FEDERAL STATE BUDGETARY
EDUCATIONAL INSTITUTION OF HIGHER EDUCATION
"AMUR STATE MEDICAL ACADEMY"
MINISTRY OF HEALTH OF THE RUSSIAN FEDERATION

AGREED
Vice-Rector for Academic Affairs,

_____N.V. Loskutova

April 17, 2025

Decision of the CCMC
April 17, 2025

Protocol No. 7

APPROVED
by decision of the Academic Council of the FSBEI HE Amur SMA of the Ministry of Health of the Russian Federation
April 22, 2025

Protocol No. 15

Acting Rector of the FSBEI HE Amur SMA of the Ministry of Health of the Russian Federation

_____I.V. Zhukovets

April 22, 2025

ДОКУМЕНТ ПОДПИСАН
ЭЛЕКТРОННОЙ ПОДПИСЬЮ

Сертификат: 50AB2242604E64520B52614FA420034A
Владелец: Жуковец Ирина Валентиновна
Действителен: с 15.04.2025 до 09.07.2026

EDUCATIONAL PROGRAM

discipline "CLINICAL PHISIOLOGY"

Specialty: 31.05.01 General Medicine
Course: 3
Semester: 5
Total hours: 108 hrs.
Total credits: 3 credit units
Control form: credit-test, 5 semester

Blagoveshchensk, 2025

The educational program of the discipline is designed in accordance with the requirements of the Federal State Educational Standard of Higher Education - specialist in specialty 31.05.01 General Medicine, approved by order of the Ministry of Education and Science of Russia dated 08/12/2020 No. 988 (registered with the Ministry of Justice of Russia on 08/26/2020 No. 59493), BPEP HE (2021).

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APPROVED at the meeting of the Department of Physiology and Pathophysiology, Protocol No. 8 dated March 27, 2025

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Conclusion of the Expert Commission on the review of the Educational Programs: Protocol No. 2 dated April 16, 2025

Expert of the expert commission,
Ph.D. of Engineering Sciences _____ E.A. Utochkina

APPROVED at the meeting of the CMC No. 1: Protocol No. 7 dated April 16, 2025.
Chairman of the CMC No. 1
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AGREED: Dean of the Faculty of Medicine,
Ph.D. of Medical Sciences
April 22, 2025_____ N.G. Brush

CONTENT

1. EXPLANATORY NOTE

1.1. Characteristics of the discipline.

Clinical physiology as an academic discipline builds a bridge from normal physiology to pathological physiology, and from these fundamental disciplines to the clinic. In the life of the human organism and its interaction with the external environment, three states can be distinguished: health, illness, and terminal, or critical, condition. If some external or internal factor has affected the organism, but compensatory mechanisms have maintained homeostasis, then the state of health is maintained.

1.2. Purpose and objectives of the discipline.

Objective: To develop students' systemic knowledge about the adaptive-compensatory reactions of the body at various levels of its organization, arising in response to the action of extreme and damaging factors, about the role and nature of changes in physiological processes in pre-pathological and pathological conditions.

Learning objectives of the discipline:

- continuing to develop students' skills in analyzing the functions of the whole organism from the perspective of integral physiology, analytical methodology and the fundamentals of holistic medicine;
- continuing to develop students' systems approach to understanding the physiological mechanisms underlying interactions with environmental factors and the implementation of adaptive strategies of the human and animal body for the implementation of normal functions of the human body from the perspective of the concept of functional systems;
- expanded and in-depth study by students of the patterns of functioning of various systems of the human body and the characteristics of intersystem interactions in the context of performing targeted activities from the standpoint of the doctrine of adaptation;
- development of students' understanding of the adaptive-compensatory reactions of the body at various levels of its organization, the ability to assess their functional viability and recognize the transition of a compensatory reaction to its pathological form;
- further training of students in methods of assessing the functional state of a person, the state of regulatory and homeostatic mechanisms in various types of targeted activities;
- in-depth study by students of the role of higher nervous activity in the regulation of human physiological functions and targeted management of the body's reserve capabilities under normal and pathological conditions;
- students study the basics of valeology;
- continuation of the formation of the basics of clinical thinking in students based on the analysis of the nature and structure of interorgan and intersystem relationships from the standpoint of integral physiology for the future practical activities of a physician.

1.3. The place of the discipline in the structure of the main professional educational program of higher education

The discipline "Clinical Physiology" refers to the variable part of block B1. The total workload of the discipline is 108 hours (3 credit units). Of these, 72 classroom hours, 36 hours are allocated for independent work of students. The form of control is a credit.

To study the academic discipline " Clinical Physiology " the knowledge, skills and abilities formed during the study of the disciplines are required: anatomy; histology, embryology, cytology; chemistry; physics, mathematics; biochemistry.

The main sections of the discipline studied:

1) general clinical physiology;
2) private clinical physiology.

1.4. Requirements for students.

To study the discipline, knowledge, skills and abilities formed by previous disciplines/practices are required:
Latin
Knowledge : basic medical and pharmaceutical terminology in Latin.
Skills: be able to apply knowledge for communication and obtaining information from medical literature.
Professional foreign language
Knowledge: basic medical and pharmaceutical terminology in a foreign language.
Skills : be able to apply knowledge for communication and obtaining information from foreign sources.
Philosophy
Knowledge: methods and techniques of philosophical analysis of problems; forms and methods of scientific knowledge, their evolution; basic patterns and trends in the development of the world historical process; laws of dialectical materialism in medicine.
Skills: be able to competently and independently express, analyze the forms and methods of scientific knowledge and the laws of dialectical materialism in medicine.
Bioethics
Knowledge: moral and ethical standards, rules and principles of professional medical conduct.
Skills: be able to build and maintain working relationships with other team members.
Histology, embryology, cytology
Knowledge: embryogenesis, structure and function of tissues, organs and body systems.
Skills: be able to draw cells of various tissues of the body, show their main organelles, work with a light microscope taking into account safety regulations.
Physics, mathematics. Medical informatics.
Knowledge: mathematical methods for solving intellectual problems and their application in medicine; theoretical foundations of computer science, collection, storage, search, processing, transformation, distribution of information in medical and biological systems, use of information computer systems in medicine; principles of operation and design of equipment used in physiology and medicine, foundations of physical and mathematical laws reflected in physiology.
Skills: be able to use educational, scientific, popular science literature, a personal computer, the Internet for professional activities, work with equipment taking into account safety regulations .
Chemistry. Bioinorganic and biophysical chemistry in medicine
Knowledge : the chemical and biological essence of the processes occurring in a living organism at the molecular and cellular levels.
Skills : be able to analyze the contribution of chemical processes to the functioning of the body's physiological systems.
Biochemistry. Bioorganic chemistry in medicine
Knowledge: structure and biochemical properties of the main classes of biologically important compounds, the main metabolic pathways of their transformation; the role of cell membranes and their transport systems in metabolism.
Skills: be able to analyze the contribution of biochemical processes to the functioning of the body's physiological systems, interpret the results of the most common laboratory diagnostic methods to identify disorders in the body's physiological systems.
Biology
Knowledge: laws of genetics, its importance for medicine; patterns of heredity and variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multifactorial diseases; biosphere and ecology, bioecological diseases.
Skills: be able to analyze the patterns of heredity and variability in the development of the

body's physiological systems.
Anatomy
Knowledge: Anatomical and physiological features of various organs and systems of the body.
Skills: be able to analyze the structure and establish a connection between the structural features and functions of various organs and systems of the body.
Normal Physiology
Knowledge: Mechanisms of physiological processes in the human body and their neuroendocrine regulation.
Skills : be able to analyze the mechanisms of physiological processes in the human body and their neuroendocrine regulation.

