diagnosis of chronic coronary heart disease.	4	0	0	0	0	4
Topic 20. ECG criteria for pulmonary embolism.	2	0	0	2	0	0
Topic 21. ECG – diagnosis of chronic pulmonary heart.	2	0	0	0	0	2
Topic 22. ECG diagnostics for pericarditis, myocarditis.	2	0	0	0	0	2
Topic 23. ECG for violations of electrolyte metabolism.	2	0	0	0	0	2
Topic 24. Features of ECG in childhood.	2	0	0	0	0	2
Total by content module 3	20	0	0	8	0	12
Total hours	90			30		60

5. Topics of practical classes

5.1. Topics of practical classes

№	Topic	Number of hours
1.	ECG recording methodology. Electrocardiographic equipment.	2

2.	Analysis of normal ECG. Methods for determining the position of the electrical axis of the heart.	2
3.	ECG - diagnosis of hypertrophy and overload of various parts of the heart.	2
4.	Functional ECG tests.	2
5.	Classification of arrhythmias. ECG diagnosis and differential diagnosis of supraventicular tachycardias.	2
6.	ECG diagnosis and differential diagnosis of atrial fibrillation and flutter.	2
7.	ECG diagnosis and differential diagnosis of ventricular tachycardias. Ventricular fibrillation.	2
8.	Classification and ECG - topical diagnosis of extrasystolic rhythm disturbances.	4
9.	Conduction disturbance. AV blockade.	2
10.	ECG - diagnosis of the bundle brunch block.	2
11.	ECG - diagnosis of myocardial infarction. ECG - diagnosis of acute coronary syndrome. Analysis of ECG of patients with different myocardial infarction localization.	6
12.	ECG criteria for pulmonary embolism.	2
		30

6. Independent work of the student

№	Topic name / types of tasks	Number of hours
1.	Anatomical and physiological bases of electrocardiography**.	6
2.	Analysis of normal ECG. Methods for determining the position of the electrical axis of the heart.	2
3.	Standard and additional electrocardiographic leads.	6
4.	Syndrome of early ventricular repolarization.	6
5.	Functional ECG tests.	4
6.	Violation of automatism, dysfunction of the sinus node. Syndrome of weakness of the sinus node.	6
7.	ECG diagnosis and differential diagnosis of atrial fibrillation and flutter.	4
8.	Syndromes of ventricular preexcitation of the heart.	6
9.	ECG - signs of left ventricular and right ventricular extrasystole. Classification of ventricular extrasystoles according to B.Lown.	4
10.	ECG – diagnosis of sinoatrial and intraatrial blockade.	4
11.	ECG - diagnosis of chronic coronary heart disease.	4
12.	ECG – diagnosis of chronic pulmonary heart.	2
13.	ECG diagnostics for pericarditis, myocarditis.	2
14.	ECG for violations of electrolyte metabolism.	2
15.	Features of ECG in childhood.	2
	Together	**60**

7. Teaching methods

Practical classes: ECG decoding, solving clinical situational problems, tests.

Independent work: independent work with recommended basic and additional literature, with electronic information resources, independent work with a bank of test tasks.

8. Forms of control and evaluation methods
(including criteria for evaluating learning outcomes)

Current control: oral questioning, testing, solving situational clinical tasks, evaluating activity in class.

Criteria for current evaluation at the practical classes

Score	Evaluation criteria
«5»	The applicant is fluent in the material, actively participates in the discussion and solution of the situational clinical problem, confidently demonstrates knowledge during the interpretation of laboratory research data, expresses his opinion on the topic of the lesson, demonstrates clinical thinking.
«4»	The applicant is fluent in the material, participates in the discussion and solution of a situational clinical problem, makes some mistakes during the interpretation of laboratory data, expresses his opinion on the topic of the lesson, demonstrates clinical thinking.
«3»	The applicant does not have enough knowledge of the material, hesitantly participates in the discussion and solution of a situational clinical problem, makes significant mistakes during the interpretation of laboratory research data.
«2»	The applicant has a poor command of the material, does not participate in the discussion and solution of the situational clinical problem, in the interpretation of laboratory data.

The credit is given to an applicant who has completed all the tasks of the work program of the discipline, took an active part in practical classes, completed and defended an individual assignment and has an average current grade of at least 3.0 and has no academic debt.

The credit is carried out in the last lesson. The score for the test is the arithmetic mean for all components on a traditional four-point scale and has a value that is rounded according to the statistical method with two decimal places after the decimal point.

9. Distribution of points, obtained by the student

The average score for the academic discipline for applicants who have successfully mastered the work program of the discipline is converted from the traditional four-point scale into points on a 200-point scale, as shown in the table:

Table of conversion of traditional score to multipoint

National Grade for the Discipline	The sum of points for the discipline
Excellent ("5")	185 – 200
Good ("4")	151 – 184
Satisfactory ("3")	120 – 150
Unsatisfactory ("2")	Below 120

A multi-point scale (200-point scale) characterizes the actual success of each applicant in mastering the educational component. The conversion of the traditional grade (average score for the academic discipline) into a 200-point grade is carried out by the Information and Technical Department of the University.

