Federal State Budgetary Educational Institution of Higher Education
"Privolzhsky Research Medical University"
Ministry of Health of the Russian Federation

APPROVED
Vice-Rector for Academic Affairs
_____ E.S. Bogomolova
31 August 2021

WORKING PROGRAM

Name of the academic discipline: **MICROSCOPIC BASES OF ANALYZERS**

Specialty: **31.05.01 GENERAL MEDICINE**

Qualification: **GENERAL PRACTITIONER**

Department: **HISTOLOGY WITH CYTOLOGY AND EMBRYOLOGY**

Mode of study: **FULL-TIME**

Labor intensity of the academic discipline: **36 academic hours**

Nizhny Novgorod
2021

The working program has been developed in accordance with the Federal State Educational Standard for specialty 31.05.01 GENERAL MEDICINE approved by Order of the Ministry of Science and Higher Education of the Russian Federation No. 988 of August 12, 2020.

Developers of the working program:
N.V. Blagova PhD, Associate Professor of the Department of Histology with Cytology and Embryology of FGBU VPO PIMU Ministry of Health of Russian Federation

The program was reviewed and approved at the department meeting (protocol No 7, 04/15/2021)
Head of the Department of Histology with Cytology and Embryology of FGBU VPO PIMU Ministry of Health of Russian Federation,
Doctor of Biology, Associate Professor, _____ /M.L. Bugrova/
(signature)

04/15/2021

AGREED
Deputy Head of EMA ph.d. of biology _____ Lovtsova L.V.
(signature)

04/15/2021

1. The purpose and objectives of mastering the academic discipline "Microscopic bases of analyzers" (hereinafter – the discipline):

1.1. The purpose of mastering the discipline: (*participation in forming the relevant competencies).*

- Able to carry out a critical analysis of problem situations based on a systematic approach, develop an action strategy (UC-1)

1.2. Requirements to the deliverables of mastering the discipline

As a result of completing the discipline, the student should

Know:

- general and specific structural and functional properties of cells of all body tissues and patterns of their embryonic and postembryonic development;
- functional, age-related and protective-adaptive changes in histological elements;
- basic histological international terminology.

Be able to:

- investigate histological preparations using a computer and a light microscope;
- identify organs, tissues, cells and non-cellular structures at the microscopic level.

Possess:

- skills of working with educational and scientific literature;
- skills of independent analytical, research work.

2. Position of the academic discipline in the structure of the General Educational Program of Higher Education (GEP HE) of the organization.

2.1. The discipline **"Microscopic bases of analyzers"** refers to or the part formed by the participants of educational relations of Block 1 of GEP HE (B1.PER.2).

The discipline is taught in 3 semester/ 2 year of study.

2.2. The following knowledge, skills and abilities formed by previous academic disciplines are required for mastering the discipline:

- ***biology***
- ***physics***
- ***chemistry***

Parallel study of anatomy, physiology with histology, embryology, cytology creates a view of the human body as a whole for the further study of medical and sanitary disciplines.

2.3. Mastering the discipline is required for forming the following knowledge, skills and abilities for subsequent academic disciplines:

- ***pathological anatomy***
- ***pathological physiology***

3. Deliverables of mastering the academic discipline and metrics of competence acquisition

Mastering the discipline aims at acquiring the following universal (UC) competencies

№	Competence code	The content of the competence (or its part)	Code and name of the competence acquisition metric	As a result of mastering the discipline, the students should:		
				know	be able to	possess
1.	UC-1	Able to carry out a critical analysis of problem situations	IAC UC-1.1 Knows: methods of critical analysis and evaluation of modern scientific	Methods of critical analysis and evaluation	To gain new knowledge based on analysis, synthesis,	Practical experience : research of the problem of

		based on a systematic approach, develop an action strategy	achievements; basic principles of critical analysis IAC $_{UC-1.2}$ Able to: gain new knowledge based on analysis, synthesis, etc.; collect data on complex scientific problems related to the professional field; search for information and solutions based on action, experiment and experience IAC $_{UC-1.3}$ Has practical experience: researching the problem of professional activity using analysis, synthesis and other methods of intellectual activity; developing an action strategy to solve professional problems	of modern scientific achievements in the field of histological research; basic principles of critical analysis	etc.; to collect data on complex scientific problems related to the professional field; to search for information and solutions based on actions, experiment and experience	professional activity with the use of analysis, synthesis and other methods of intellectual activity; development of an action strategy for solving professional problems