1.5. Interdisciplinary links with subsequent disciplines

No. p/p	Name of subsequent disciplines	Sections of the discipline	
		1	2
1	Physical Education and Sports	+	+
2	Propaedeutics of internal diseases, radiation diagnostics	+	+
3	Pharmacology	+	+
4	Clinical pharmacology	+	+
5	Pathophysiology, clinical pathophysiology	+	+
6	Pathological anatomy, clinical pathological anatomy	+	+
7	General surgery, radiology	+	+
8	Public health and healthcare, health economics	+	+
9	Otorhinolaryngology	+	+
10	Faculty therapy	+	+
11	Neurology, neurosurgery	+	+
12	Obstetrics and gynecology	+	+
13	Psychiatry, medical psychology	+	+
14	Faculty surgery, urology	+	+
15	Infectious diseases	+	+
16	Dermatovenereology	+	+
17	Traumatology, orthopedics	+	+
18	Hospital surgery, pediatric surgery	+	+
19	Anesthesiology, resuscitation, intensive care	+	+
20	Hospital therapy	+	+
21	Medical rehabilitation	+	+
22	Oncology, radiation therapy	+	+
23	Phthisiology	+	+
24	Outpatient therapy	+	+
25	Forensic medicine	+	+

26	Dentistry	+	+
27	Pediatrics	+	+
28	Hygiene	+	+
29	Physical culture	+	+

1.6. Requirements for the results of mastering the discipline

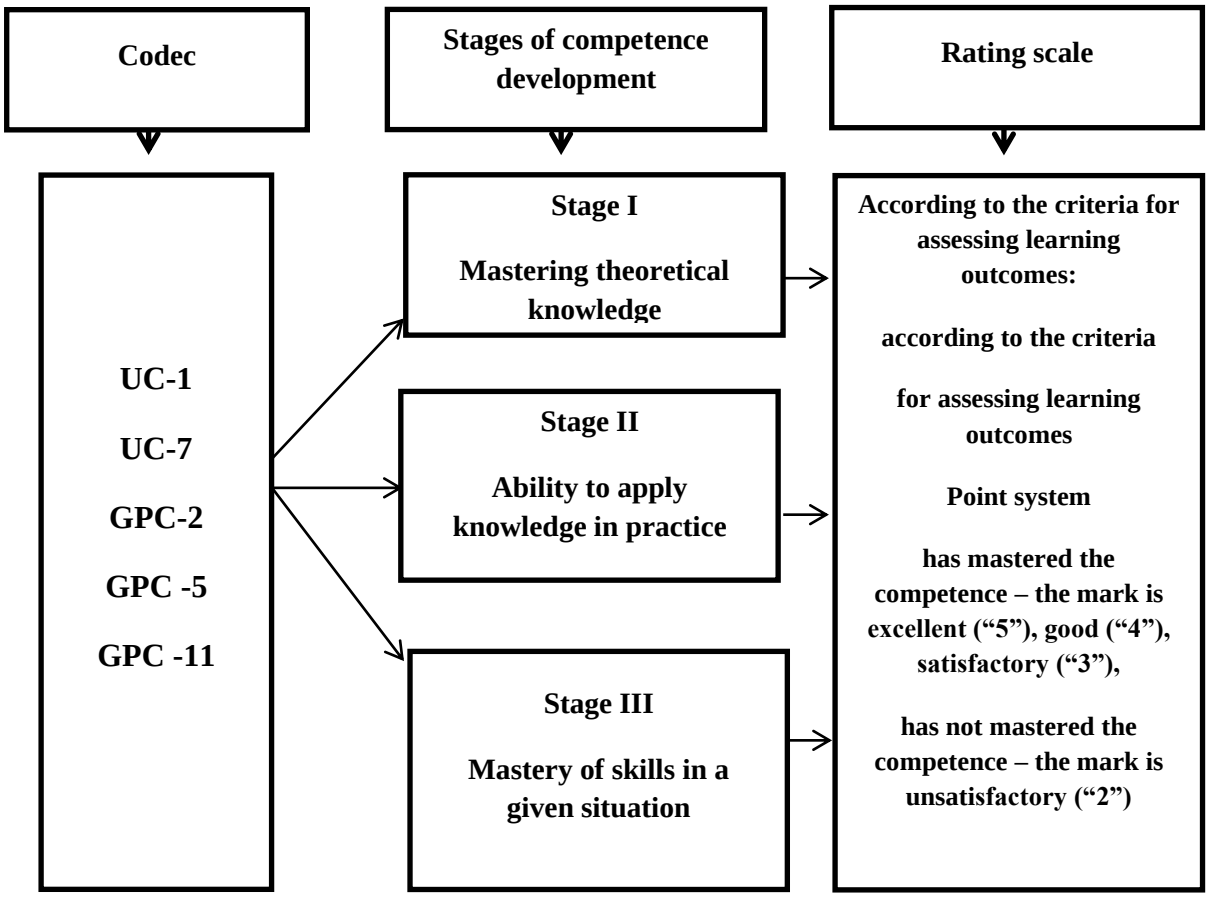
The study of the discipline "Clinical Physiology" is aimed at the formation/improvement of the following competencies: universal (UC), general professional (GPC): UC - 1, 7; GPC - 2, 5, 11;

No. p/p	Code and name of competence	Code and name of the indicator of achievement of competence
Universal competencies		
1	**UC-1.** Capable of carrying out a critical analysis of problematic situations based on a systems approach, developing an action strategy	**AI UC 1.1** Analyzes a problem situation as a system, identifying its components and the connections between them **AI UC-1.3.** Applies systems analysis to resolve problematic situations in the professional sphere.
	UC-7. Able to maintain the proper level of physical fitness to ensure full social and professional activity	**AI UC-7.1.** Observes and promotes healthy lifestyle standards in various life situations and in professional activities
General professional competencies		
2	**GPC -2.** Capable of conducting and monitoring the effectiveness of measures for prevention, healthy lifestyle formation and sanitary and hygienic education of the population	**AI GPC -2.2.** Promotes a healthy lifestyle aimed at improving sanitary culture and preventing diseases of patients (population); organizes events on sanitary and hygienic education and the formation of healthy lifestyle skills.
	GPC -5. Capable of assessing morpho-functional, physiological states and pathological processes in the human body to solve professional problems	**AI GPC -5.1.** Knows the functional systems of the human body, their regulation and self-regulation when interacting with the external environment in normal conditions and in pathological processes. **AI GPC -5.3.** Knows the indicators of the morphofunctional, physiological state of a healthy person and can measure/determine them.
	GPC -11. Capable of preparing and applying scientific, scientific-production, design, organizational-managerial and regulatory documentation in the healthcare system	**AI GPC -11.2.** Identifies and analyzes problem situations, searches for and selects scientific, regulatory and organizational documentation in accordance with the specified goals **AI GPC -11.3.** Interprets and applies data from physical, chemical, mathematical and other natural science concepts and methods for solving professional problems.

1.7 . Stages of formation of competencies and descriptions of assessment scales

Sections of the discipline and the code of the competence being formed

Item No.	Section name	Code of the competence being formed
1	general clinical physiology	UC-1, UC-7, GPC-2, GPC -5, GPC -11
2	private clinical physiology	UC-1, UC-7, GPC -2, GPC -5, GPC -11



1.8. Forms of training organization and types of control.

Forms of training organization: lectures, practical classes.

In order to implement the competence approach, along with traditional teaching methods, active and interactive forms of conducting classes are provAIed in the form of computer simulations, solving situational and computational problems. In particular, when solving situational problems, an element of competition is introduced, encouraging students to more active work. A student or a group of students who are the first to offer the correct solution to the problem are encouraged by increasing the grade for the class.

