MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION

PENZA STATE UNIVERSITY

MEDICAL INSTITUTE

APPROVED
by the director of the institute
A. N. Mitroshin
« 07 » March 2016

WORKING PROGRAMME OF THE DISCIPLINE

C1.2.5 FUNCTIONAL DIAGNOSTICS

Specialty – 31.05.01 General Medicine

Graduate's qualification – medical doctor

Type of study – full-time

Penza, 2016

1. Goals of the discipline

The primary goals of the discipline Functional Diagnostics are mastering modern diagnostic methods, which are used in cardiology, pulmonology, gastroenterology, and nephrology and required for differentiating the diagnosis of diseases in internal organs, evaluating their functional status, monitoring the effectiveness of therapy and dynamic monitoring of the patient's condition.

The objectives of the discipline Functional Diagnostics are as follows: developing the ability to work with medical and technical equipment; analysing and interpreting the results of electrocardiography, transesophageal electrical stimulation of the heart, 24-hour monitoring of blood pressure and ECG, ECHO-CG, ultrasound examination of the abdominal cavity, retroperitoneal space, spirometry, and pulse oximetry.

2. Place of the discipline in Basic Professional Educational Programme (hereinafter – BPEP)

The academic discipline Functional Diagnostics refers to the variable part of the C1 block of the discipline. Functional Diagnostics is one of the obligatory disciplines in the variable part, which is interlinked with such disciplines as Anatomy; Biology; Biochemistry; Histology, Embryology, Cytology; Normal Physiology; Propaedeutics of Internal Diseases, and Radiation Diagnostics.

The main topics of the discipline are necessary for studying the clinical disciplines: Faculty Therapy, Occupational Diseases; Polyclinic Therapy; Infectious Diseases; Neurology, Medical Genetics; Paediatrics; Hospital Therapy, Endocrinology; Anaesthesiology, Resuscitation, Intensive Care.

3. Student's competences acquired through successful completion of the discipline Functional Diagnostics

The process of studying the discipline is aimed at forming the components of the following competences in accordance with Federal State Educational Standards of Higher Education (hereinafter – FSES HE) in this field of study:

Code of the competence	Name of the competence	Components of the competence (On successful completion of the course, the student should know, be able to, obtain and apply)
1	2	3
GC-1	Ability to abstract thinking, analysing and summarising	Know: methods of analysing and summarising
		Be able to: apply methods of analysing and summarising
		Obtain and apply: methods of analysing and summarising
GC-8	Skills of working in a team, using principles of modern business ethics and social psychology in the process of business and research communication	Know: social, ethnic, confessional and cultural differences
		Be able to: tolerate social, ethnic, confessional and cultural differences
		Obtain and apply: willingness to work in a team
GPC-1	Readiness to address standard tasks of professional activity using information and reference sources, medical and biological terminology, information and communication technologies, and take into account the basic requirements for information security	Know: medical and biological terminology, fundamentals of information and communication technologies, and information security requirements
		Be able to: use information and reference sources, information and communication technologies
		Obtain and apply: skills to address standard tasks of professional activity using information

		and reference sources, medical and biological terminology, information and communication technologies, and take into account the basic requirements for information security
PC-1	Ability and readiness to implement a set of measures aimed at maintaining and improving health, including a healthy lifestyle, preventing the occurrence and (or) spread of diseases, diagnosing them at early stages, identifying the causes and conditions for their occurrence and development, as well as eliminating harmful effects of environmental factors on human health	Know: set of measures aimed at maintaining and improving health, including a healthy lifestyle, preventing the occurrence and (or) spread of diseases
		Be able to: make early diagnosis and identify the causes and conditions of emerging and developing diseases under the guidance of the lecturer
		Obtain and apply: skills to independently implement a set of measures aimed at maintaining and improving health, including a healthy lifestyle, preventing the occurrence and (or) spread of diseases, diagnosing them at early stages, identifying the causes and conditions for their occurrence and development, as well as eliminating harmful effects of environmental factors on human health
PC-3	Ability and readiness to carry out anti-epidemic measures, organise the protection of population in the foci of especially dangerous infections, in case of the deteriorating radiation situation, natural disasters, and emergency situations	Know: order of organising anti-epidemic measures in the foci of especially dangerous infections, ways of protecting population from the deteriorating radiation situation and natural disasters,
		Be able to: organise the protection of population in case of the deteriorating radiation situation, natural disasters, and emergency situations
		Obtain and apply: the ability to conduct anti-epidemic measures, organise the protection of population in the foci of especially dangerous infections, in case of the deteriorating radiation situation, natural disasters, and emergency situations
PC-5	Readiness to collect and analyse patient complaints, his history, examination results, laboratory, instrumental, pathological and anatomical and other studies to recognize the condition or establish the presence or absence of disease	Know: complaints, laboratory and instrumental methods of research in various diseases
		Be able to: collect complaints, anamnesis; examine the patient
		Obtain and apply: skills to analyse complaints, anamnesis, examination results, laboratory, instrumental, pathological and anatomical and other studies to recognize the condition or establish the presence or absence of disease
PC-17	Ability to apply the basic principles of organising and managing health care in medical organisations and their structural subdivisions	Know: basic principles of organising and managing health care in medical organisations and their structural subdivisions
		Be able to: apply the basic principles of organising and managing health care in medical organisations and their structural subdivisions under the guidance of the lecturer
		Obtain and apply: skills to independently use the basic principles of organising and managing

		health care in medical organisations and their structural subdivisions

4. Structure and content of the discipline Functional Diagnostics

4.1. Structure of the discipline

The total workload of the discipline amounts to 2 credit units, 72 academic hours.

