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Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University

Institute of Medicine

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Physics

course title

Recommended by the Didactic Council for the Education Field of:

31.05.01 General Medicine

The course instruction is implemented within the professional education programme of higher education:

General Medicine

1. COURSE GOAL(s)

The main goal of the discipline is laying the foundations of natural science thinking. Learn the basic laws of physics. Develop the ability to use physical abstractions and models while considering problems and take into account the conditions of applicability of the assumptions made at the same time. To form the skill of quantitative assessment of the accuracy of scientific prediction and the results of experiments.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The process of studying the discipline “Physics” is aimed at the formation of the following competencies: UC-1, GPC-4.

Table 2.1. List of competences that students acquire through the course study

Competence code	Competence descriptor	Competence formation indicators (within this course)
UC-1	Being able to implement critical analysis of problem situations based on systems approach, develop an action strategy.	UC-1.2. Critically assesses the reliability of information sources, works with contradictory information from different sources.
GPC-4	Being able to use medical devices provided for by the procedure for providing medical care, as well as to conduct examinations of the patient in order to establish a diagnosis.	GPC -4.2. Being able to evaluate the effectiveness and safety of using medical devices.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core/variable/elective* component of (B1) block of the higher educational programme curriculum.

a. - Underline whatever applicable.

Within the higher education programme students also master other (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course study.

Table 3.1. The list of the higher education programme components/disciplines that contribute to the achievement of the expected learning outcomes as the course study results

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
UC-1.2.	Being able to implement critical analysis of problem situations based on systems approach,		Biochemistry Hygiene Public health and healthcare, healthcare economics

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
	develop an action strategy.		Epidemiology Neurology, Medical Biochemistry Hygiene Public health and healthcare, healthcare economics Epidemiology Neurology, medical genetics, neurosurgery Hospital therapy Endocrinology Infectious diseases Phthisiology Medical Elementology Allergology Introduction to Nutritionology
GPC-4	GPC -4.2. Being able to evaluate the effectiveness and safety of using medical devices.		General surgery Neurology, medical genetics, neurosurgery Faculty therapy Endocrinology Obstetrics and gynecology Emergency Medical Manipulation Practice (Simulation Center)

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course is 2 credits (72 academic hours).

Table 4.1. Types of academic activities during the periods of higher education programme mastering (**full-time training**)*

Type of academic activities	Total academic hours	Semesters/training modules
		1
<i>Contact work, ac.h.</i>	51	51
including:		
Lectures (LC)	17	17
Laboratory works (LW)	34	34
Seminars (S)	0	0
<i>Self-studies</i>	18	21
<i>Evaluation and assessment (exam/passing/failing grade)</i>	3	0

Type of academic activities		Total academic hours	Semesters/training modules
			1
Course workload	academic hours	72	72
	credits	2	2

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	Course module contents (topics)	Academic activities types
Section 1. Introduction	Methods of processing measurement results. Direct and indirect measurements. Error theory. Types of errors: systematic, random; absolute, relative. Rules for the design of laboratory work report. The order of writing the synopsis. Basic concepts of mathematical and vector analysis. Derivatives and differentials. Rules for adding (subtracting) and multiplying vectors. Integration rules. Calculations of indefinite and definite integrals.	LC, LW
Section 2. Oscillations	Harmonic oscillations. Gravitational interaction. Acceleration of free fall. Weightlessness. Longitudinal and transverse waves. Ultrasound	LC, LW
Section 3. The waves. Sound wave	Mechanical waves. The plane wave equation. Parameters of vibrations and waves. Energy characteristics. The Doppler effect and its use in medicine. Sound. Types of sounds. A complex tone and its acoustic spectrum. Wave resistance. Objective(physical)and subjective (biological) characteristics of sound. Infrasound. Ultrasound, the physical basis of application in medicine.	LC, LW
Section 4. Hydrostatic. Thermodynamics	The viscosity. Stationary flow, laminar and turbulent flows. Newton's formula, Newtonian and non-Newtonian liquids. Features of hemodynamics in the main, resistive, capillary and venous vessels of the circulatory model. Work and warmth. The first beginning of thermodynamics. Heat capacity. An adiabatic process (Poisson's formula). The basic equation of molecular kinetic theory. The heat and motion of molecules. The first principle of thermodynamics applied to the human body. The role of nutrition and respiration. Internal energy. Internal pressure and surface tension in the fluid. Diffusion. Osmosis. Wetting Capillary phenomena.	LC