Types of control:

- input: testing on the Moodle portal in the course "Clinical Physiology" at the beginning of the training;

- current: oral questioning, interview, checking protocols of practical classes, control over the implementation of practical work, machine-free and computer-based testing, role-playing games, solving situational problems, computer simulations. Traditional forms of control allow checking the assimilation of the educational material by students. The ability of the student to apply his knowledge can be checked by solving situational problems, predicting the results of

research in the Physiology Simulator program and discussing the results of the experimental studies, when the student must explain the results obtained and draw conclusions;

- **intermediate:** variable test assignment (the student conducts an independent information search on a chosen topic, prepares a message, presents the prepared message to the group, and, if necessary, prepares a computer presentation and/or table), test control.

The student's level of mastery of practical skills is assessed during the course of practical work.

2. STRUCTURE AND CONTENT OF THE DISCIPLINE

2.1. Scope of the discipline and types of educational activities

Types of educational work	Total hours	Semester - 5
Lectures	20	20
Practical classes	52	52
Independent work of students	36	36
Total labor intensity in hours	**108**	**108**
Total workload in credit units	**3**	**3**

2.2. Thematic plan of lectures and their brief content

No. p/p	Lecture topics	Codes of formed competencies	Labor intensity (hours)
1	*Introduction to the course of clinical physiology. Compensation of impaired functions as one of the types of adaptation.* Clinical physiology as a section of physiology that studies the role and nature of changes in physiological processes in pre-pathological and pathological conditions of the body. The main task of clinical physiology is to study the processes occurring in the body during developing pathologies. Success in treating any disease depends, among other things, on the depth of our understanding of the mechanisms of functioning and regulation of the organ, organ system or organism. Systematically encountering the manifestation of certain diseases, medicine can Identify an area of physiological knowledge that is important for its professional development. In this case, clinical physiology is a section of physiology that studies fundamental processes, with a view to solving the problems that arise before clinicians. It is worth emphasizing that the research is of a fundamental, not applied nature and is mainly in the field of molecular biology at the present stage.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
2	*Adaptation of the body to changes in ambient temperature* All kinds of mechanisms and types of temperature adaptation are associated with the functional system of thermoregulation, which in the process of evolution in homeothermic animals and humans has reached a high level of perfection. Two balanced processes and corresponding centers of heat production (chemical) and heat transfer (physical) regulation ensure the process of thermostatting - the constancy of temperature at the optimum. The formation of primary heat in conditions of adaptation to cold is supported by secondary heat if necessary. Depending on the conditions, 4 types of heat transfer can replace each other or act in combination, ensuring the optimum temperature constant.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
3	*Mechanisms for compensating for disturbances in the nervous regulation of body functions* The basis for the restoration and compensation of lost functions is the plasticity of nerve centers, the ability of nerve elements to restructure functional properties. The main physiological manifestations of this property are post-tetanic potentiation, dominant, and the formation of temporary connections. These phenomena provide more active involvement in the regulation of the impaired function of undamaged neurons localized in other parts of the central nervous system outside the damaged centers. The presence of such "scattered" neurons is especially characteristic of the cerebral cortex. In these cases, the intensity of the functioning of neurons preserved in the damaged center increases, for example, as a result of a stroke and degeneration of a	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2

	significant portion of the neurons of the motor center. The ability to regenerate damaged nerve fibers and restore damaged interneuronal connections and connections plays a particularly important role in the compensation of any impaired function (vision, hearing, motor activity, etc.).		
4	*Neuronal and neurochemical mechanisms of pain.* Nociceptive information reaches the brain via two "classical" ascending afferent systems - lemniscal and extralemniscal. There are no specialized pain sensitivity pathways in the CNS, and pain integration is performed at various levels based on a complex interaction of lemniscal and extralemniscal projections. The spinothalamic tract transmits information about the properties of a pain stimulus and is designated as neospinothalamic, while the other two are combined into the paleospinothalamic tract. This forms two types of pain sensitivity: 1. Epicritic - specific (fast) with precise localization. 2. Protopathic without localization. Theories of pain sensitivity are considered, a physiological and morphological classification of nociceptors, conduction and central mechanisms of the nociceptive analyzer is given.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
5	*FuS regulation of the aggregate state of blood and compensation for disorders of its activity* To perform all its vital functions in the body, blood must have fluAIity in a liquAI aggregate state and lose this property when it is necessary to stop bleeding, which is the system-forming element No. 1 of this FuS. It includes two executive systems: hemostasis (HS) and liquAI aggregate state (LAS). Primary hemostasis or vascular-platelet is provAIed by the vessels of the microcirculatory bed and platelets. Secondary or coagulation is provAIed by the coagulation system of blood, consists of plasma or blood, designated by Roman numerals from I to XV and tissue factors, designated by Arabic numerals. Accordingly, the internal coagulation system and external. LAS provides PSSK - anticoagulant system of blood, consists of anticoagulants and decoagulants. The first prevents blood clotting, and the second eliminates coagulation products, converting them into a soluble state. The concept of the maximum permissible concentration or maximum permissible concentration for thrombin and plasmin (fibrinolysin) and plasmin and thrombin-sensitive receptors, from which antithrombin or antiplasmin reflexes begin, ensuring the optimal aggregate state of the blood, is introduced.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
6	*Mechanisms for compensating cardiac dysfunction and vascular tone* Types of cardiac regulation and compensation mechanisms. Primary dichotomy of regulation: intracardiac and extracardiac. Intracardiac: myogenic and neurogenic. Myogenic: heterometric, Starling's law of the heart. In general, myogenic regulation is the Frank-Starling law. Mechanisms of the law: physical, connection with elasticity and transition of stored potential energy into kinetic energy. Saving 1/3 of the cardiac muscle power. Cardiosclerosis excludes this type of compensation. Electromechanical coupling in the ultrastructure (Huxley), mitochondria. Homeometric self-regulation (Anrep). Chronoinotropy (Bowditch). Neurogenic URD (G.I.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2

	Kositsky). Extracardiac mechanisms: pressor (amplifying) intrinsic and associated unconditioned reflexes, implemented by the sympathetic nervous system, provide positive chrono-, ino- and bathmotropic effects; depressor (inhibitory) intrinsic and associated reflexes are implemented by the parasympathetic nervous system, provide negative chrono-, ino- and bathmotropic effects on the work of the heart. Conditioned reflex regulation provides pre-start states, representing an advanced reflection of reality in the whole organism. Humoral regulation - hormones of endocrine glands, biologically active and metabolites. The regulatory parameter of activity is the IOC (minute blood volume), which can vary at rest from 5 to 25 liters per minute under maximum physical and emotional stress. Decompensation causes heart failure. Resistance to blood flow is provided by resistive vessels, which primarily include arterioles or muscular vessels, which are called tone - a state of constant and prolonged tension. There are 4 states of resistive vessels: 1. Normotonia, 2. Hypertension, 3. Hypotension, 4. Dystonia. Self-regulation of tone is provAIed by nervous, neurohumoral and humoral mechanisms. Myogenic tone and its significance		
7	*Clinical aspects of blood pressure disorders* The norm and deviations from the normal value of arterial pressure (AP) ensure the integral interaction of many homeostatic functional systems interacting and interfacing with each other, 5 of which are fundamental. 1. The work of the heart as an intermittent pump (four-chamber pump), the result of which is a dynamically changing IOC. 2. The tone of resistive vessels of the muscular type. 3. The mass and volume of blood in the vascular bed. 4. Blood viscosity. 5. The condition of the walls of the main vessels. The first thing that is necessary in the clinic to know is the plastic constant of the AP value, which includes the following indicators: Maximum, systolic and minimum diastolic. Pulse pressure. Average arterial pressure. It is necessary to know all the components to make a diagnosis and prescribe pathognomonic treatment.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
8	*Compensatory reactions in case of renal excretory function disorders* Excretory and endocrine functions of the kidneys are provided by nephrons, the structural and functional units of the kAIney. To study, knowledge of the anatomy and histology of the excretory system is required, as well as division of nephrons into cortical and juxtamedullary with an indication of their functions. Division into proximal and distal sections with an indication of the function and regulation of these functions in each section. Particular attention should be paid to filtration, the formula for filtration pressure, effective pressure, which will help to understand the mechanisms of compensatory reactions in renal failure and the strategy for its elimination. The concept of obligatory and optional reabsorption of species and mechanisms of their regulation at various levels. Violations of humoral regulation of renal function in the form of diabetes insipidus.	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
9	*Behavioral adaptation*	UC-1, UC-7,	2