No.	Name of discipline (module) units and topics	Semester	Semester weeks	Types of academic work including students' individual work and workload *(in academic hours)*									Forms of on-going performance assessment *(in semester weeks)*							
				In-class work				Individual work												
				Total	Lecture	Practical classes	Laboratory work	Total	Preparation for in-class work	Papers, essays etc.	Coursework (project)	Preparation for exams	Interview	Spoken test	Test	Check work marking	Paper marking	Marking of essays and other creative works	Coursework (project)	Skills testing
1.	Section 1. Clinical Electrocardiography	5		18		18		6												
1.1.	Topic 1.1. Clinical pathophysiology of the heart. Basics of electrocardiography (ECG). Normal ECG. Determination of the electrical axis of the heart (EAH).	5	1	3		3		1	1				1							
1.2.	Topic 1.2. ECG in cardiac hypertrophy.	5	2	3		3		1	1				2		2					
1.3.	Topic 1.3. ECG in case of conduction disturbance: blockade of the sinoatrial node, AV-connection, blockade of the legs of the His-bundle.	5	3	3		3		1	1				3		3					
1.4.	Topic 1.4. ECG in cases of disturbances in the function of excitability and automatism (violations	5	4	3		3		1	1				4		4					

	of the automaticity of the sinus node, active and passive ectopic complexes and rhythms).																			
1.5.	Topic 1.5. ECG in cases of disturbances in the function of excitability and automatism (slow and fast slipping complexes, atrial fibrillation and flutter, fibrillation and flutter of the ventricles).	5	5	3		3		1	1				5		5					
1.6.	Topic 1.6. ECG with myocardial ischemia and myocardial infarction.	5	6	3		3		1	1				6		6					
2.	Section 2. Functional diagnosis of the cardiovascular system.	5		12		12		2												
2.1.	Topic 2.1. Basics of Holter ECG monitoring.	5	7	3		3		0,5	0,5			1	7		7					
2.2.	Topic 2.2. Functional tests in cardiology under ECG recording control (physical activity tests, pharmacological tests, respiratory tests, transesophageal pacing).	5	8	3		3		0,5	0,5			2	8		8					
2.3.	Topic 2.3. Basics of ambulatory blood pressure monitoring (ABPM).	5	9	3		3		0,5	0,5			1	9		9					
2.4.	Topic 2.4. Basic methods of diagnosis of vascular pathology. Clinical physiology of blood vessels. Rheovasography. Sphygmography. Rheoencephalography. Duplex scanning of vessels. Ultrasound dopplerography.	5	10	3		3		0,5	0,5			2	10		10					
3.	Section 3. Basics of ultrasound diagnosis of internal organs.	5		15		15		3												
3.1.	Topic 3.1. Basic principles of ultrasonic diagnostics of endocrine system diseases.	5	11	3		3		0,5	0,5				11		11					

3.2.	Topic 3.2. Basic principles of ultrasound diagnosis of the cardiovascular system: echodopplerography.	5	12	3		3		1	1				12		12					
3.3.	Topic 3.3. Basic principles of ultrasound diagnosis of diseases of the digestive system.	5	13	3		3		0,5	0,5				13		13					
3.4	Topic 3.4. Basic principles of ultrasound diagnosis of diseases of the digestive system.	5	14	3		3		0,5	0,5				14		14					
3.5.	Topic 3.4. Basic principles of ultrasound diagnosis of kidney and urinary tract diseases.	5	15	3		3		0,5	0,5				15		15					
4.	Section 4. Functional diagnostics of the respiratory system.	5		6		6		1												
4.1.	Topic 4.1. Basic principles and methods of functional diagnostics of the respiratory system. Spirometry.	5	16	6		3		0,5	0,5				16		16					
4.2.	Topic 4.2. Basic principles and methods of functional diagnostics of the respiratory system. The flow-volume curve of forced expiration. Pneumotachometry. Pulse oximetry.	5				3		0,5	0,5				17		17					
5.	Section 5. Functional diagnostics of the digestive system.	5		3		3		0,5												
5.1.	Topic 5.1. Clinical physiology of the stomach, liver, biliary tract. Basics of the study of gastric secretion, duodenal sounding.		17	3		3		0,5	0,5				18		18					
6.	Section 6. Functional diagnosis of the urinary system.	5		3		3		0,5												
6.1.	Topic 6.1. Clinical physiology and pathophysiology of the kidneys. Basic methods of functional diagnostics in		18	3		3		0,5	0,5				19		19					

	nephrology.																				
	General workload, in academic hours			72		57		15	13			2	Interim assessment								
													Type					Semester			
													Pass/fail exam					5			
													Exam					-			

