

AMENDMENTS AND CHANGES TO THE CURRICULUM IN THE EDUCATIONAL DISCIPLINE
«MEDICAL AND BIOLOGICAL PHYSICS»
for the specialty 7-07-0911-03 «DENTISTRY»

for 2024/2025 academic year

Amendments and changes	Basis/Reason
1. Changes have been introduced into the Explanatory Note (appendix 1)	Educational Plan for 2024/2025 academic year
2. Changes have been introduced into the Thematic Plan (appendix 2)	Educational Plan for 2024/2025 academic year
3. Changes have been introduced into the Content of the Educational Material (appendix 3)	Educational Plan for 2024/2025 academic year
4. Changes have been introduced into the Educational Discipline Curricular Chart (appendix 4)	Educational Plan for 2024/2025 academic year

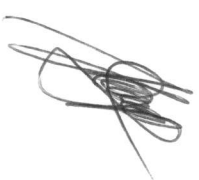
The curriculum is revised and approved at the Medical and Biological Physics Department meeting
(protocol # 10 of 30.05.2024)

Head of the Medical and Biological Physics Department


M.V. Goltsev

APPROVED

Dean of the Medical Faculty for International Students


O.S. Ishutin

Changes in the Explanatory Note

Total number of hours for the study of the discipline is 124 academic hours, of which 81 classroom hours and 43 hours of student independent work. Classroom hours according to the types of studies: lectures - 9 hours (including 3 hours of supervised student independent work (SSIW)), laboratory classes - 44 hours, practical classes - 28 hours).

ALLOCATION OF ACADEMIC TIME ACCORDING TO SEMESTERS OF STUDY

Code, name of the specialty	7-07-0911-03 «Dentistry»									
	1	2	64	42	3	3				
semester	1	60	39	in-class	lectures	3				
							total			
								including		
									supervised student independent work	
										laboratory and practical classes
Form of intermediate assessment	21	36	36	22	examination					
						-				

THEMATIC PLAN

Section (topic) name		Lectures (incl. SSIW)	laboratory	practical
Number of class hours				
1. Mathematical description of medical and biological processes and medical data processing	1.1. Investigation of functional dependencies	-	-	2
	1.2. Principles of the error theory	-	-	2
2. Fundamentals of biomechanics with aspects of materials science in dentistry	2.1. Physical basis of materials mechanics	1,5	2	2
	2.2. Mechanical and thermal properties of dental materials and tooth tissues		4	-
	2.3. Principles of maxillofacial system biomechanics		-	2
	3. Bioacoustics	-	2	4
3.1. Origin and classification of acoustic waves	3.2. Physical and physiological characteristics of sound waves. Sound methods in medicine	-	2	-
	3.3. Ultrasound and its application in medicine	-	-	2
	4. Physical basis of biorheology, hydrodynamics and hemodynamics	1,5	4	8
	4.1. The main concepts and laws governing ideal and viscous fluid flow. Viscosimetry	1,5	2	4
4.2. Physical basis of hemodynamics (hemorheology)	4.3. Principles of surface phenomena physics		-	2
	4.4. Adhesion. Role of adhesion in dentistry		-	2
	5. Physical processes in biological membranes		-	4
5.1. Physical properties of biological membranes. Transport of substances across membranes	5.2. The membrane cell potentials	-	-	2

Section (topic) name		Lectures (incl. SSIW)	laboratory	practical
Number of class hours				
6. Application of electric current, electric and magnetic fields in medicine		1,5	14	-
6.1. Physical basis of tissue and organ electrophysiology		1,5	2	-
6.2. Electrostimulation of tissues and organs			2	-
6.3. Obtaining and recording medical data, characteristics of electromedical equipment			4	-
6.4. Electric and magnetic properties of human body tissues. Physical basis of magnetic resonance imaging			4	-
6.5. Effect of electric current, electric and magnetic fields on human organism			2	-
7. Electromagnetic radiation and its application in medicine		4,5	18	4
7.1. Electromagnetic waves, its properties. Light polarization, polarization methods in biology and medicine. The light absorption and its laws		1,5	4	-
7.2. Refractometry. Optical microscopy			4	-
7.3. Light reflection, absorption and scattering processes in skin, tooth tissues and dental materials			2	-
7.4. Thermal radiation of bodies. Clinical thermography. Heat transfer of the human body			2	-
7.5. Light emission and absorption by atoms and molecules. Luminescence			4	-
7.6. Stimulated emission. Lasers and their medical applications		1,5	2	-
7.7. Bremsstrahlung X-radiation, its origin and generation			-	-
7.8. X-radiation interaction mechanisms with matter. X-radiation application in medicine		1,5	-	1
7.9. Ionizing Radiation Dosimetry			-	-
Total hours		9	44	28

Exposure, absorbed and equivalent doses of ionizing radiation, the relationship between them and units. Effective equivalent dose, its units, tissue weighting factor. Collective effective dose. Dose rate.