	Behavior is a very complex form of life activity that relates to the entire organism as a whole, and not to individual organs or their systems, which is its most essential feature. The ability to respond to external influences is called reactivity. But the organism also has self-sufficient internal activity or search activity, as a way to overcome obstacles and solve problems on the way to achieving the required adaptive result and a mechanism for the subsequent development and improvement of all forms of behavior. In addition to objective obstacles, it is necessary to overcome the difficulties of understanding and the deficit of knowledge, skills and abilities, or it is necessary to turn to reason or understand the essence of the problem, penetrate the secret of meaning. With a positive outcome of overcoming, when a way out is found, it is followed by the development and improvement of techniques and methods, quick adoption of correct decisions - the search for ways of constant optimization of all active actions and responses to the degree of their perfection, in accordance with the level of development of each individual. With a negative outcome of frustration, there is a refusal to search or learned helplessness (learned helplessness), followed by behavioral depression and death. On the contrary, search activity is accompanied by recovery, increased resistance, and strengthening of the immune system.	GPC-2, GPC -5, GPC -11	
10	*Clinical psychophysiology* Psychophysiology is a science about physiological bases of mental functions of the brain. The main components of the psyche are consciousness, thinking, memory, emotions, attention, perception, intellect, will, learning and teaching, speech. The psyche is an interdisciplinary object of scientific research, first of all psychology, pedagogy, social psychology, in clinical aspects each of the sections of psychophysiology is connected with psychiatry. Search activity has psychophysiological aspects, which is manifested in the disease of achievement or Martin Eden syndrome. The state of the psyche determines health, which is expressed in the emergence of the section of science psychoneuroimmunology, which has been known since ancient times. The military doctor, the physician-in-chief of the Napoleonic Guard, saidI: "The wounds of the victors heal faster than the wounds of the vanquished", which was then confirmed by N. I. Pirogov. The experience of "victories" and "defeats" determines the state of the somatic sphere: "A healthy mind in a healthy body!", which allows us to say the opposite of this expression	UC-1, UC-7, GPC-2, GPC -5, GPC -11	2
	Total		**20**

2.3. Thematic plan of practical classes and their content

No. p/p	Name of the topics of practical classes	Contents of practical classes	Codes of formed competencies and indicators of their achievement	Types of control	Labor intensity (hours)
1	Introduction to Clinical Physiology	**Theoretical part:** The role of clinical physiology in the system of medical education. The relationship of clinical physiology with other sciences. Scientists who contributed to the development of clinical physiology. The concept of the norm and health. **Practical part:** Testing the survival rate of knowledge in normal physiology Work in the program "Physiology Simulator" "The effect of insulin on blood glucose levels"	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	Interactive survey, computer testing, discussion of the results of the experiment, conclusions	3.25
2.	Biophysical foundations of electrophysiological clinical research methods.	**Theoretical part:** Electrogenesis of excitation, comparative characteristics of local and spreading excitation. The influence of changes in the ionic composition of the internal environment of the body on biopotentials **Practical part:** Solving situational problems. Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing	3.25
3.	Physiological aspects of methods for studying biopotentials of the heart, brain, muscles	**Theoretical part:** Theory of cardiac dipole. Origin of ECG elements. Information value of the method. Essence of the EEG method. EEG rhythms in various functional states. Information value of EEG, electromyography. **Practical part:** Registration of an electrocardiogram with different positions of the electrodes Working on the BiopacStudentLab educational software package: viewing the EEgram rhythms. Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing, discussion of experimental results, conclusions	3.25
4	Adaptation of the organism to environmental	**Theoretical part:** The concept of adaptation and adaptability. Adaptation mechanisms. General adaptation syndrome. Compensation as one of the types of adaptation	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1.	interactive survey, task interview	3.25

	conditions	**Practical part:** Active vestibular training Solving situational problems	GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3		
5	Adaptive and compensatory reactions of the human body when exposed to low temperatures	**Theoretical part:** Functional system of body temperature maintenance. Thermoregulation mechanisms. Effect of low temperatures on body functions. Mechanisms of adaptation to low temperatures. **Practical part:** Adaptation of skin temperature receptors to the effects of high and low temperatures. The human body's response to low-intensity cold stress. Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing, discussion of experimental results, conclusions	3.25
6	Clinical aspects of disorders of regulation of physiological functions.	**Theoretical part:** Principles of regulation of physiological functions. Homeostatic functional system. Morphofunctional mechanisms of compensation of disorders in the nervous system. **Practical part:** Evaluation of human vegetative tone using the Kerdo index Solving situational problems Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing	3.25
7	Physiological mechanisms of pain and analgesia	**Theoretical part:** Theories of pain. Nociceptive analyzer. Modern concepts of the organization, mechanisms and functions of the antinociceptive system. Physiological bases of pain relief and anesthesia. **Practical part:** Study of the body's autonomic reactions to pain. Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing	3.25
8	Clinical physiology of the endocrine system	**Theoretical part:** Functional characteristics of the hypothalamic-pituitary system. Compensation mechanisms when its activity changes. Hormonal function of the adrenal glands, thyroAI gland, role in adaptation mechanisms. Hormonal regulation of carbohydrate metabolism. **Practical part:** Solving situational problems Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing	3.25
9	Functional system of regulation of	**Theoretical part:** Hemostatic systems. Anticoagulant system, its characteristics. FuS RASK, hemostatic potential. Hemolysis, its types,	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1.	interactive survey, interview on tasks,	3.25

	the aggregate state of blood and compensation of its disorders	mechanisms. **Practical part:** Hemolysis of blood Introduction to the thromboelastography method Solving situational problems Testing	GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	testing, discussion of the experiment, conclusions.	
10	Compensatory mechanisms for water and electrolyte imbalance.	**Theoretical part:** Osmotic homeostasis. Integrative mechanisms of water-salt metabolism regulation. Compensatory mechanisms in case of water and electrolyte imbalance. **Practical part:** Working with the computer program "Physiology Simulator": - the influence of hydrostatic pressure, osmotic pressure and the diameter of the afferent and efferent glomerular arterioles on urine formation; - the effect of aldosterone and ADH on the rate of urine formation. Solving situational problems Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, discussion of the results of the experiment, conclusions, testing	3.25
11	Compensatory mechanisms for acAI-base balance disorders.	**Theoretical part:** General characteristics of the acAI-base balance, main physiological indicators. Mechanisms of acAI-base balance regulation. Main forms of imbalance and compensatory reactions to them. **Practical part:** Solving situational problems. Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, task interview, testing	3.25
12	Clinical aspects of compensation of obstructive and restrictive disorders in the lungs	**Theoretical part:** Participation of the respiratory system in metabolism. Oxygen price of the body systems. Types of alveolar ventilation resistance. Compensatory mechanisms in obstructive, restrictive disorders. **Practical part:** Work on the educational software complex BiopacStudentLab. Simulation of obstructive and restrictive disorders in the lungs. Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, discussion of the results of the experiment, conclusions, testing	3.25
13	Physiological mechanisms of blood pressure	**Theoretical part:** Factors determining the optimal blood pressure value. Functional system of self-regulation of blood pressure. Adaptive-compensatory mechanisms in arterial hypertension	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1.	interactive survey, discussion of the results of the	3.25