4.2. Content of the discipline (module)

Section of the discipline	№	Topic	Content
5 semester			
1. Clinical Electrocardiography	1.	Clinical pathophysiology of the heart. Basics of electrocardiography (ECG). Normal ECG. Determination of the electrical axis of the heart (EAH).	Vector theory of the formation of the electromotive force (EMF) of the heart. Concept of resting membrane potential and action potential. Action potential curve and the excitability curve of typical and atypical cardiomyocytes. Role of ions Na +, K +, Cl-, Ca ++. Absolute and relative refractoriness. Primary functions of the myocardium. Structure and function of the conduction system of the heart. Dipole theory of ECG formation. ECG recording technique. Scheme for the formation of standard and reinforced leads from the limbs. Characteristics of the leading waves and intervals on the standard ECG. Determination of the excitation source. Concept of sinus rhythm. Determination of the heart rate frequency (HR). Determination of the electrical axis of the heart (EAH). Variants of the position of EAH. Determination of the direction of EAH.
	2.	ECG in cardiac hypertrophy.	Definition of the concept of hypertrophy. Leading causes of hypertrophy of the heart. ECG signs of hypertrophy of the left atrium, right atrium, left ventricle, right ventricle. ECG-signs of combined hypertrophy of the atria and ventricles. Acute overload of the atria. Systolic overload of the ventricles.
	3.	ECG in case of conduction disturbance: blockade of the sinoatrial node, AV-connection, blockade of the legs of the His-bundle.	Structure and function of the conduction system of the heart. Sinoatrial node (SA node), the atrioventricular junction (AV node), the His-bundle legs, Purkinje fibers. Generation of impulses and conduction of excitation through various sections of the conducting system. Routes of excitation from the SA node to the working cardiomyocyte. ECG

			signs of SA block, AV block of 1, 2, 3 degrees. Second-degree AV block Mobitz type 1 and 2. Blockade of the legs of His-bundle. ECG-signs of premature ventricular excitation (WPW-syndrome). Tactics of patients management, the basic principles of treatment.
	4.	ECG in cases of disturbances in the function of excitability and automatism (violations of the automaticity of the sinus node, active and passive ectopic complexes and rhythms).	Functions of the myocardium. Conductive system of the heart and its importance in the formation of arrhythmias and heart block. Arrhythmias: etiology and classification. Mechanisms of occurrence of arrhythmias. Re-entry mechanism. Clinical picture of arrhythmias. ECG diagnostics. Tachycardia: concept, classification. Classification of antiarrhythmic drugs. Tactics of patients management, the basic principles of treatment.
	5.	ECG in cases of disturbances in the function of excitability and automatism (slow and fast slipping complexes, atrial fibrillation and flutter, fibrillation and flutter of the ventricles).	ECG-diagnostics of arrhythmias. Sinus tachycardia, sinus bradycardia, sinus arrhythmia. Atrial, nodular and ventricular extrasystoles. Left and right ventricular extrasystoles. Paroxysmal tachycardia. Concept of heart defibrillation. Atrial fibrillation and flutter. Fibrillation and flutter of the ventricles. ECG diagnostics. Cardioversion: concept, indications for conduction. Tactics of patients management, the basic principles of treatment.
	6.	ECG with myocardial ischemia and myocardial infarction.	The concept of damage, ischemia, myocardial necrosis, and their signs on the ECG. Etiology. Pathogenesis of myocardial infarction (MI). Atherosclerosis of the coronary arteries. Concept of endothelial dysfunction. Definition of MI. Stages of MI. Classification by prevalence and localisation. Symptoms of myocardial infarction on the ECG. Complications of MI.
2. Functional diagnosis of the cardiovascular system.	7.	Basics of Holter ECG monitoring.	Holter ECG monitoring (HM ECG): concept, the definition of indications, procedure. Value of

			HM for the diagnosis of coronary heart disease, cardiac rhythm disturbances. Processing of research results using a personal computer and software. Interpreting the results.
	8.	Functional tests in cardiology under ECG recording control (physical activity tests, pharmacological tests, respiratory tests, transesophageal pacing).	Variants of physical activity during functional tests (statistical, dynamic, mixed). Emotional tests. Orthostatic test. Samples with medications (stress tests). Cold sample. The Valsalva test. Definition of indications. Bicycle ergometer test: concept, methodology of conducting, definition of indications. Transesophageal electrostimulation: concept, technique of conducting, definition of indications. Interpretation of the results of functional research.
	9.	Basics of ambulatory blood pressure monitoring (ABPM).	ABPM: concept, methodology of conducting, definition of indications. Concept of ABPM profiles. Processing of research results using a personal computer and software. Interpreting the result.
	10.	Basic methods of diagnosis of vascular pathology. Clinical physiology of blood vessels. Rheovasography. Sphygmography. Rheoencephalography. Duplex scanning of vessels. Ultrasound dopplerography.	Echocardiography. Indications for the study. Concept of the diagnostic capabilities of one-dimensional, two-dimensional and Doppler scanning of the heart and blood vessels. Principles of diagnosis of valvular lesions, signs of hypertrophy and dilated heart. Evaluation of systolic and diastolic function of the heart, local disturbances of myocardial contractility. Identification of intracardiac formations. Concept of stress echocardiography. Sphigmography. Diagnostic value. Rheography. The principle of the method, its diagnostic value.
3. Basics of ultrasound diagnosis of internal organs.	11	Basic principles of ultrasonic diagnostics of endocrine system diseases.	Ultrasound research: concept, main aspects of the methodology, study, determination of indications. Anatomy, clinical physiology of the thyroid gland. Ultrasound of the thyroid gland: technique of conducting, determining the

