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: **PHYSICS, MATHEMATICS**

Specialty: **31.05.01 GENERAL MEDICINE**

Qualification: **GENERAL PRACTITIONER**

Department: **MEDICAL BIOPHYSICS**

Mode of study: **FULL-TIME**

Labor intensity of the academic discipline: **108 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:

D.I. Iydin, Ph.D. (Physical and Mathematical Sciences), Ph.D. (Biology), Professor, Head of the Department of Medical Biophysics of Federal State Budgetary Educational Institution of Higher Education «Privolzhsky Research Medical University» of the Ministry of Health of the Russian Federation

S.L. Malinovskaya, Ph.D. (Biology), Professor of the Department of Medical Biophysics of Federal State Budgetary Educational Institution of Higher Education «Privolzhsky Research Medical University» of the Ministry of Health of the Russian Federation

The program was reviewed and approved at the department meeting of the Department of Medical Biophysics (protocol No. 9, *April 15, 2021*)
Head of the Department of Medical Biophysics,
Ph.D. (Physical and Mathematical Sciences), Ph.D. (Biology),
Professor _____ D.I. Iydin
(signature)

April 15, 2021

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

April 15, 2021

1. The purpose and objectives of mastering the academic discipline «Physics, mathematics» (hereinafter – the discipline):

1.1. **The purpose of mastering the discipline:** participation in the formation of UC-1 competencies consists in the formation of students' ability to carry out a critical analysis of problem situations based on a systematic approach, to develop an action strategy.

1.2. **Tasks of the discipline:**

- formation of logical thinking among students of the medical faculty, the ability to accurately formulate a task, the ability to isolate the main and secondary, the ability to draw conclusions based on the obtained measurement results;
- acquisition by students of the ability to draw conclusions based on the obtained measurement results;
- study of sections of applied physics, which consider the principles of operation and capabilities of medical equipment used in diagnosis and treatment;
- teaching students mathematical methods that are used in medicine and allow them to extract the necessary information from the results of observations and measurements, to assess the degree of reliability of the data obtained;
- formation of skills for studying scientific literature;
- training of students in safety when working with electronic and optical equipment.

1.3. **Requirements to the deliverables of mastering the discipline**

As a result of completing the discipline, the student should

Know:

- methodology of abstract thinking for systematization of quantitative and qualitative characteristics of the physiological state of the organism and the environment;
- methodology for measuring the physical characteristics of a biological object;
- the method of mathematical processing of the results of the physical characteristics of a biological object.

Be able to:

- to identify objective, physical processes in biological systems and determine their relationship with the fundamental laws of physics;
- use analog and digital measuring instruments to measure the mechanical properties of liquids, electrical and optical characteristics of biological objects, dosimetry;
- to evaluate the resolution and resolution limit of an optical microscope, to characterize the properties of images obtained in a lens, eyepiece, microscope, to find instrument errors of analog and digital measuring instruments;
- to carry out statistical processing of the results of laboratory measurements of physical quantities, to evaluate confidence intervals according to a given confidence probability, mode, median of the sample, to build histograms and cumulative distributions, to evaluate the errors of direct and indirect measurements of physical quantities, to carry out measurements using digital devices.

Possess:

- abstract thinking methodology for making conclusions about the results of measurements of physical characteristics of biological objects and mathematical processing of the data obtained;
- methods for measuring physical quantities using analog and digital measuring instruments, methods for estimating errors of direct and indirect measurements.

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 «Physics, mathematics» refers to the core part of Block 1 (B1.E.9) of GEP HE. The discipline is taught in 1 semester/1year of study.

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

- school physics course,
- school math course.

2.3. Mastering the discipline is required for forming the following knowledge, skills and abilities for subsequent academic disciplines: physiology, biochemistry, microbiology and virology, hygiene, public health, radiation diagnostics and radiation therapy.

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

Mastering the discipline aims at acquiring the following universal (UC) or/and general professional (GPC) or/and professional (PC) competencies

№	Compe-tence 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 based on a systematic approach, develop an action strategy	*ID-1* *UC-1.1.* Knows: methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis *ID-2* *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	methods of systematic and critical analysis; methods of developing action strategies for identifying and solving a problem situation	apply the methods of a systematic approach and critical analysis of problem situations; develop a strategy of actions, make concrete decisions for its implementa-tion	methodology of systematic and critical analysis of problem situations; methodology of goal setting, determination of ways to achieve it, development of action strategies.

** Competence achievement indicator – a set of planned learning outcomes in disciplines (modules) and practices that ensure the formation of all graduate competencies established by the specialty program.*

These are generalized characteristics that clarify and reveal the formulation of competence in the form of specific actions performed by a graduate who has mastered this competence. Indicators should be comparable to labor functions and/or labor actions (professional standard), but not equal to them. Indicators of competence achievement should be measured using the means available in the educational process.

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
MEDICAL BIOPHYSICS

CHANGE REGISTRATION SHEET

working program for the academic discipline
PHYSICS, MATHEMATICS

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