Academic programme component

<u>**31.05.01 General Medicine**</u>
programme

<u>**Б1.0.09**</u>
discipline code

SYLLABUS

Discipline (module)

<u>**Б1.О.09 Mathematics and Physics**</u>

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Approved at the meeting of the
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Record no._____ dated
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signature

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Clarification

Discipline volume _____ credit points

1. **Discipline (module) training results** correlated with the indicators of competencies achievement determined by the educational programme

Competency	Indicators of competency achievement	Discipline (module) training results
УК-1 Can design action plans and apply systematic approach to critical analysis of problem situations	**ИД1$_{УК-1}$** Applies systematic approach in research and analytical activities to solve assigned tasks	**To know:** – fundamentals of Mathematics; – basics of Mathematics for solving professional problems; – methods of Calculus and mathematical modelling; – definitions and theorems; – problem solving methods; – safety recommendations when working in physical laboratories; – basic laws of Physics and physical phenomena; – characteristics of physical factors affecting a living organism; – metrological requirements when working with physical equipment; – forms, methods, and evolution of scientific knowledge. **To be able to:** – apply methods of Calculus and mathematical modelling, theoretical and experimental research to solve professional problems; – use literature on Mathematics; – independently expand and deepen mathematical knowledge; – use educational, scientific, popular science literature; – use physical equipment; – make calculations based on the results of the experiment; – calculate the absolute and relative accuracy of measurement results. **To have:** – basic knowledge and methods of Mathematics; – knowledge of terms and symbols of Mathematics; – skills of using modern mathematical equipment to solve professional problems; – methodology of creating, analysing and applying mathematical models for assessing the state, forecasting the real phenomena and processes development;

		− methods of measuring the physical values;
		− skills of using and working with the Physics laboratory equipment;
		− methodology for calculating characteristics, estimates of distribution characteristics and measurement accuracy.

2. Discipline (module) contents

Unit 1. Elements of Discrete Mathematics
Unit 2. Basics of Theory of Probability and Mathematical Statistics
Unit 3. Proportions and Percentage in Solving Medical Problems
Unit 4. Mechanics
Unit 5. Molecular Physics and Thermodynamics
Unit 6. Electrical Phenomena
Unit 7. Electromagnetic Phenomena
Unit 8. Wave processes. Optics
Unit 9. Quantum Physics
Unit 10. Atomic and Nuclear Physics

3. Training support materials

- multimedia presentations on the discipline (module) are available on MAU LMS Moodle;
- practical training/laboratory work/test manuals are available on MAU LMS Moodle;
- learning materials are available on MAU official website at «Информация по образовательным программам, в том числе адаптированным».

4. Discipline assessment materials

Discipline assessment materials is a separate document within the educational programme, it includes

- a list of competencies indicating the stages of their achievement within the discipline (module);
- formative assessment tasks;
- interim assessment tasks;
- tasks for internal assessment of education quality.

5. The list of main and supplementary literature (printed sources, electronic textbooks and (or) resources of Digital Library Systems)

Main literature:

1. Gmurman, V. E.Teoriya veroyatnostei i matematicheskaya statistika : uchebnik dlya prikladnogo bakalavriata / V. E. Gmurman. — 12-e izd. — Moskva : Izdatel'stvo Yurait, 2024. — 479 s. — (Bakalavr. Prikladnoi kurs). — ISBN 978-5-534-00211-9. — Tekst : elektronnyi // EBS Yurait [sait]. — URL: https://urait.ru/bcode/535417.
2. Bogomolov, N. V.Matematika : uchebnik dlya prikladnogo bakalavriata / N. V. Bogomolov, P. I. Samoilenko. — 5-e izd., pererab. i dop. — Moskva : Izdatel'stvo Yurait, 2024. — 401 s. — (Bakalavr. Prikladnoi kurs). — ISBN 978-5-534-07001-9. — Tekst : elektronnyi // EBS Yurait [sait]. — URL: https://urait.ru/bcode/535729.
3. Vasil'ev, A. A. Meditsinskaya i biologicheskaya fizika. Laboratornyi praktikum : uchebnoe posobie dlya srednego professional'nogo obrazovaniya / A. A. Vasil'ev. – 2-e izd., ispr. i dop. – M.: Izdatel'stvo Yurait, 2024. – 313 s. – (Professional'noe obrazovanie). — ISBN 978-5-534-10175-1. — Tekst : elektronnyi // EBS Yurait [sait]. — URL: https://urait.ru/bcode/541987.

Supplementary literature:

1. Gmurman, V. E. Rukovodstvo k resheniyu zadach po teorii veroyatnostei i matematicheskoi statistike : uchebnoe posobie dlya bakalavriata i spetsialiteta / V. E. Gmurman. — 11-e izd., pererab. i dop. — Moskva : Izdatel'stvo Yurait, 2024. — 406 s. — (Bakalavr i spetsialist). — ISBN 978-5-534-08389-7. — Tekst : elektronnyi // EBS Yurait [sait]. — URL: https://urait.ru/bcode/535416.