4. Sections of the academic discipline and competencies that are formed when mastering them

№	Competence code	Section name of the discipline	The content of the section in teaching units
1.	UC-1	NEURONS AND NEUROGLIA	Types of neurons and neuroglia. Nerve fibres. Nerve terminations Synapses Interneuronal connections and principles of the organization of neural systems. Histogenesis and regeneration of nervous tissue.
2.	UC-1	NERVOUS SYSTEM	Central and peripheral nervous system. Principles of structural and functional organization of nerves, peripheral ganglia, spinal cord and brain.
3.	UC-1	SENSE ORGANS	Classification of sensory organs. The organ of vision. The shells of the eye. Accommodation-dioptric apparatus of the eye. Neural organization of the retina. Photoreceptor cells. The organ of hearing and balance. Histophysiology of sound perception, gravity, and angular acceleration. The organ of taste.
4.	UC-1	INTEGUMENTARY	The integumentary system and its derivatives.

		SYSTEM. RECEPTORS.	Skin receptors.
5.	UC-1	RESPIRATORY SYSTEM.	Organs of the respiratory system. Receptors. Olfactory organ.

5. Volume of the academic discipline and types of academic work

Type of educational work	Labor intensity		Labor intensity (AH) in semesters			
	volume in credit units (CU)	volume in academic hours (AH)	2	3		
Classroom work, including	**0,6**	**19**		**19**		
Lectures (L)	0,1	2		2		
Laboratory practicum (LP)*						
Practicals (P)	0,5	17		17		
Seminars (S)						
Student's individual work (SIW)	**0,3**	**14**		**14**		
Mid-term assessment						
Credit	**0,1**	**3**		**3**		
TOTAL LABOR INTENSITY	**1,0**	**36**		**36**		

6. Content of the academic discipline

6.1. Sections of the discipline and types of academic work

№	Name of the section of the academic discipline	Types of academic work* (in AH)					
		L	LP	P	S	SIW	total
1.	Neurons and neuroglia	2		20		14	
2.	Nervous system						
3.	Sense organs and specific receptors						
4.	Integumentary system. Receptors.						
5.	Respiratory system. Olfactory organ.						
	TOTAL	**2**		**20**		**14**	**36**

* - L – lectures; LP – laboratory practicum; P – practicals; S – seminars; SIW – student's individual work.

6.2. Thematic schedule of educational work types:

6.2.1 Thematic schedule of lectures

№	Name of lecture topics	Volume in AH	
		2 semester	3 semester
1.	**NERVOUS TISSUE**. Types of neurons and neuroglia. Nerve fibers. Nerve endings. Synapses. Interneuronal connections and principles of the organization of neural systems. Histogenesis and regeneration of nervous tissue.		
2.	**NERVOUS SYSTEM**. Interneuronal connections and principles of the organization of neural systems. Central and peripheral nervous system. Principles of structural and functional organization of nerves, peripheral ganglia, spinal cord and brain.		