7.9 Ionizing Radiation Dosimetry

Changes in the Content of Educational Material

ACADEMIC DISCIPLINE CURRICULAR CHART

Section, topic #	Section (topic) name	Number of hours			Supervised student independent work	Practical skills	Form of control	
		lectures	laboratory	practical			of practical skills	of current / intermediate assessment
1 semester								
	Lectures	3	-	-	-			
1.	Fundamentals of biomechanics with aspects of materials science in dentistry	1,5	-	-	-			
2.	Physical basis of hydrodynamics and hemodynamics	1,5	-	-	-			
	Practical and Laboratory Classes							
1	Mathematical description of medical and biological processes and medical data processing	-	-	4	-			
1.1	Investigation of functional dependencies	-	-	2	-			interview
1.2	Principles of the error theory	-	-	2	-			interview
2	Fundamentals of biomechanics with aspects of materials science in dentistry	1,5	6	4	-			
2.1	Physical basis of materials mechanics	-	-	2	-			interview
	Fundamentals of biomechanics with aspects of materials science in dentistry	1,5	-	-	-			
	Determination of the elasticity modulus by the bending beam method	-	2	-	-	Determination of the elasticity modulus by the	report	interview
	L.W. Determination of the elasticity							

	modulus of materials by the bending beam method					bending beam method		
2.2	Mechanical and thermal properties of dental materials and tooth tissues	-	4	-	-		report	
	Hardness determination by Brinell, Vickers, and Knoop hardness tests. L.W. Determination of hardness of materials by Vickers test	-	2	-	-	The use of optical microscope for hardness determination	report	interview
	Thermal properties of dental materials and tooth tissues, their characteristics. L.W. Determination of liner coefficient of thermal expansion	-	2	-	-	Determination of liner coefficient of thermal expansion	report	interview
2.3	Principles of maxillofacial system biomechanics	-	-	2	-			interview
3	Bioacoustics	-	2	4	-			
3.1	Origin and classification of acoustic waves	-	-	2	-			interview
3.2	Physical and physiological characteristics of sound waves. Sound methods in medicine. L.W. Measurement of the ear spectral characteristic at the threshold of hearing	-	2	-	-	Measurement of the ear spectral characteristic at the threshold of hearing	report	interview
3.3	Ultrasound and its application in medicine	-	-	2	-			interview, ТесТ
4	Physical basis of biorheology, hydrodynamics and hemodynamics	1,5	4	8	-			
4.1.	The main concepts and laws governing ideal and viscous fluid flow. Viscosimetry	-	2	4	-			interview
	Equation of continuity of flow. Ideal fluid, Bernoulli's equation.		-	2	-			
	The main concepts and laws governing viscous fluid flow.	-	-	2	-			
	Viscosity of fluid and methods of viscosity measurements.	-	2	-	-	Determination of viscosity of fluid by Ostwald viscometer	report*	interview
	L.W. Determination of viscosity of fluid by Ostwald viscometer							

4.2	Physical basis of hemodynamics (hemorheology)	-		2	-			interview, test
	Physical basis of hydrodynamics and hemodynamics	1,5	-	-	-			
4.3.	Principles of surface phenomena physics. L. W. Determination of the surface tension of liquid by maximum bubble pressure method	-	2	-	-	The use of maximum bubble pressure method for determination of the surface tension of liquid	report	interview
4.4	Adhesion. Role of adhesion in dentistry.	-	-	2	-			interview, essay
5	Physical processes in biological membranes	-	-	4	-			
5.1	Physical properties of biological membranes. Transport of substances across biological membranes	-	-	2	-			interview, rect
5.2	The membrane cell potentials	-	-	2	-			interview, electronic test*
	Total hours	3	36	-	-			
2 Semester								
	Lectures	3	-	-	3			
1.	Electric and magnetic phenomena in organism, electric effects and methods of investigation	1,5	-	-	-			essay
2.	Optical methods of investigation and the interaction of the optical region radiation with biological objects	1,5	-	-	-			essay
3.	Luminescence. Lasers and their medical applications.	-	-	-	1,5			
4.	X-radiation, its application in medicine	-	-	-	1,5			
	Practical and Laboratory Classes							
6	Application of electric current, electric and magnetic fields in medicine	1,5	14	-	-			
6.1.	Physical basis of tissue and organ	-	2	-	-	Recording and	report	interview