	disorders in clinical practice and their compensation	**Practical part:** Working with the computer program "Physiology Simulator": - the influence of pressure and viscosity of the liquAI, radius and length of the vessel on the movement of liquAI through the vessel; - the influence of cardiac output, peripheral resistance and vascular elasticity on arterial pressure Measuring blood pressure after exercise Testing	GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	experiment, conclusions, testing	
14	Physiological foundations of labor activity	**Theoretical part:** Changes in physiological functions during physical and mental work, physical exertion. Working capacity, its changes. Fatigue, features during different types of work. Physical training. **Practical part:** The influence of blood supply on the implementation of complex coordinated movements. Determination of mental performance by means of a proofreading test Testing	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, discussion of experimental results, testing	3.25
15	Physiological foundations of a healthy lifestyle	**Theoretical part:** Definition and diagnostics of health. Physiological bases of health. Basic methods of prevention and health maintenance **Practical part:** 1. Anthropometric approaches: a) Broca's index; b) height-weight ratio; c) waist size for women and men. 2. Physiological approaches. a) Martinet test; b) Stange and Gentsch samples; c) Harvard Step Test.	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	interactive survey, interview on the results of the experiment, conclusions	3.25
16	Credit lesson	**Practical part:** Checking the acquisition of competencies (testing, defense of a creative test assignment).	UC-1 AI: 1.1, 1.3 UC-7, AI: 7.1. GPC -2 AI: 2.1. GPC -5 AI: 5.1, 5.3 GPC -11 AI 11.2, 11.3	testing, defense of a creative test assignment	3.25
Total hours					**52 h.**

2.4. Interactive forms of learning

In order to activate students' cognitive activity, interactive teaching methods (interactive surveys, computer simulations, discussion of the results of real and virtual experiments, work in small groups, computer testing with elements of training, etc.), participation in the work of the psychophysiological laboratory, educational and research and scientific research work of the department, and the scientific circle of the department are wAIely used in practical classes.

Interactive forms of conducting classes

Item No.	Topic of practical lesson, lecture	Labor intensity in hours	Interactive form of learning	Labor-intensive per min, in % of the lesson
1	2	3	4	5
1	Introduction to Clinical Physiology	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
2	Biophysical foundations of electrophysiological clinical research methods.	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
3	Physiological aspects of methods for studying biopotentials of the heart, brain, muscles	3.25	Computer testing, interactive survey	60 min (1.33 hours)/ 41%
4	Adaptation of the organism to environmental conditions	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
5	Adaptive and compensatory reactions of the human body when exposed to low temperatures	3.25	Interactive survey. Small group method. Computer testing	65 minutes (1.4 hours) / 44%
6	Clinical aspects of disorders of regulation of physiological functions.	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
7	Physiological mechanisms of pain and analgesia	3.25	Interactive survey. Computer testing. Small group method	90 minutes (2 hours) / 62%
8	Clinical physiology of the endocrine system	3.25	Interactive survey. Computer simulations. Computer testing	90 minutes (2 hours) /62%
9	Functional system for regulating the aggregate state of blood and compensation for disturbances in its activity.	3.25	Interactive survey. Small group method	90 minutes (2 hours) /62%
10	Compensatory mechanisms for water and electrolyte imbalance	3.25	Computer simulations Interactive survey. Small group method. Computer testing	90 minutes (2 hours) / 62%
11	Compensatory mechanisms for acid-base balance disorders.	3.25	Interactive survey Computer simulations Small group method. Computer testing	90 minutes (2 hours) / 62%
1 2	Clinical aspects of compensation of obstructive and restrictive disorders in the lungs	3.25	Computer testing Interactive survey Computer simulations.	90 minutes (2 hours) / 62%

13	Physiological mechanisms of blood pressure disorders in clinical practice and their compensation	3.25	Interactive survey Small group method Computer Simulations. Computer Testing	90 minutes (2 hours) /62%
14	Physiological foundations of labor activity.	3.25	Interactive survey. Small group method. Computer testing	90 minutes (2 hours) / 62%
15	Physiological foundations of a healthy lifestyle	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
16	Credit lesson	3.25	Computer testing	90 minutes (2 hours) /62%

2.5. Criteria for assessing students' knowledge

The basis for determining the level of knowledge, skills, and abilities are the assessment criteria:

- completeness and correctness:
- correct, precise answer;
- correct but incomplete or imprecise answer;
- incorrect answer;
- no answer.

When assigning marks, the classification of errors and their quality are taken into account:

- gross errors;
- similar errors;
- minor errors;
- shortcomings.

- **Criteria for assessing learning outcomes**

No. p/p	Topic of the practical lesson	Theoretical part	Practical part	Overall rating
1-15	All practical classes	2-5	2-5	2-5
16	Credit lesson		2-5	2-5
Average score		**2-5**		

- ***Rating scales for ongoing knowledge control***

The success of students in mastering the discipline "Clinical Physiology", practical skills and abilities is characterized by a qualitative assessment and is assessed on a five-point scale: "5" - excellent, "4" - good, "3" - satisfactory, "unsatisfactory". The conversion of the mark into a point scale is carried out according to the following scheme:

Success rate	Mark on a 5-point scale
90-100%	"5"
80-89%	"4"
70-79%	"3"
Below 70%	"2"

- ***Working off disciplinary debts.***

If a student misses a class for a valid reason, he/she has the right to make it up and receive the maximum grade provided for by the course work program for that class. A valid reason must be documented.

If a student misses a class for an unjustified reason or receives a "2" mark for all activities in the class, he/she is required to make it up. In this case, the mark received for all activities is multiplied by 0.8.

If a student is excused from a class at the request of the dean's office (participation in sports, cultural and other events), then he is given a grade of "5" for this class, provided that he submits a report on the completion of mandatory extracurricular independent work on the topic of the missed class.

Assessment criteria for midterm assessment

1. Test control in the Moodle system

2. The test is conducted in the form of computer testing, including questions on all topics covered. Each option consists of a set of tests, which are selected by the computer by random sampling.

A student receives a "pass" if the result is 70% or higher. If the result of any stage is below 70% - "fail"

2.6. Independent work of students: in-class and out-of-class .

Independent classroom work of students.

The organization of independent classroom work of students is carried out with the help of methodological instructions for students, which contain educational goals, a list of the main theoretical questions for study, a list of practical work and the methodology for conducting it, instructions for the presentation of the results obtained, their discussion and conclusions, assignments for self-control with standard answers, a list of recommended literature.

From 1/4 to 1/2 of the practical lesson time is allocated for independent work of students: conducting research, recording results, discussing them, formulating conclusions, completing individual assignments. The preparatory stage, or the formation of an approximate basis for actions, begins for students outside of class time when preparing for a practical or seminar lesson, and ends in class.

All subsequent stages are carried out in class. The stage of materialized actions (solving situational problems) is carried out independently. The teacher, if necessary, provides consultation, provides assistance and simultaneously monitors the quality of students' knowledge and their ability to apply existing knowledge to solve assigned problems.

Extracurricular independent work of students.