			indications. Carrying out a puncture biopsy of the thyroid gland under the supervision of ultrasound. Immunological studies of thyroid hormone levels, correlation with ultrasound findings. Interpretation of results.
	12	Basic principles of ultrasound diagnosis of the cardiovascular system: echodopplerography.	Echocardiography. Indications for the study. Concept of the diagnostic capabilities of one-dimensional, two-dimensional and Doppler scanning of the heart and blood vessels. Principles of diagnosis of valvular lesions, signs of hypertrophy and dilated heart. Evaluation of systolic and diastolic function of the heart, local disturbances of myocardial contractility. Identification of intracardiac formations. Concept of stress echocardiography.
	13	Basic principles of ultrasound diagnosis of diseases of the digestive system.	Anatomy of the hepatobiliary zone. Ultrasound diagnosis of the liver, spleen and bile ducts. General understanding of the diagnostic capabilities of the method.
	14	Basic principles of ultrasound diagnosis of diseases of the digestive system.	Features of the preparation for the study. Value of the ultrasound method of investigation in the diagnosis of pancreatic diseases. Interpreting the result.
	15	Basic principles of ultrasound diagnosis of kidney and urinary tract diseases.	Anatomy of the small pelvis. Ultrasound examination of the kidneys, bladder, prostate. General understanding of the diagnostic capabilities of the method. Preparation for the study. Concept of the importance of ultrasound research in the diagnosis of diseases of the kidneys and urinary tract. Interpreting the result.
4. Functional diagnostics of the respiratory system.	16	Basic principles and methods of functional diagnostics of the respiratory system. Spirometry.	Clinical physiology and pathophysiology of the respiratory system. Concept of elastic recoil. Breathing volumes and capacities (statistical and dynamic indicators).
	17	Basic principles and methods of functional diagnostics of the respiratory system. The flow-volume curve of forced expiration.	Spirography. Significance of the functional examination of the respiratory system in the diagnosis of failure of the function of external respiration. Concept of obstructive and restrictive respiratory failure.

		Pneumotachometry. Pulse oximetry.	Tiffno test. Concept of pneumotachometry and pneumotachography. Concept of computer spirography and the study of inspiratory and expiratory volume velocity air flow ("flow-volume" loop). Gas composition of blood. Concept of carbonation of blood gases. Pulse oximetry. Interpreting the results.
5. Functional diagnostics of the digestive system.	18	Clinical physiology of the stomach, liver, biliary tract. Basics of the study of gastric secretion, duodenal sounding.	Examination of gastric secretion. Method of fractional gastric sounding. Concept of basal and stimulated gastric secretion (histamine, pentagastrin parenteral stimuli). Investigation of physical properties of gastric contents (amount, color, odor, impurities). Chemical Study: determination of total acidity, free and bound hydrochloric acid titration method. Assessment of the acid-forming function of the stomach by the production of hydrochloric acid. Concept of the debit hour of HC1 basal, submaximal and maximum secretion and its calculation, peak acid production. Diagnostic value. Concept of determining the intragastric pH (pH-metry). Continuous pH-metry of gastric contents. Investigation of the enzyme-forming function of the stomach. Definition of pepsin. Reaction to lactic acid and blood. A general presentation of non-probe methods for the study of gastric secretion. Duodenal sounding. Sounding technique. Physical properties of duodenal contents, chemical, microscopic and bacteriological study. Modern modifications of the method: multi-stage and chromatographic diagnostics. Examination of the external and internal function of the pancreas (the study of enzymes in duodenal contents, blood and urine), studies of carbohydrate metabolism. Diagnostic value of the coprological study.

6. Functional diagnosis of the urinary system.	19	Clinical physiology and pathophysiology of the kidneys. Basic methods of functional diagnostics in nephrology.	Clinical physiology and pathophysiology of the urinary system. Nephron: definition, structure, the concept of a structural unit. Value of the urine density test for assessing the functional state of kidneys. Zimnitsky test. Hyposthenuria, isosthenuria, nocturia and their diagnostic significance. Concept of methods for determining partial functions of the kidneys. Rehberg-Tareev test and its diagnostic significance. Determination of urea, creatinine, residual nitrogen, protein and protein fractions, lipids, electrolytes in serum and their diagnostic value.

5. Educational technologies

- Traditional classes, including the analysis of ECG, data of PPP, spirometry, ultrasound, 24-hour Holter ECG, and ABPM within the discipline topics;
- Testing;
- Out-of-class work with literature;
- Analysis of patients' complaints within the topic of practical training.

In order to implement an individual approach to teaching students undergoing special learning process within the framework of an individual work plan, the study of this discipline is based on the following opportunities: providing students' individual work, including work in the electronic educational environment using appropriate software equipment, forms of distance learning, Internet resources, individual consultations, etc.