2. Bogomolov, N. V. Matematika. Zadachi s resheniyami v 2 ch. Chast' 1 : uchebnoe posobie dlya prikladnogo bakalavriata / N. V. Bogomolov. — 2-e izd., ispr. i dop. — Moskva : Izdatel'stvo Yurait, 2024. — 439 s. — (Bakalavr. Prikladnoi kurs). — ISBN 978-5-534-07535-9. — Tekst : elektronnyi // EBS Yurait [sait]. — URL: https://urait.ru/bcode/544898.

3. Bogomolov, N. V.Matematika. Zadachi s resheniyami v 2 ch. Chast' 2 : uchebnoe posobie dlya prikladnogo bakalavriata / N. V. Bogomolov. — 2-e izd., ispr. i dop. — Moskva : Izdatel'stvo Yurait, 2024. — 320 s. — (Bakalavr. Prikladnoi kurs). — ISBN 978-5-534-07533-5. — Tekst : elektronnyi // EBS Yurait [sait]. — URL: https://urait.ru/bcode/544898.

4. Physics=Fizika: praktikum : [16+] / sost. N.V. Zhdanova, V.V. Mizina, O.A. Tsvetsikh ; Ministerstvo nauki i vysshego obrazovaniya Rossiiskoi Federatsii i dr. – Stavropol' : SKFU, 2018. – 136 s. : il. – Rezhim dostupa: po podpiske. – URL: http://biblioclub.ru/index.php?page=book&id=563306. – Bibliogr.v kn. – Tekst : elektronnyi.

5. Shredinger, E. Chto takoe zhizn' s tochki zreniya fiziki? / Per. s angl. A.A. Malinovskogo. – M.: RIMIS, 2009. – 176 s., il.

6. **Professional databases and information reference systems**

   1. Legal Reference System "Consultant Plus". Online access at http://www.consultant.ru/

   2. LLC "Modern Media Technologies in Education and Culture". Online access at http://www.informio.ru/

7. **The list of licensed and openly distributed software, including domestic software**

   7.1. Licensed software of domestic production:

   - Kaspersky Anti-Virus

   7.2. Licensed software of foreign production:

   - MS Office
   - Windows 7 Professional
   - Windows 10

   7.3. Openly distributed software of domestic production:

   - 7Zip

   7.4. Openly distributed software of foreign production:

   - Adobe Reader
   - Mozilla FireFox
   - LibreOffice.org

8. **Ensuring mastering the discipline for people with special needs**

   To ensure the educational process for people with special needs, the discipline can be adapted in accordance with the specifics of its acquirement and didactic requirements, based on individual abilities and on the student's application.

9. The material and technical support of the discipline (module) is presented in the appendix to the academic programme "Material and technical conditions for the implementation of the academic programme" and includes:

- technically equipped classrooms for conducting training sessions provided for the Specialist programme;

- spaces for self-study work equipped with computer, Internet connection and access to MAU LMS Moodle;

- Laboratories of Mechanics, Molecular Physics, Electromagnetism, Optics, Atomic and Quantum Physics.

Replacement of the equipment with its virtual counterparts is prohibited.

10. Study load distribution by the type of educational activity

Table 1 - Study load distribution

Type of educational activity	The discipline (module) study load distribution by the forms of training		
	Full-time		
	Semester		Total hours
	Year 1 / Semester 2	Year 2 / Semester 3	
Lectures	20	16	36
Seminars	34	-	34
Laboratory work	-	16	16
Self-study	18	4	22
Total hours on the discipline / in the form of seminars	108		
	22		
Interim and formative assessment			
Credit	+	+	
Number of control works	3	-	

The list of laboratory works by the forms of training

No. п\п	Laboratory work topics
1	2
	Full-time
1	General information about physical experiments, accuracy estimation and statistical processing of results
2	Performing laboratory work on Mechanics in accordance with an individual schedule
3	Performing laboratory work in Molecular Physics and Thermodynamics in accordance with an individual schedule
4	Performing laboratory work on Electricity in accordance with an individual schedule
5	Performing laboratory work on Optics in accordance with an individual schedule
6	Performing laboratory work on Atomic and Quantum Physics in accordance with an individual schedule
7	Laboratory work presentation
8	Laboratory work presentation

The list of seminars by the forms of education

No.	Seminar topics
1	**2**
	Full-time
1	Sets and Set Elements
2	Set Comparison
3	Set Operations
4	Mathematical Logic
5	Mathematical Logic
6	Classical Definition of Probability
7	Addition Theorem on Probability
8	Multiplication Theorem on Probability
9	Law of Total Probability
10	Bayes' Theorem
11	Bayes' Theorem
12	Key Elements of Random Variate
13	Problems of Mathematical Statistics
14	Empirical Processing of Experimental Data
15	Metric Units
16	Calculation of the Solution Concentration
17	Fluid Balance