3.	**SENSE ORGANS**. Classification of sensory organs. The organ of vision. The shells of the eye. Accommodation-dioptric apparatus of the eye. Neural organization of the retina. Photoreceptor cells. The organ of hearing and balance. Histophysiology of sound perception, gravity, and angular acceleration.		2
4.	**INTEGUMENTARY SYSTEM**. Embryonic sources. The structure and functions of different skin parts. Types of human skin. Skin glands, hair, nails. Skin receptors.		
5.	**RESPIRATORY SYSTEM**. Sources of respiratory organs development. The mucosa of the nasal cavity. Olfactory organ. Larynx. Trachea. Lung: features of portions of the bronchial tree, alveoli. Acinus. Air-blood barrier.		
	TOTAL (total – **2** AH)		**2**

6.2.2. The thematic plan of laboratory practicums (*this type of classes is unstipulated in the curriculum)*

6.2.3. Thematic plan of practicals

№	Name of the topics of practicals	Volume in AH	
		2 semester	3 semester
1.	Neurons and neuroglia		2
2.	Peripheral nervous system		3
3.	Central nervous system		3
4.	Sense organs and specific receptors		3
5.	Integumentary system. Skin receptors		3
6.	Respiratory system. Olfactory organ		3
7.	***Credit***		3
	TOTAL (total - AH)		**20**

6.2.4. Thematic plan of seminars (*this type of classes is unstipulated in the curriculum)*

6.2.5. Types and topics of student's individual work (SIW)

№	Types and topics of SIW	Volume in AH	
		2 semester	3 semester
1.	Working with electronic educational resources on the distance education portal of PIMU		7
2.	Working with literature and other sources of information		7
	TOTAL (total – **14** AH)		**14**

7. Types of assessment formats for ongoing monitoring and mid-term assessment

№	Semester No.	Types of control		Name of section of academic discipline	Competence codes	Assessment formats		
						types	number of test questions	number of test task options
1.	3	Current monitori	Control of mastering	Neurons and neuroglia	UC-1	Test	30	1
				Nervous system	UC-1	Test	30	1

		ng	the topic	Sense organs and specific receptors	UC-1	Test	30	1
				Integumentary system. Receptors.	UC-1	Test	30	1
				Respiratory system. Olfactory organ.	UC-1	Test	30	1
			Monitoring the student's individual work	Neurons and neuroglia	UC-1	Diagnostics of histopreparations and electron micrographs		2 1
				Nervous system	UC-1	Diagnostics of histopreparations and electron micrographs		2 1
				Sense organs and specific receptors	UC-1	Diagnostics of histopreparations and electron micrographs		2 1
				Integumentary system. Receptors.	UC-1	Diagnostics of histopreparations and electron micrographs		2 1
				Respiratory system. Olfactory organ.	UC-1	Diagnostics of histopreparations and electron micrographs		2 1
2.	3	Mid-term assessment	Credit	Microscopic basics of analyzers	UC-1	Test control	50	1
						Diagnostics of histopreparations and electronograms		2 2
						Job		

						interview		

EXAMPLES OF EVALUATION MEANS:

1. Protocols of practical classes, drawn up by students personally on the basis of studying histopreparations, are used for the current control.

2. The assimilation of theoretical knowledge is discussed during the interview on questions to the topic of the lesson.

3. The assimilation of key terms and classification is controlled by sets of test tasks.

Test tasks examples:

	Questions	Select one or more correct answers
1	CLASSIFICATION OF NEURONS ACCORDING TO THEIR PLACE IN THE REFLEX ARC:	afferent (receptor) associative (interneurons) efferent (motor) auxiliary secretory
2	PROCESS OF NEURON BY WHICH THE NERVE IMPULSE IS DIRECTED TO THE BODY OF THE SAME NEURON	nerve fiber dendrite axon collateral spinule
3	PARTS OF THE NEURON CAN FORM SYNAPTIC CONTACTS	axon dendrite neuron body spines nucleus
4	PRINCIPAL TYPES OF MACROGLIA	oligodendrocytes astrocytes ependimocytes microglia lemmocytes
5	NEURAL LAYERS OF THE CEREBELLAR CORTEX	molecular ganglionic granular pyramid polymorphic

4. For the Current monitoring of the assimilation of educational material, thematic control classes are used, combining diagnostics and "reading" histopreparations and electronic microphotographs, as well as test tasks.