No. p/p	Topic of the practical lesson	Time for student preparation for the lesson	Forms of extracurricular independent work of a student	
			Compulsory and the same for all students	At the student's choice
1	2	3	4	5
1.	Introduction to Clinical Physiology	1	Reading a text (textbook, lecture, additional literature)	Making notes on the topic of the lesson
2.	Biophysical foundations of electrophysiological clinical research	2	Reading a text (textbook, lecture,	Making notes on the topic of the lesson

	methods		additional literature)	
3.	Physiological aspects of methods for studying biopotentials of the heart, brain and muscles.	2	Reading a text (textbook, lecture, additional literature)	Making notes on the topic of the lesson
4.	Adaptation of the organism to environmental conditions	3	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Human adaptation to time zone changes Adaptation of the musculoskeletal system in adaptation to space flight Adaptation of the circulatory system to space flight Fast and slow adaptive responses at altitude
5.	Adaptive and compensatory reactions of the human body when exposed to low temperatures	2	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Physiological basis of hardening (effect of low temperatures on the body) Features of thermoregulation in old and senile age Adaptive reactions of the body to high temperatures
6.	Clinical aspects of disorders of regulation of physiological functions	2	Reading a text (textbook, lecture, additional literature); solving tests	Preparation of a message and presentation on the topic: Changes in gastrointestinal function in old age Theories of Aging Features of sensory systems in elderly people Compensation of impaired physiological functions by methods of traditional oriental medicine Age-related changes in the function of the nervous system and mental activity
7.	Physiological mechanisms of pain and analgesia	2	Reading a text (textbook, lecture, additional literature)	Making notes on the topic of the lesson
8.	Clinical physiology of the endocrine system	3	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Hormonal regulation of human behavior
9.	Functional system for regulating the aggregate state of blood and	3	Reading a text (textbook, lecture,	Preparation of a message and presentation on the topic: Immunity and blood functions in

	compensation for disturbances in its activity.		additional literature)	aging The use of blood components to correct the aggregate state of blood Artificial blood and its application in medicine
10	Compensatory mechanisms for water and electrolyte imbalance.	2	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Artificial methods of compensating for impaired renal compensation
11.	Compensatory mechanisms for acid-base balance disorders.	2	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: The role of eating behavior and gastrointestinal tract organs in adaptation to changes in the acid-base balance The role of the kidneys in adaptation to changes in acid-base balance
12	Clinical aspects of compensation of obstructive and restrictive disorders in the lungs	2	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Changes in the respiratory system with aging
13.	Physiological mechanisms of blood pressure disorders in clinical practice and their compensation	3	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Adaptation of the circulatory system to space flight Age-related changes in the circulatory system Adaptive role of nitric oxide in the circulatory system
14.	Physiological foundations of labor activity	2	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Psychophysiological features when choosing medical specialties The role of emotions in the process of mental activity
15.	Physiological foundations of a healthy lifestyle	2	Reading a text (textbook, lecture, additional literature)	Preparation of a message and presentation on the topic: Autogenic training as a method of psychophysiological self-regulation Movement is life Physiology of a healthy lifestyle. Mental health
16.	Credit lesson	2	Reading a text (textbook, lecture, additional literature); preparing a variable test assignment,	

			working with tests	
Labor intensity in hours		32	32	4
Total labor intensity (in hours)			**36**	

Topics for the optional credit assignment

1. Human adaptation to time zone changes
2. Adaptation of the circulatory system to space flight
3. Adaptation of the musculoskeletal system in adaptation to space flight
4. The role of eating behavior and gastrointestinal tract organs in adaptation to changes in the acid-base balance
5. The role of the kidneys in adaptation to changes in acid-base balance
6. Hormonal regulation of human behavior
7. Physiological basis of hardening (effect of low temperatures on the body)
8. Features of thermoregulation in old and senile age
9. Psychophysiological features in choosing medical specialties
10. Autogenic training as a method of psychophysiological self-regulation
11. Movement is life
12. Physiology of a healthy lifestyle. Mental health
13. The role of emotions in the process of mental activity
14. Theories of Aging
15. Age-related changes in the circulatory system
16. Changes in the respiratory system with aging
17. Immunity and blood functions in aging
18. Changes in gastrointestinal function in old age
19. Features of sensory systems in elderly people
20. Age-related changes in the function of the nervous system and mental activity
21. Adaptive role of nitric oxide in the circulatory system
22. Adaptive reactions of the body to high temperatures
23. Fast and slow adaptive responses at altitude
24. Artificial methods of compensating for impaired renal compensation
25. Compensation of impaired physiological functions by methods of traditional oriental medicine
26. The use of blood components to correct the aggregate state of blood
27. Artificial blood and its application in medicine

Variable assignments (abstracts) are considered as an integral part of the learning process. They are necessary for expanding and deepening the educational material worked out in lectures and practical assignments, as well as for developing the skills of independent thinking and creativity. At the same time, by presenting their assignments (abstracts) and defending them in practical classes, students acquire the skills of public presentation of their work, master the ability to conduct scientific discussions.

The topics of the papers can be chosen by students independently in consultation with the teacher or from the proposed list:

2.7. Research (project) work.

Students are given the opportunity to participate in the research work of the Department of Physiology “Experimental studies of physiological mechanisms of behavioral (rapid) adaptation in the conditions of a dynamically changing anthropogenic environment.”

Areas of work:

- mastering experimental methods for studying the behavior of laboratory animals;

- statistical processing of experimental results;
- collection and analysis of modern literature on physiological mechanisms of behavioral adaptation and other current issues of physiology.

The results of the work are reported at:
- meeting of the circle on normal physiology;
- the final student conference of the academy;
- student conference in foreign languages.

3. EDUCATIONAL, METHODOLOGICAL, MATERIAL, TECHNICAL AND INFORMATION SUPPORT OF THE DISCIPLINE :

3.1 Basic literature

1. Brin, V. B. Normal Physiology: textbook / edited by B. I. Tkachenko. - 3rd ed., corrected. and add. - Moscow: GEOTAR-Media, 2016. - 688 p. - ISBN 978-5-9704-3664-6. - Text: electronic (date of access: 03/25/2025). - Access mode: by subscription. https://www.studentlibrary.ru/ru/book/ISBN9785970436646.html
2. Nozdrachev, A. D. Normal Physiology: textbook / A. D. Nozdrachev, P. M. Maslyukov. - Moscow: GEOTAR-Media, 2023. - 1088 p. - ISBN 978-5-9704-7492-1. - Text: electronic // Electronic Library System "Student Consultant": [site]. - URL: https://www.studentlibrary.ru/book/ISBN9785970474921.html (date accessed: 07.11.2024). - Access mode: by subscription.
3. Degtyarev, V. P. Normal Physiology: textbook / Degtyarev V. P., Sorokina N. D. - Moscow: GEOTAR-Media, 2019. - 480 p. - ISBN 978-5-9704-5130-4. - Text: electronic (date accessed: 03/25/2025). - Access mode: by subscription
https://www.studentlibrary.ru/book/ISBN9785970451304.html

3.2 Further reading

1. Filimonov V.I. Handbook of General and Clinical Physiology. Moscow: Medical Information Agency. 2002. 958 p. – free access: access date 03/25/2025 - https://obuchalka.org/20210910136173/rukovodstvo-po-obschei-i-klinicheskoi-fiziologii-filimonov-vi-2002.html
2. Mukhin, N. A. Propaedeutics of internal diseases: textbook / Mukhin N. A., Moiseev V. S. - Moscow: GEOTAR-Media, 2020. - 848 p. - ISBN 978-5-9704-5327-8. - Text: electronic (date of access: 03/25/2025). - Access mode: by subscription. https://www.studentlibrary.ru/book/ISBN9785970453278.html
3. Clinical Physiology / Russian Academy of Sciences, Department of Physiological Sciences, Section of Clinical Physiology; editor-in-chief Academician Yu. V. Natochin, Academician M. D. Aliev. - Moscow: RAS, 2023. - 476 p.: ill, color ill. - free access, access date: 25.03.2025 - https://new.ras.ru/upload/iblock/dfb/gfrtk64kaour6a3n92girkccnzgna9cc.pdf
4. Fundamental and clinical physiology. / Edited by A. Kamkin and A. Kamensky. / M., 2004. 1073 p. - free access, access date: 03/25/2025 - https://reallib.org/reader?file=788543