Active learning methods

The method of analysing specific situations (role-playing games)

Role-playing games are an innovative method of working with students, which is aimed at stimulating their independent and creative activity. In the process of the game, it is possible to understand the nuances of the problem in an accessible and thorough manner, determine the level of the student's preparation. Role-playing games are of a learning-controlling character and are conducted at the end of the cycle lessons on the main sections of the discipline. Before the game starts, the lecturer gives the game task (ECG data, spirometry, ultrasound, Holter ECG, ABPM). The lecturer offers students at will to participate in it, if there are not any, the participants of the game will be selected by the lecturer. The reviewers of participants are appointed only by the lecturer from among the most successful students. After the game, the results are summed up. When making an assessment, the correctness of task performance, timeliness of reaction, and knowledge are taken into account.

6. Teaching and methodological support for students' individual work. Estimating means for on-going performance assessment, interim assessment on successful competition of the discipline.

6.1. Schedule of students' individual work

Week №	Topic	Type of individual work	Task	Recommended literature	Amount of hours
1	Clinical pathophysiology of the heart. Basics of electrocardiography (ECG). Normal ECG. Determination of the electrical axis of the heart (EAH).	Preparing for in-class work	To study theoretical material on the topic of the lesson. To revise methods for diagnosing internal organs. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	1
2	ECG in cardiac hypertrophy.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods ECG registration. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	1
3	ECG in case of conduction disturbance: blockade of the sinoatrial node, AV-connection, blockade of the legs of the His-bundle.	Preparing for classwork	To study the theoretical material on the topic of the lesson. To revise methods ECG registration. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	1
4	ECG in cases of disturbances in the function of excitability and automatism (violations of the automaticity of the sinus node, active and passive ectopic complexes and	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods ECG registration. To answer	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov	1

	rhythms).		questions for self-control.	V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	
5	ECG in cases of disturbances in the function of excitability and automatism (slow and fast slipping complexes, atrial fibrillation and flutter, fibrillation and flutter of the ventricles).	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods ECG registration. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	1
6	ECG with myocardial ischemia and myocardial infarction.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods ECG registration. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	1
7	Basics of Holter ECG monitoring.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods Holter ECG monitoring. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M.: GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	0,5
8	Functional tests in cardiology under ECG recording control (physical activity tests, pharmacological tests, respiratory tests, transesophageal pacing).	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods ECG registration. To answer questions for self-control.	1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html 2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M.: GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html 3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html	0,5
9	Basics of ambulatory blood pressure monitoring	Preparing for classwor	To study theoretical material on	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. -	0,5

	(ABPM).	k	the topic of the lesson. To revise methods registration of 24-hour ambulatory BP monitoring. To answer questions for self-control.	http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html	
10	Basic methods of diagnosis of vascular pathology. Clinical physiology of blood vessels. Rheovasography. Sphygmography. Rheoencephalography. Duplex scanning of vessels. Ultrasound dopplerography.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods diagnosis of vascular pathology. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html	0,5
11	Basic principles of ultrasonic diagnostics of endocrine system diseases.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of ultrasound diagnosis of the endocrine system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html	0,5
12	Basic principles of ultrasound diagnosis of the cardiovascular system: echodopplerography.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of ultrasound diagnosis of the cardiovascular system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html	1
13	Basic principles of ultrasound diagnosis of diseases of the	Preparing for classwork	To study theoretical material on the topic of	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430	0,5

	digestive system.		the lesson. To revise methods of ultrasound diagnosis of the digestive system. To answer questions for self-control.	78.html 2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html	
14	Basic principles of ultrasound diagnosis of diseases of the digestive system.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of ultrasound diagnosis of the digestive system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html	0,5
15	Basic principles of ultrasound diagnosis of kidney and urinary tract diseases.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of ultrasound diagnosis of the urinary system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html	0,5
16	Basic principles and methods of functional diagnostics of the respiratory system. Spirometry.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of functional diagnostics of the respiratory system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html	0,5
17	Basic principles and methods of functional diagnostics of the respiratory system. The flow-volume	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Pathophysiology. Concise Lectures, Tests,	0,5

	curve of forced expiration. Pneumotachometry. Pulse oximetry.		methods of functional diagnostics of the respiratory system. To answer questions for self-control.	Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html	
18	Clinical physiology of the stomach, liver, biliary tract. Basics of the study of gastric secretion, duodenal sounding.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of functional diagnostics of the digestive system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html 3. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html	0,5
19	Clinical physiology and pathophysiology of the kidneys. Basic methods of functional diagnostics in nephrology.	Preparing for classwork	To study theoretical material on the topic of the lesson. To revise methods of ultrasound diagnosis of the urinary system. To answer questions for self-control.	1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html 2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html 3. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. http://www.studmedlib.ru/book/ISBN9785970436004.html	0,5

6.2. Methodological guidelines on organising students' individual work

Individual work of students is conducted following the methodological recommendations of the department teaching the discipline Functional Diagnostics:

1. Rakhmatullov F.K., Dementieva R.E. Functional diagnostics: Methodical recommendations for practical lessons on clinical hematology. Penza: Penza State University publishing, 2016. 52 p.