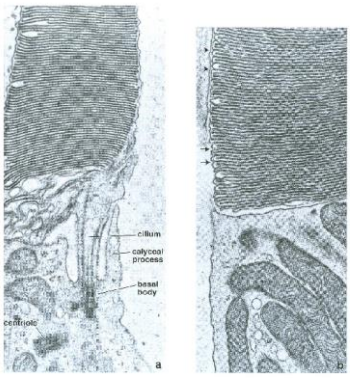
QUESTIONS FOR THE CREDIT LESSON

1. Nervous tissue. Morphological and functional characteristics. Origination in embriogenesis. Classification of the tissue elements, their structure and function. Neurones: structural and functional characteristics and classification. Neuroglia: general reference and classification. Nerve fibers. Nerve endings. Synapses. Degeneration and regeneration.

2. The peripheral nervous system. General characteristics. Origination in embriogenesis. Nerve trunks. Structure and significance of the nerve trunk in the analyzer. Ganglia. Craniospinal ganglia, their cell and tissue composition. Role of the craniospinal ganglia in sensory systems. Autonomic ganglia, their cell and tissue composition. Autonomic nervous system. Ability for regeneration.

3. The central nervous system. Brain and spinal cord. Origination in embryogenesis. White and gray matter. Internal and external interneuronal connections of the spinal cord. Spinal elements in sensory systems. Ability for regeneration.
4. Cerebrum. General tissual organization. The types of neuronal organization. The cerebral cortex. Cell composition and organizations of the cerebral cortex. Neocortical elements of sensory systems.
5. Cerebellum. General tissual organization. The cerebellar cortex. Cell composition. Cerebellar elements of sensory systems.
6. Principles of neural organization of the nervous system. Reflex arc. Histological components of different types of analyzers. Motor systems.
7. Special senses. Specialized receptors. The eye. General characteristics and the coats of the eyeball. Refractive (or dioptric) parts of the eye. Accommodation. Inner coat of the eye or retina, its neuronal organization. Histophysiology of the photoreception. The ear. External ear. Middle ear. Inner ear. Cochlea duct. Organ of Corti. Peripheral (receptive) part of the analyzer. Receptors and sensory organs. Receptors or sensory nerve endings: their varieties, structure and significance.
8. Integumentary system: structure and receptors.
9. Respiratory system. Olfactory organ.

Examples of electron micrographs for credit:



8. Educational, methodological and informational support for mastering the academic discipline (printed, electronic publications, the Internet and other network resources)

8.1. Key literature references

№	Name according to bibliographic requirements	Number of copies	
		at the department	in the library
1.	Ross, M.H. Histology: a Text and Atlas / M.H. Ross, G.I. Kaye, W. Pawlina – Philadelphia.: Lippincott W&W, 2016. – 876 pp.	no	50
2.	Gartner, L.P. Color Textbook of Histology / L.P. Gartner, J.L. Hiatt – W.B.Saunders Company, 2017. – 577 pp.	no	50
3.	Yushkantseva, Sophia I. A brief atlas of histology, citology and embryology / S.I. Yushkantseva, V. Bykov. – St.Petersburg : s.n., 2007. – 120 p.: 279 ill.	no	100

8.2. Further reading

№	Name according to bibliographic requirements	Number of copies	
		at the	in the library

		department	
1.	Radaev, A.M. Histological structures of human sensory systems (Materials for self-training of students on the specialty "Medical specialty") / A.M. Radaev /: Nizhny Novgorod: Publishing House of Nizhny Novgorod State Medical Academy, 2018 – 24 pp.	5	Electronic library system
2.	Methodological manuals for practical classes for students in modules	for each student (in the SDE)	