Course module title	Course module contents (topics)	Academic activities types
Section 5. Electromagnetic phenomena	Electrical conductivity of biological tissues. The use of direct current in medicine (therapy, electrophoresis). The use of alternating current in medicine (therapy, rheography, electrical stimulation). Application of static electric and magnetic fields in medicine. The use of electromagnetic fields in medicine. Mechanisms of ion transport through the membranes of biocells. Membrane potential difference. The potential of rest. Action potential. Propagation of a nerve impulse by axon. Electric fields of human organs. Basics of electrocardiography and encephalography.	LC, LW
Section 6. Electromagnetic waves	The scale of electromagnetic waves and the sources of these waves. Light and its perception by the human eye. Fiber-optic light guides and their application in medicine. Infrared (thermal) radiation and its application in medicine. Luminescence. Luminescent microscope. Forced radiation. Lasers and their application in medicine.	LC, LW
Section 7. Geometrical and wave optics	Reflection and refraction of light. Snell's law. Dispersion of light. Thin lens formula. Diffraction of light. Fresnel' zone method.	LC, LW
Section 8. Ionizing radiation.	Atomic structure. Nuclear force. Isotopes. Electronic paramagnetic resonance. Principles of magnetic resonance imaging. Electron-positron tomography. Ultraviolet radiation and its application in medicine. X-ray radiation and its application in medicine. Radioactive radiation and their use in medicine. Radionuclide diagnostic methods in medicine. Radiation therapy. Detection and dosimetry of ionizing radiation.	LC

* - to be filled in only for **full**-time training: LC - lectures; LW - lab work; S - seminars.

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
Lecture	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; a board (screen) and technical means	

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
	of multimedia presentations.	
Lab-work	An auditorium for laboratory work, individual consultations, routine monitoring and interim certification, equipped with a set of specialized furniture and equipment.	Rulers, micrometers, calipers, cylindrical shape objects, thread pendulum, timer, liquid glycerin, school sound Generator, low-frequency speaker on a stand, source of D.C., scheme for studying D.C. current properties, concave/convex lenses, Clement-Desormes vessel with pump, He-Ne laser generator.
Self-studies	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to EIOS.	

* The premises for students' self-studies are subject to **MANDATORY** mention

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

- Grabovsky Rostislav Ivanovich. Physics course [Text] : Textbook / R.I. Grabovsky. - 13th ed. - St. Petersburg : Lan, 2022. - 608 p. : ill. - (Textbooks for universities. Special literature). - ISBN 5-8114-0466-2 : 141.57.
- Remizov. - 4th ed., ispr. and reprint - M. : GEOTAR-Media, 2016. - 656 p. – ISBN 978-5-9704-3577-9.

Additional readings:

- Nikitin A.K. Course of lectures on general physics [Text] : For students of medical and agricultural faculties / A.K. Nikitin. - 9th ed., reprint. and additional. - M. : Publishing House of RUDN, 2013. -254 p. - ISBN 978-5-209-05180-0 : 136.54.
- Savelyev Igor Vladimirovich. General Physics course [Text] : Textbook for higher education institutions: In 5 books M. : Astrel : AST, 2002, 2003, 2004, 2006, 2008.
- A short course in medical and biological physics with elements of rehabilitation. Lectures and seminars [Electronic resource] : textbook / V.N. Fedorova, L.A. Stepanova. - 2nd ed., ispr. - M. : Fizmatlit, 2008. - 622 p. - ISBN 978-5-9221-1022-8.

Resources of the Internet information and telecommunication network:

1. EBS RUDN and third-party EBS, to which university students have access on the basis of concluded contracts:

- Electronic library system of RUDN – EBS RUDN <http://lib.rudn.ru/MegaPro/Web>
- EBS "University Library online" <http://www.biblioclub.ru>
- ABS Yurayt <http://www.biblio-online.ru>
- EBS "Student Consultant" www.studentlibrary.ru
- EBS "Doe" <http://e.lanbook.com/>
- EBS "Trinity Bridge"

2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation <http://docs.cntd.ru/>
- search engine Yandex <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- bibliographic database SCOPUS <http://www.elsevierscience.ru/products/scopus/>

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION

The assessment toolkit and the grading system* to evaluate the competences formation level (UC-1, GPC-4.) upon the course study completion are specified in the Appendix to the course syllabus.

a. The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

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