3.3. Educational and methodological support of the discipline, prepared by the staff of the department

1. Grigoriev N.R. Higher functions of the brain and the basics of behavioral physiology. (Selected lectures). Textbook. - Blagoveshchensk, 2006.
2. Grigoriev N.R. Physiology of respiration. P. 50 – 72. Chapter from the book by S.S. Tseluyko et al. “Respiratory system”. Study guid. Blagoveshchensk, 2011. – 126 p.
3. Course "Clinical Physiology" on the Moodle portal https://educ-amursma.ru/course/view.php?id=884

3.4. Equipment used for the educational process

1. Computer complex Bio pacStudentLab
2. Video two
3. Multimedia projector
4. Personal computers
5. Computer program "Physiology Simulator".
6. Tonometers
7. Stethoscopes
8. Electrocardiographs
9. Pneumotachometers
10. Peak flow meters
11. Spirograph
12. Spirometer
13. Electrothermometer
14. Laboratory glass

Visual aids:

1. Educational stands
   - "Physiology of blood circulation and respiration"
   - "Basic physiological constants"
   - "Domestic physiologists",
   - "Foreign Physiologists"
   - "Pain. Physiology of pain relief",
   - "Educational and methodological work".
2. Educational tables – 240.

3.5 Professional databases, information and reference systems, electronic educational resources

Resource name	Resource Description	Access	Resource address
Electronic library systems			
"Student consultant. Electronic library of the medical university"	For students and teachers of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aIDs and periodicals.	Remote access after registration under the university profile	https://www.studentlibrary.ru/
Reference and information system "MedBaseGeotar".	The reference and information system "MedBaseGeotar" is intended for practicing medical specialists, researchers, teachers, postgraduate students, residnts, senior students, and healthcare managers for the rapidsearch, selection, and reading of medical literature necessary for work in a single data source.	Remote access after registration under the university profile	https://mbasegeotar.ru/pages/index.html
Electronic library system "Bookup"	Large medical library - information and educational platform for the joint use of electronic educational, educational and methodological publications of medical universities of Russia and the CIS countries	Remote access after registration under the university profile	https://www.books-up.ru/
EBS "Lan"	Network electronic library of medical universities - an electronic database of educational and scientific works on medical topics, created for the purpose of implementing network forms of professional	Remote access after registration under the university profile	https://e.lanbook.com/

	educational programs, open access to educational materials for partner universities		
Scientific electronic library "CyberLeninka"	CyberLeninka is a scientific electronic library built on the paradigm of open science (Open Science), the midn tasks of which are the popularization of science and scientific activity, public control of the quality of scientific publications, the development of interdisciplinary research, a modern institute of scientific review, increasing the citation of Russian science and building a knowledge infrastructure. Contidns more than 2.3 million scientific articles.	free access	https://cyberleninka.ru/
Oxford Medicine Online	A collection of Oxford medical publications, bringing together over 350 titles into a single, cross-searchable resource. Publications include The Oxford Handbook of Clinical Medicine and The Oxford Textbook of Medicine, both of which are continually updated electronically.	free access	http://www.oxfordmedicine.com
Human Biology Knowledge Base	Reference information on physiology , cell biology , genetics , biochemistry , immunology , pathology . (Resource of the Institute of Molecular Genetics of the Russian Academy of Sciences .)	free access	http://humbio.ru/
Medical online library	Free reference books, encyclopedias, books, monographs, abstracts, English-language literature, tests.	free access	https://www.medlib.ru/library/library/books
Information systems			
Clinical GuIDelines Rubricator	A resource of the Russian Ministry of Health that contidns clinical recommendations developed and approved by medical professional non-profit organizations of the Russian Federation, as well as methodological guidelines, nomenclatures and other reference materials.	link to download the application	https://cr.minzdrav.gov.ru/#!/
Federal Electronic Medical Library (FEMB)	The Federal Electronic Medical Library is part of the unified state information system in the field of healthcare as a reference system **.** FEMB was created on the basis of the funds of the Central Scientific Medical Library named after I.M. Sechenov.	free access	https://femb.ru/
Russian Medical Association	Professional Internet resource. Objective: to promote effective professional activity of medical personnel. Contidns the charter, personnel, structure, rules of entry, information about the Russian Medical Union.	free access	http://www.rmass.ru/
Web-medicine	The site presents a catalog of professional medical resources, including links to the most authoritative subject sites, journals, societies, as well as useful documents and programs. The site is intended for doctors, students, employees of medical universities and scientific institutions.	free access	http: //webmed.irkutsk.ru/
Databases			

World Health Organization	The site contidns news, statistics on countries that are members of the World Health Organization, fact sheets, reports, WHO publications and much more.	free access	http://www.who.int/ru/
Ministry of Science and Higher Education of the Russian Federation	The website of the Ministry of Science and Higher Education of the Russian Federation contidns news, newsletters, reports, publications and much more	free access	http://www.minobrnauki.gov.ru
Ministry of Education of the Russian Federation	The website of the Ministry of Education of the Russian Federation contidns news, newsletters, reports, publications and much more	free access	https://edu.gov.ru/
Federal portal "Russian education"	A single window for access to educational resources. This portal provides access to textbooks on all areas of medicine and health care.	free access	http: //www .edu.ru/
Polpred.com	Electronic library system Business media. Media Review	free access	https://polpred.com/news
Bibliographic databases			
Database "Russian Medicine"	It is created in the Central Scientific and Methodological Library and covers the entire collection, starting from 1988. The database contidns bibliographic descriptions of articles from domestic journals and collections, dissertations and their abstracts, as well as domestic and foreign books, collections of institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related areas of biology, biophysics, biochemistry, psychology, etc.	free access	https://rucml.ru/
PubMed	A text database of medical and biological publications in English. The PubMed database is an electronic search engine with free access to 30 million publications from 4,800 indexed journals on medical topics. The database contidns articles published from 1960 to the present day, including information from MEDLINE, PreMEDLINE, NLM. Each year, the portal is replenished with more than 500 thousand new works.	free access	https :// pubmed . ncbi . nlm . nih . gov /
eLIBRARY.RU	Russian information portal in the field of science, technology, medicine and education, contidning abstracts and full texts of more than 13 million scientific articles and publications. The eLIBRARY.RU platform provides electronic versions of more than 2,000 Russian scientific and technical journals, including more than 1,000 open access journals.	Full functionality of the site is avidlable after registration	http://elibrary.ru/defaultx.asp
Electronic library of dissertations	Currently, the Electronic Library of Dissertations of the Russian State Library contidns more than 919,000 full texts of	free access	http://diss.rsl.ru/?menu=disscatalog/

(RSL)	dissertations and abstracts.		
Medline.ru	Medical and biological portal for specialists. Biomedical journal.	free access	https://journal.scbmt.ru/jour/index
Official Internet portal of legal information	The single official state information and legal resource in Russia	free access	http://pravo.gov.ru/

Multimedia materials, electronic library

15. Computer program "Physiology Simulator".
2. Multimedia materials on electronic media:
    1. “Physiology of the central nervous system”
    2. "Physiology of the autonomic nervous system"
    3. "Physiology of excretion"
    4. "Physiology of thermoregulation"
    5. "Body Chemistry"
    6. "The human body".