6.3. Materials for interim and on-going performance assessment of students' knowledge

Competence mastering assessment

№	Assessment type	Monitored topics (sections)	Competencies that include components under assessment
1	Interview	Section 1, 2, 3, 4, 5, 6	GC-1, GC-8, GPC-1, PC-1, PC-3, PC-5, PC-7
2	Test	Section 1, 2, 3, 4, 5, 6	GC-1, GC-8, GPC-1, PC-1, PC-3, PC-5, PC-7

Interview questions

1. Equipment for conducting functional studies of internal organs and systems.
2. Electrophysiological equipment.
3. Fundamentals of ECG formation. Bipolar theory. Characteristics of waves, intervals.
4. Scheme of formation of standard leads and augmented unipolar limb leads.
5. Methods and scheme of ECG analysis.
6. Normal ECG. Determination of the electrical axis of the heart.
7. Signs of myocardial hypertrophy.
8. Criteria for SA blockade and determining its degree.
9. ECG signs at different stages of myocardial infarction.
10. ECG signs of supraventricular tachycardia.
11. ECG signs of atrial fibrillation and flutter, differential diagnosis between them.
12. Transesophageal electrophysiological study (TEEPS) as a method of examination in cardiology. Equipment. Indications, contraindications.
13. The procedure of TEEPS. TEEPS with various heart rhythm disturbances and conduction.
14. Transesophageal pacing (TEEPS) of the heart in the diagnosis of paroxysms of atrial fibrillation and flutter. Method of conducting. Indications and contraindications. The main functional indicators.
15. TEEPS in the diagnosis of coronary heart disease. Method of conducting. Indications and contraindications. The main functional indicators.
16. Doppler study of blood flow in blood vessels.
17. Doppler-echocardiography. Indications for the study. The concept of diagnostic capabilities of one-dimensional, two-dimensional and Doppler scanning of the heart and blood vessels.
18. Echocardiography. Principles of diagnosis of valvular heart diseases, signs of hypertrophy and dilatation of the heart. Evaluation of systolic and diastolic function of the heart, local disturbances of myocardial contractility. Identification of intracardiac formations. The concept of stress echocardiography.
19. Sphigmography. Diagnostic value. Rheography. The principle of the method, its diagnostic value.
20. Ultrasound research: concept, the main aspects of the methodology, conducting research, determining the indications.
21. Physical principles of ultrasound imaging of the heart. A-, M- and B-mode.
22. Samples with physical activity. Bicycle ergometer test. Indication, contraindications, sample procedure.
23. Pharmacological tests in cardiology.
24. Methods of studying external respiration in humans. Research of ventilating functions of lungs and respiratory mechanics.
25. Spirometry and spirography.

26. Research of the functional state of the kidneys. Zimnitsky and Rehberg-Tareev tests, Cockroft-Gault formula.

Assessment criteria for interview pass are as follows:
• The “passed” grade is given to a student if he/she shows good knowledge of material within the topic, can conduct the survey and interpret its results, logically and consistently expounds the subject matter, reveals the meaning of the question, and gives satisfactory answers to additional questions.
• The “failed” grade is given to a student if he/she has fragmentary knowledge of this topic, finds it difficult to correctly diagnose, prescribe an examination, make a differential diagnosis, administer treatment, and gives incomplete answers to questions asked within basic literature recommended for the discipline.

Test questions

1. The inner side of the cell membrane of the myocyte in a state of rest is charged:
a) Negatively
b) Positively
c) The charge is 0
d) All three options are possible
2. Inside the myocyte at rest, the concentration of potassium ions is:
a) More than in the extracellular fluid
b) Less than in the extracellular fluid
c) Same as in the extracellular fluid
3. Within the myocyte at rest, the concentration of sodium ions is:
a) More than in the extracellular fluid
b) Less than in the extracellular fluid
c) Same as in the extracellular fluid
4. The phase "0" of the action potential of the cells of the conduction system of the heart and the myocardium is due to:
a) The release of potassium ions from the cell
b) The entry into the cell of sodium ions
c) The entry into the cell of calcium ions
d) The exit from the cell of calcium ions
5. The shortest phase of the action potential is:
a) 0
b) 1
c) 2
d) 3
e) 4
6. The longest phase of the action potential is:
a) 0
b) 1
c) 2
d) 3
7. The 2nd phase of the action potential of myocardial cells is mainly due to:
a) The rapid entry of sodium ions into the cell
b) The release of chloride ions from the cell
c) The entry of calcium ions into the interior of the cell
d) The yield of potassium ions
e) There is no correct answer
8. What frequency is characteristic for the replacement rhythm of the AV connection?

a) Less than 20 per minute
b) 20-30 per minute
c) 40-50 per min.
d) 60-80 per min.
e) 90-100 per min.
9. What frequency is characteristic for the replacement rhythm of the Purkinje fibers?
a) Less than 20 per min.
b) 20-30 per minute.
c) 40-50 per min.
d) 60-80 per min.
10. The speed of the impulse depends on:
a) Velocities and amplitudes of the "0" phase of the action potential
b) The level of rest potential
c) Both the one and the other
d) Neither one nor the other
11. Refractory period in the cells of the working myocardium falls on the following phases of the action potential:
a) Phases 0, 1, 2
b) Phases 0, 1, 2, 3
c) Phases 0, 1, 2, 3, 4
12. Duration of the refractory period in myocardial cells with the acceleration of rhythm:
a) Decreases
b) Increases
c) Does not change
13. Duration of the refractory period in the cells of the sinus and atrioventricular nodes during acceleration of the rhythm:
a) Is shortened
b) Extends
c) Does not change
d) There is no correct answer
14. Pulses are conducted with the lowest speed:
a) In the sinus node
b) In interstitial atrial tracts
c) In the AV node
d) In the common trunk of His's bundle
e) Correct answers are a, c
15. Depolarization in the myocardium of the ventricles is normally directed:
a) From the endocardium to the epicardium
b) From the epicardium to the endocardium
c) Both options are possible
16. The direction of repolarization in the ventricles is normally:
a) From the endocardium to the epicardium
b) From the epicardium to the endocardium
c) Both options are possible
17. A negative P wave in leads III and aVF can be recorded:
a) With ectopic atrial rhythm
b) If the electric axis of the auricle deviates to the left
c) In either case
d) In neither case
18. The amplitude of the P wave in the II lead is normally:
a) Less than 2.0 mm
b) Up to 2.5 mm