8.3. Electronic educational resources for teaching academic subjects

8.3.1. Internal Electronic Library System of the University (IELSU)

8.3.1. Internal Electronic Library System of the University (IELSU)

№	Name of the electronic resource	Brief description (content)	Access conditions	Number of users
1	Internal electronic library system (IELS) http://nbk.pimunn.net/MegaPro/Web	Proceedings of the faculty of the university: textbooks, teaching aids, collections of problems, methodological manuals, laboratory work, monographs, collections of scientific papers, scientific articles, dissertations, abstracts of dissertations, patents	From any computer and mobile device with an individual login and password. Access mode: http://nbk.pimunn.net/MegaPro/Web	Not limited

8.3.2. Electronic educational resources acquired by the University

№	Name of the electronic resource	Brief description (content)	Access conditions	Number of users
1.	ELS "Student Advisor" (Electronic database "Student Advisor". Database “Medicine. Healthcare (VO) and “Medicine. Healthcare (SPO)") http://www.studmedlib.ru	Educational literature, additional materials (audio, video, interactive materials, test tasks) for higher medical and pharmaceutical education	From any computer and mobile device with an individual login and password. Access mode: http://nbk.pimunn.net/MegaPro/Web	Not limited
2.	Database “Doctor's Consultant. Electronic Medical Library» https://www.rosmedlib.ru	National guidelines, clinical guidelines, textbooks, monographs, atlases, pharmaceutical guides, audio and video materials, ICD-10 and ATC	From any computer and mobile device with an individual login and password. Access mode: http://nbk.pimunn.net/MegaPro/Web	Not limited
3.	Electronic library system "Bukap" https://www.books-up.ru	Educational and scientific medical literature of Russian publishing houses, incl. translations of foreign publications.	From any computer and mobile device using an individual login and password; access from university	Not limited

		Within the framework of the Big Medical Library project, publications of universities participating in the project are available	computers is automatic. Publications from the "My Books" section are available for reading. Access mode: http://nbk.pimunn.net/MegaPro/Web	
4.	Electronic periodicals as part of the database "Scientific electronic library eLIBRARY https://elibrary.ru	Electronic medical magazines	From university computers. Access mode: https://elibrary.ru	Not limited
5.	Integrated information and library system (IBS) of the scientific and educational medical cluster of the Volga Federal District - "Srednevolzhsky" (contract free of charge)	Electronic copies of scientific and educational publications from the funds of the libraries participating in the scientific and educational medical cluster of the Volga Federal District "Srednevolzhsky"	Access by individual login and password from any computer and mobile device. Access mode: sites of libraries participating in the project	Not limited
6.	National Electronic Library (NEL) (contract free of charge) http://нэб.рф	Electronic copies of publications (including scientific and educational) on a wide range of knowledge	Scientific and educational works that have not been republished for the last 10 years are in the public domain. Works limited by copyright – from the computers of the scientific library. Access mode: http://нэб.рф	Not limited

8.3.3 Open access resources

№	Name of the electronic resource	Brief description (content)	Access conditions
1.	Federal Electronic Medical Library (FEML) http://нэб.рф	Full-text electronic copies of printed publications and original electronic publications in medicine and biology	From any computer on the Internet. Access mode: http://нэб.рф
2.	Scientific electronic library eLIBRARY.RU https://elibrary.ru	Abstracts and full texts of scientific publications, electronic versions of Russian scientific journals	From any computer and mobile device. Access mode: https://elibrary.ru