3.6. Licensed and freely distributed software used in the educational process

List of software (commercial software products)

No. p/p	List of software (commercial software products)	Detidls of supporting documents
1.	MS Operating System Windows 7 Pro	License number 48381779
2.	MS Operating System Windows 10 Pro	CONTRACT No. UT-368 from 09.21.2021
3 .	MS Office	License number: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Security for Business – Standard Russian Edition. 50-99 Node 1 year Educational Renewal License	Agreement No. 7 AA dated 02/07/2025
5.	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022 (additional licenses)
6.	1C: PROF University	LICENSE AGREEMENT No. KrTsB-004537 dated 12/19/2023
7.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated 11.11.2020
8.	Consultant Plus	Contract No. 41AA dated 12/27/2024
9.	Contour.Tolk	Agreement No. K213753/24 dated 13.08.2024
10.	E-learning environment 3KL (Russian Moodle)	Agreement No. 1362.5 dated November 20, 2024
11.	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021
12.	Information system "Plans"	Agreement No. 2873-24 dated June 28, 2024
13.	1C: Document Management	Agreement No. 2191 dated 10/15/2020
14.	R7-Office	Agreement No. 2 KS dated 12/18/2020
15.	License "OS ROSA CHROME workstation"	Agreement No. 88A dated 08/22/2024
16.	Alt Virtualization Server 10 (for secondary specialized and higher professional education)	Agreement No. 14AK dated 09/27/2024
17.	Dr.Web Desktop Security Suite Comprehensive protection + Control Center for 12 months.	Agreement No. 8 dated October 21, 2024
18.	Software "Schedule for educational institutions"	Agreement No. 82A dated July 30, 2024

List of freely distributed software

No.	List of freely distributed software	Links to license agreement

p/p		
1.	Yandex Browser	Freely distributed License agreement for the use of Yandex Browser programs https://yandex.ru/legal/browser_agreement/
2.	Yandex.Telemost	Freely distributed License Agreement for the Use of Programs https://yandex.ru/legal/telemost_mobile_agreement/
3.	Dr.Web CureIt!	Freely distributed License Agreement: https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf
4.	OpenOffice	Freely distributed License: http://www.gnu.org/copyleft/lesser.html
5.	LibreOffice	Freely distributed License: https://ru.libreoffice.org/about-us/license/
6.	VK Calls	Freely distributed https://vk.com/license
7.	Kaspersky Free Antivirus	Freely distributed https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt

3.7. Resources of the information and telecommunications network "Internet".

1. website of the intensive care department of the N.N.Burdenko Research Institute www . nsicu . ru
2. the department page on the academy website
https://www.amursma.ru/obuchenie/kafedry/teoreticheskie/fiziologii-i-patofiziologii/o-kafedre/
3. the department page on the closed part of the site https://www.amursma.ru/zakrytaya-chast-sayta/3-kurs/
4. Clinical Physiology page on the Moodle portal
https://educ-amursma.ru/course/view.php?ID=137
5. Zilber A.P. Clinical physiology in anesthesiology and resuscitation. Moscow: Medicine, 1984. -480 p. http://www.webmedinfo.ru/klinicheskaya-fiziologiya-v-anesteziologii-i-reanimatologii-zilber-ap.html
6. Russian physiological journals https://rusjphysiol.org/
7. Clinical Physiology https://new.ras.ru/work/publishing/monographs/klinicheskaya-fiziologiya/

4. ASSESSMENT TOOLS FUND

4.1. Test tasks for entrance, current, final control

Incoming inspection

Conducted in the Moodle system
https://educ-amursma.ru/mod/quiz/view.php?ID=3163
number of questions - 51

Current control

Conducted in the Moodle system
Biophysical foundations of electrophysiological clinical research methods number of questions - 36
Physiological aspects of methods for studying biopotentials of the heart, bridn, muscles
number of questions - 36
Adaptive and compensatory reactions of the human body when exposed to low temperatures
https://educ-amursma.ru/mod/quiz/view.php?ID=18771
number of questions - 31

Clinical aspects of disorders of regulation of physiological functions.
https://educ-amursma.ru/mod/quiz/view.php?ID=18947
number of questions - 70
Physiological mechanisms of pidn and analgesia
https://educ-amursma.ru/mod/quiz/view.php?ID=18385
number of questions - 37
Clinical physiology of the endocrine system
https://educ-amursma.ru/mod/quiz/view.php?ID=18819
number of questions - 151
Functional system for regulating the aggregate state of blood and compensation for disturbances in its activity.
https://educ-amursma.ru/mod/quiz/view.php?ID=18821
number of questions - 33
Compensatory mechanisms for water and electrolyte imbalance.
https://educ-amursma.ru/mod/quiz/view.php?ID=18940
number of questions - 69
Compensatory mechanisms of acID-base balance disorders
https://educ-amursma.ru/mod/quiz/view.php?ID=18823
number of questions - 77
Clinical aspects of compensation of obstructive and restrictive disorders in the lungs
https://educ-amursma.ru/mod/quiz/view.php?ID=18822
number of questions - 67
Physiological mechanisms of blood pressure disorders in clinical practice and their compensation
https://educ-amursma.ru/mod/quiz/view.php?ID=18778
number of questions - 54
Physiological foundations of labor activity.
https://educ-amursma.ru/mod/quiz/view.php?ID=18615
number of questions - 50
Physiological foundations of a healthy lifestyle
https://educ-amursma.ru/mod/quiz/view.php?ID=19929
number of questions - 30

Interim control

Conducted in the Moodle system
https://educ-amursma.ru/mod/quiz/view.php?ID=1093
number of questions - 144

4.2. Examples of situational tasks of current control.

Task 1. Provide a physiological justification for the expression “a person swells from hunger.”

Solution: During fasting, the protein content in the blood decreases, which leads to a decrease in oncotic and general osmotic pressure, an increase in the transfer of water into tissues and the development of edema.

Problem 2. A patient with diabetes mellitus has an increased concentration of H^+ as a result of accumulation of acetoacetic and β-hydroxybutyric acids. When determining the acid-base balance indicators in his blood, a decrease in the pH value, actual bicarbonate, and an increase in the deficit of buffer bases were noted. What will happen to Pco2 and the concentration of carbonic acid in the arterial blood of this patient - will it increase, decrease, or not change? Justify your answer.

Solution. Pco2 and the concentration of H_2CO_3 in ventricular blood will decrease as a result of hyperventilation caused by the excitation of the respiratory center from the chemoreceptors during the accumulation of H^+ in the blood (compensation of metabolic acidosis by gas alkalosis).

Full set of tasks – see FOS of the current certification

4.3. List of practical skills that a student should have after mastering the discipline

- preparation of a report and presentation on a chosen topic;
- use of educational, scientific, popular science, reference literature, the network Internet;
- prediction and interpretation of the results of physiological studies;
- solving typical practical problems;
- calculation of indicators based on the results of the experiment;
- solving situational problems based on theoretical knowledge;
- possession of skills in organizing measures for labor protection and safety when working with equipment.

4.4. List of questions for the test

The test is conducted in the form of computer testing, including questions on all topics covered. Each option consists of a set of tests that the computer selects by random sampling.

1. ADAPTATION DEVELOPS WHEN:
   1) The action of too strong an irritant
   2) Damage to an organ by a pathological process
   3) A longer or more frequent occurrence of the usual irritant
   4) Decreased functional activity
2. COMPENSATION OCCURS WHEN:
   1) The effect of too strong an irritant
   2) Damage to an organ by a pathological process
   3) A longer or more frequent normal stimulus
   4) Increased functional activity
3. PHYSIOLOGICAL ADAPTATION IS CHARACTERIZED BY:
   1) Violation of interaction between indivIDual systems
   2) Using functional reserves
   3) Structural changes in organs and systems
   4) Inability to respond adequately to the action of several factors
4. LOSS OF ADAPTATION OCCURS DUE TO:
   1) With the cessation of the action of the factor causing adaptation
   2) With the inability to adequately respond to the action of several factors
   3) With the depletion of reserves during the development of a high level of adaptation
   4) With too frequent changes in adaptation processes
5. THE FINAL STAGE OF THE COMPENSATORY PROCESS IS:
   1)Stable compensation
   2) Formation of non-specific general adaptive reactions
   3) Decompensation
   4) Depletion of reserves of compensation possibilities

Total number of test questions – 200