c) Up to 3.5 mm
d) Up to 4 mm
19. The duration of the P wave is normally:
a) 0.02 sec
b) Up to 0.10 s
c) Up to 0.12 sec
d) Up to 0.13 s
20. The duration of the PQ interval in adults is normally:
a) 0.08-0.12 sec
b) 0.14-0.20 sec
c) 0.22-0.24 s
d) 0.26-0.48 s

7. Methodological and information support of the discipline (module) Functional Diagnostics

a) basic literature:
1. Internal diseases propaedeutics [Electronic resource] / Ivashkin V.T., Okhlobystin A.V. - M. : GEOTAR-Media, 2014. - http://www.studmedlib.ru/book/ISBN9785970430378.html
2. Ternova S.K., Sinitsyn V.E. Diagnostic radiology, and therapy. - M.: GEOTAR-Media, 2010. - 304 c. http://www.studmedlib.ru/book/ISBN9785970413920.html

b) additional literature:
1. ECG in arrhythmia: an atlas. Kolpakov E.V., Lyusov V.A., Volov N.A. – M.: GEOTAR-Media, 2013. http://www.studmedlib.ru/book/ISBN9785970426036.html
2. Atlas of ECG: a study guide. Shchukin Yu.V., Surkova E.A., Dyachkov V.A. – M. : GEOTAR-Media, 2012. http://www.studmedlib.ru/book/06-COS-2340.html
3. ECG with myocardial infarction: an atlas. Lyusov V.A., Volov N.A., Gordeev I.G. – M.: GEOTAR-Media, 2009. http://www.studmedlib.ru/book/ISBN9785970412640.html
4. Rakhmatullov F.K. Transesophageal electrostimulation of the heart and clinical electrophysiology of antiarrhythmic drugs. - Monograph. Penza: PSU, 2006. 112 p.
5. Rakhmatullov F.K. Lone atrial fibrillation. Monograph. - Penza: PSU, 2013. 163 p.
6. Pathophysiology. Concise Lectures, Tests, Clinical-Pathophysiological Situations and Clinical-Laboratory Cases [Electronic resource]: Student Manual / Litvitsky P., Pirozhkov S., Tezikov E. - M.: GEOTAR-Media, 2016. - http://www.studmedlib.ru/book/ISBN9785970436004.html.

c) online resources:
1. http://www.studmedlib.ru – Student consultant
2. http://www.rmj.ru – Russian Medical Journal
3. http://www.con-med.ru – Journal Consilium Medicum
4. https://www.hrsonline.org – Heart Rhythm Society
5. www.onlinejacc.org – Journal of American College of Cardiology
6. https://www.ncbi.nlm.nih.gov/pubmed - US National Library of Medicine

d) Software and Internet resources:
1. Microsoft Windows (subscription DreamSpark / Microsoft Imagine Standart); registration number 00037FFEBACF8FD7, contract No. SD-130712001 of 12.07.2013;
2. Kaspersky Anti-Virus 2016-2017, registration number KL4863RAUFQ, agreement No. XII-567116 dated 29 August 2016;
3. Free software: Open Office; Mozilla Firefox; Google Chrome, Adobe Acrobat Reader, 7zip, DJVU reader.