According to the points received on a 200-point scale, the achievements of applicants are evaluated according to the ECTS rating scale. Further ranking on the ECTS rating scale allows you to evaluate the achievements of applicants in the educational component, who are studying in the same course of the same specialty, in accordance with the points they receive.

The ECTS scale is a relative comparative rating scale, which establishes the applicant's belonging to the group of the best or worst among the reference group of fellow students (faculty, specialty). A grade "A" on the ECTS scale cannot be equal to an "excellent" grade, and a grade "B" cannot be equal to a "good" grade, etc. When converting from a multi-point scale, the boundaries of grades "A", "B", "C", "D", "E" on the ECTS scale do not coincide with the limits of marks "5", "4", "3" on the traditional scale. Applicants who receive grades "FX" and "F" ("2") are not included in the list of ranked applicants. The "FX" grade is given to applicants who have scored the minimum number of points for the current educational activity, but who have not been credited with the final control. The grade "F" is given to applicants who have attended all classes in the discipline, but have not received an average score (3.00) for the current educational activity and are not allowed to the final control.

Applicants studying in one course (one specialty), based on the number of points scored in the discipline, are ranked on the ECTS scale as follows:

Conversion of the traditional grade in the discipline and the sum of points on the ECTS scale

ECTS score	Statistical indicator
A	Top 10% of applicants
B	The next 25% of applicants
C	The next 30% of applicants
D	The next 25% of applicants
E	The next 10% of applicants

ECTS score	Statistical indicator
And	Top 10% of applicants
Into	The next 25% of applicants
C	The next 30% of applicants
D	The next 25% of applicants
E	The next 10% of applicants

10. Methodological support

- Work program of the discipline
- Sylabus
- Methodical developments for practical classes
- Methodical recommendations for independent work of higher education students
- Multimedia presentations
- Situational clinical tasks
- Electronic bank of test tasks by discipline units
- Educational and methodical literature

11. Questions for the ongoing control

1. Diagnostic value of electrocardiography. The principle of ECG registration.
2. The principle of the ECG method. Fundamentals of electrophysiology of the heart: rest potential, action potential, refractory period absolute, relative, effective, functional. The structure of the cardiac conduction system.

3. Standards electrocardiogram of a healthy person.
4. Electrocardiogram analysis: rhythm, source of rhythm driver, voltage, heart rate; definition, diagnostic value of changes in these indicators.
5. The electrical axis of the heart: concept, methods of determination and diagnostic value.
6. Signs of hypertrophy of various parts of the heart: atria, ventricles.
7. ECG signs of a violation of the automatism of the heart.
8. Sinus tachycardia. Etiology. ECG - signs. Sinus bradycardia. Etiology. ECG - signs.
9. Supraventricular tachycardia. Etiology. Atrial paroxysmal tachycardia. ECG – signs.
10. Tachycardia with AB - compounds. ECG – signs.
11. Ventricular tachyarrhythmias. Etiology. ECG – signs.
12. Flutter and atrial fibrillation. Classification. Etiology. ECG – signs.
13. Extrasystole. Definition. Etiology. Classification (according to the localization of the ectopic focus, frequency, shape, and so on). Gradations of extrasystoles according to B. Lown. Differential diagnosis of functional and organic extrasystoles. Clinic. ECG – signs of different types of extrasystoles.
14. Blockades: definition, etiology, classification by localization and degree.
15. Sinoatrial blockade: etiology, ECG-signs of sinoauricular blockade I, II, III degree. Syndrome of weakness of the sinus node.
16. Atrial block: ECG signs.
17. Atrioventricular block I, II, III degree. Etiology. ECG signs.
18. Intraventricular blockade. ECG signs of complete and incomplete blockades of the right and left legs of the bundle of His. Diagnosis of myocardial infarction against the background of complete blockade of the left leg of the bundle of His. Blockade of branches of the left leg of the bundle of His. Bifascicular blockade. Trifascicular blockade.
19. ECG - diagnosis of myocardial infarction. ECG for myocardial infarction of various localization.
20. ECG criteria for pulmonary embolism.
21. ECG – diagnosis of chronic pulmonary heart.
22. ECG diagnostics for pericarditis, myocarditis.
23. ECG for violations of electrolyte metabolism.
24. Features of ECG in childhood.
25. The procedure for analyzing and writing an ECG protocol. Clinical interpretation of ECG data.

12. Recommended literature

Basic:
1. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
2. Richard B. Berry MD, Mary H. Wagner MD, in Sleep Medicine Pearls (Third Edition), 2015 Premature Beats.
3. John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.

Additional:
1. Harrison's Principles of Internal Medicine, Twenty-First Edition (Vol.1 & Vol.2). Joseph Loscalzo, Anthony Fauci, Dennis Kasper, Stephen Hauser, Dan Longo, J. Larry Jameson. – McGraw Hill / Medical. 2022. – 2 / 15164 p.

Electronic resources
1. Dr. Smith`s ECG Blog http://hqmeded-ecg.blogspot.com/
2. American College of Cardiology http://www.acc.org/

3. American Heart Association http://news.heart.org/
4. European Society of Cardiology http://www.escardio.org/
5. BMJ Clinical Evidence http://clinicalevidence.bmj.com
6. http://www.ecgmadesimple.com
7. https://ekg.academy
8. https://www.skillstat.com/tools/ecg-simulator
9. https://ecg.utah.edu