	electrography. L.W. Recording and treatment of electrocardiogram					treatment of electrocardiogram		
6.2.	Electrostimulation of tissues and organs L.W. Determination of the parameters of rectangular pulses of voltage	-	2	-	-	Determination of the parameters of rectangular pulses of voltage	report	interview
6.3	Obtaining and recording medical data, characteristics of electromedical equipment	-	4	-	-			
	Obtaining and recording medical data, characteristics of electromedical equipment. Sensors. L.W. Calibration of electrical temperature sensors	-	2	-	-	Calibration of electrical temperature sensors	report	interview, essay
	Amplifiers of biopotentials. L.W. Determination of frequency and amplitude characteristics of amplifier	-	2	-	-	Determination of frequency bandwidth and dynamic range of amplifier	report	interview
6.4	Electric and magnetic properties of human body tissues. Physical basis of magnetic resonance imaging	-	4	-	-			
	Electric and magnetic phenomena in organism, electric effects and methods of investigation	1,5	-	-	-			essay
	Electric and magnetic properties of human body tissues. Physical basis of magnetic resonance imaging. L.W. Investigation of principle of working of the galvanization apparatus	-	2	-	-			interview, essay, report
	Electrical impedance of tissue and its dependence on the alternating current frequency. The estimation of tissue viability L.W. Investigation of the dependence of	-	2	-	-	Determination of the dependence of biological tissue impedance on	report*	interview, essay

	biological tissue impedance on alternating current frequency					frequency		
6.5	Effect of electric current, electric and magnetic fields on human organism L.W. Investigation of high frequency electric current and fields on human organism	-	2	-	-	The use of high frequency therapeutic apparatus	report	interview, electroic test*
7	Electromagnetic radiation and its application in medicine	1,5	18	4	3			
7.1.	Electromagnetic waves, its properties. Light polarization, polarization methods in biology and medicine. The light absorption and its laws	-	4	-	-			
	Electromagnetic waves, its properties. Light polarization. L.W. Determination of the optically active substance concentration by polarimeter	-	2	-	-	The use of polarimeter for determination of the optically active substance concentration	report	interview
	The light absorption phenomenon and its laws. L.W. Determination of the solution concentration by photoelectric colorimeter	-	2	-	-	Determination of the solution concentration by photoelectric colorimeter	report*	interview
7.2	Refractometry. Optical microscopy	-	4	-	-			
	Refractometry L.W. Determination of the solution concentration by the refractometer	-	2	-	-	Determination of the solution concentration by the refractometer	report*	interview,
	Optical microscopy L.W. Measurement of the small object sizes using an optical microscope	-	2	-	-	Measurement of the small object sizes using an optical microscope	report	interview,
7.3	Light reflection, absorption and scattering	-	2	-	-			interview, report,

	processes in skin, tooth tissues and dental materials L. W. Investigation of optical characteristics of biological tissues						essay
	Optical methods of investigation and the interaction of the optical region radiation with biological objects	1,5	-	-	-		essay
7.4	Thermal radiation of bodies. Clinical thermography. Heat transfer of the human body L. W. Investigation of principle of working of thermal imager	-	2	-	-		interview, report, essay
	Luminescence. Lasers and their medical applications.	-	-	-	1,5		
7.5	Light emission and absorption by atoms and molecules. Luminescence	-	4	-	-		
	Light emission and absorption by atoms and molecules. L. W. Investigation of the absorption spectrum of blood	-	2	-	-		interview, report, essay
	Luminescence, application of luminescent methods in medicine. L. W. Investigation of the spectra of fluorescent markers		2	-	-		interview, report, essay
7.6	Stimulated emission. Lasers and their medical applications. L. W. Determination of the laser radiation wavelength with the use of diffraction grating		2	-	-	Determination of the laser radiation wavelength with the use of diffraction grating	report interview, essay
	X-radiation, its application in medicine	-	-	-	1,5		

7.7. 7.8.	Bremsstrahlung X-radiation, its origin and generation X-radiation interaction mechanisms with matter. X-radiation application in medicine	-	-	2	-			interview
7.9	Dosimetry of ionizing radiation	-	-	2	-			interview, electronic test*, examination
	Всего часов	3	36	3				

*This is a mandatory form of current certification (each student will receive a mark)