8. Material and technical support of the discipline Functional Diagnostics

Name of particular premises and premises for individual work	Equipment of individual rooms and premises for individual work	List of licensed software. Requisites of the confirming document
Training room number 2 for practical classes in the "Clinical Hospital № 6 named after. G.A. Zakharin" following the agreement with the health facility	A set of educational furniture: tables, chairs, training board. Multimedia system (projector, screen, laptop)	1. Microsoft Windows (subscription DreamSpark / Microsoft Imagine Standart); registration number 00037FFEBACF8FD7, contract No. SD-130712001 of 12.07.2013; 2. Kaspersky Anti-Virus 2016-2017, registration number KL4863RAUFQ, agreement No. ХП-567116 dated 29 August 2016; 3. Free software: Open Office; Mozilla Firefox; Google Chrome, Adobe Acrobat Reader, 7zip, DJVU reader.
	Clinical history of the disease with the results of studies performed on medical equipment: – Ultrasound system SIEMENS ACUSON X-300; – X-ray apparatus KRD-"Maxim"; – X-ray apparatus "ABRIS" RDS; – CT Scanner Toshiba “Aquilion”; – MRI Scanner GE “Signa HD” 1,5 T; – Complex for non-invasive electrophysiological studies (TEEPS) Astrocard “Polysystem-EP/L”; – Treadmill Astrocard “Trackmaster”, Treadmill Excite®+ “Run 600 Treadmill”; – Ergometer SCHILLER “ERG 911BP”; – Schiller “BR-102 PLUS” ambulatory blood pressure monitor; – Holter monitor SCHILLER “Microvit MT-101”; – SCHILLER “AT-2” ECG machine; – Ultrasound system PHILIPS “HD 11XE”; – Spirometer «Spiro-Spectrum»; – Ergometer Medicor “KE-12”; – Bplab “MnSDP-2” ambulatory blood pressure monitor; – Holter monitor Astocard “HE2”, following the agreement with the health facility.	
Training room number 3 for practical classes in the "Clinical Hospital № 6 named after. G.A. Zakharin" following the agreement with the health facility	A set of educational furniture: tables, chairs, training board. A laptop.	1. Microsoft Windows (subscription DreamSpark / Microsoft Imagine Standart); registration number 00037FFEBACF8FD7, contract No. SD-130712001 of 12.07.2013; 2. Kaspersky Anti-Virus 2016-2017, registration number KL4863RAUFQ, agreement No. ХП-567116 dated 29 August 2016; 3. Free software: Open Office; Mozilla Firefox; Google Chrome, Adobe Acrobat Reader, 7zip, DJVU reader.
	Clinical history of the disease with the results of studies performed on medical equipment: – Ultrasound system SIEMENS ACUSON X-300; – X-ray apparatus KRD-"Maxim"; – X-ray apparatus "ABRIS" RDS; – CT Scanner Toshiba “Aquilion”;	

	– MRI Scanner GE “Signa HD” 1,5 T; – Complex for non-invasive electrophysiological studies (TEEPS) Astrocard “Polysystem-EP/L”; – Treadmill Astrocard “Trackmaster”, Treadmill Excite®+ “Run 600 Treadmill”; – Ergometer SCHILLER “ERG 911BP”; – Schiller “BR-102 PLUS” ambulatory blood pressure monitor; – Holter monitor SCHILLER “Microvit MT-101”; – SCHILLER “AT-2” ECG machine; – Ultrasound system PHILIPS “HD 11XE”; – Spirometer «Spiro-Spectrum»; – Ergometer Medicor “KE-12”; – Bplab “MnSDP-2” ambulatory blood pressure monitor; – Holter monitor Astocard “HE2”, following the agreement with the health facility.	
Classroom for individual work: PSU 10-204	A set of educational furniture: tables, chairs, training board. Computers with training CDs.	1. Microsoft Windows (subscription DreamSpark / Microsoft Imagine Standart); registration number 00037FFEBACF8FD7, contract No. SD-130712001 of 12.07.2013; 2. Kaspersky Anti-Virus 2016-2017, registration number KL4863RAUFQ, agreement No. ХП-567116 dated 29 August 2016; 3. Free software: Open Office; Mozilla Firefox; Google Chrome, Adobe Acrobat Reader, 7zip, DJVU reader.
Classroom for individual work: PSU 10-209	A set of educational furniture: tables, chairs, training board. Computers with training CDs	1. Microsoft Windows (subscription DreamSpark / Microsoft Imagine Standart); registration number 00037FFEBACF8FD7, contract No. SD-130712001 of 12.07.2013; 2. Kaspersky Anti-Virus 2016-2017, registration number KL4863RAUFQ, agreement No. ХП-567116 dated 29 August 2016; 3. Free software: Open Office; Mozilla Firefox; Google Chrome, Adobe Acrobat Reader, 7zip, DJVU reader.

The study program for the discipline "Functional diagnostics" is drawn in accordance with the federal state educational standard of higher education and academic plan for the course 31.05.01 – General Medicine.

The program developers:

1. Associate Professor at the Department of Internal Diseases _____ R. E. Dementieva
2. Assistant at the Department of Internal Diseases _____ N. E. Dyatlov

The program was discussed and agreed at the department meeting.

Record No. 9 on «03» March 2016

Head of the Department of Internal Diseases _____ F. K. Rakhmatullov

The program is agreed with the Dean of the Medical Faculty of PSU

Dean of the Medical Faculty _____ I. Ya. Moiseeva

The program was approved by the methodological commission of the Medical Institute

Record No. 7 on «05» March 2016

Chair of the methodological commission _____ O. V. Kalmin

Information on re-confirmation of the programme for the next academic year and registration of amendments

Academic year	Department solution (No. of the protocol, data, signature of the department head)	Introduced amendments	Page numbers		
			changed	new	annulled
2016-2017	№. 2, 03.09.2016	No changes	-	-	-
2017-2018	№. 2, 05.09.2017	1. Changes were made to the title page of the subject syllabus: "General Practitioner" changed to "Medical doctor" on the basis of the order of the Ministry of Education and Science of the Russian Federation No. 320 "On introducing changes in the lists of specialties and directions for the preparation of higher education" (registered May 10, 2017); 2. A description of the application of educational technologies to students with disabilities and disabled people is added to paragraph 5; 3. Amendments were made to paragraph 8 - material and technical means.	1 1 2	-	-

Перевод проверен.

Переводчик отдела сопровождения международных проектов АГУ Пешищева М.В.