3.	Scientific electronic library of the open Access CyberLeninka http://cyberleninka.ru	Full texts of scientific articles with annotations published in scientific journals in Russia and neighboring countries	From any computer and mobile device. Access mode: http://cyberleninka.ru
4.	Springer Electronic Collection https://rd.springer.com	Full-text scientific publications (journals, books, articles, scientific protocols, conference proceedings)	From university computers. Access mode: https://rd.springer.com
5.	Wiley Periodicals Database www.onlinelibrary.wiley.com	Wiley Periodicals	From university computers, from any computer using an individual login and password Access mode: www.onlinelibrary.wiley.com
6.	Electronic collection of periodicals "Freedom" on the Science Direct platform https://www.sciencedirect.com	Elsevier Periodicals	From university computers, from any computer using an individual login and password Access mode: https://www.sciencedirect.com
7.	Scopus database www.scopus.com	International Science Citation Abstract Database	From university computers, from any computer using an individual login and password Access mode: www.scopus.com
8.	Web of Science Core Collection Database https://www.webofscience.com	International Science Citation Abstract Database	From university computers, from any computer using an individual login and password Access mode: https://www.webofscience.com
9.	Questel Database Orbit https://www.orbit.com	Questel Patent Database	From university computers Access mode: https://www.orbit.com
10.	PubMed https://www.ncbi.nlm.nihgov/pubmed	Search engine of the US National Library of Medicine on the databases "Medline", "PreMedline"	From any computer and mobile device. Access mode: https://www.ncbi.nlm.nihgov/pubmed
11.	Directory of Open Access Journals http://www.doaj.org	Directory of open access to the full-text collection of periodicals	From any computer and mobile device. Access mode: http://www.doaj.org
12.	Directory of open access books (DOAB) http://www.doabooks.org	Directory of open access to the full-text collection of scientific books	From any computer and mobile device. Access mode: http://www.doabooks.org

9. Material and technical support for mastering an academic discipline

9.1. List of premises for classroom activities for the discipline

1. Large lecture hall - 303 seats
2. Classrooms for practical classes (6 rooms for 84 workplaces)

9.2. List of equipment for classroom activities for the discipline

1. Multimedia complexes (laptop, projector, screen) in the lecture hall
2. Computers for individual work of students in classrooms
3. Sets of scanned histopreparations for the discipline
4. Laptops in classrooms to demonstrate materials on televisions
5. Televisions in classrooms
6. Light microscopes in classrooms to demonstrate histopreparations
7. Sets of histopreparations on all topics
8. Sets of multimedia visual materials
9. Blackboards in classrooms
10. A set of electronic microphotographs for the course
11. Test tasks on the topics of classes

9.3. A set of licensed and freely distributed software, including domestic production

Item no.	Software	number of licenses	Type of software	Manufacturer	Number in the unified register of Russian software	Contract No. and date
1	Wtware	100	Thin Client Operating System	Kovalev Andrey Alexandrovich	1960	2471/05-18 from 28.05.2018
2	MyOffice is Standard. A corporate user license for educational organizations, with no expiration date, with the right to receive updates for 1 year.	220	Office Application	LLC "NEW CLOUD TECHNOLOGIES"	283	without limitation, with the right to receive updates for 1 year.
3	LibreOffice		Office Application	The Document Foundation	Freely distributed software	
4	Windows 10 Education	700	Operating systems	Microsoft	Azure Dev Tools for Teaching Subscription	
5	Yandex. Browser		Browser	«Yandex»	3722	
6	Subscription to MS Office Pro for 170 PCs for FGBOU VO "PIMU" of the Ministry of Health of Russia	170	Office Application	Microsoft		23618/HN10030 LLC "Softline Trade" from 04.12.2020

10. List of changes to the working program (to be filled out by the template)

Federal State Budgetary Educational Institution of Higher Education
"Privolzhsky Research Medical University"
Ministry of Health of the Russian Federation
(FSBEI HE "PRMU" of the Ministry of Health of Russia)

Department of
Name of the department

CHANGE REGISTRATION SHEET

working program for the academic discipline
NAME OF THE ACADEMIC DISCIPLINE

Field of study / specialty / scientific specialty: _____
(code, name)

Training profile: _____
(*name) - for master's degree programs*

Mode of study: _____
full-time/mixed attendance mode/extramural

Position	Number and name of the program section	Contents of the changes made	Effective date of the changes	Contributor's signature
1				

Approved at the department meeting
Protocol No. _____of _____20__

Head of the Department
_____ _____/_____
department name, academic title signature print name