FACULTY MEDICINE 2

STUDY PROGRAM 0912.1 MEDICINE

CHAIR OF HUMAN PHYSIOLOGY AND BIOPHYSICS

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum in Medicine
Minutes No. 5 of 04.04.24
Chairman Ph. D., asoc. prof.
Padure Andrei _____

APPROVED
at the Council meeting of the Faculty Medicine 2
Minutes No. 8 of 23.04.24
Dean of Faculty Ph. D., asoc. prof.
Betiu Mircea _____

APPROVED
approved at the meeting of the chair
Human Physiology and Biophysics
Minutes No. 18 of 05.03.2024
Head of chair Ph. D., prof.
Lozovanu Svetlana _____

SYLLABUS

DISCIPLINE **HUMAN PHYSIOLOGY**

Integrated studies

Type of course: **Compulsory**

Curriculum developed by the collective of authors:

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I. INTRODUCTION

General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional / specialty training program

Physiology is the discipline that studies the functions of living organisms, various organs and tissues and is based on the fundamental principle of the functioning of the body as a whole. The physiology course offers notions on the fundamental properties of living matter, in correlation with its structural organization; the roles of macro- and microelements in the human body. The course ensures the acquisition of knowledge about the functions of the cardiovascular, respiratory, digestive, renal systems, as well as the regulation mechanisms involved in adapting the functioning of these systems to the various internal and external demands. Also, the study of the functions of the nervous and endocrine systems allows us to understand the way in which the integration of all physiological systems in the functioning of the organism as a whole is achieved. The acquisition of physiology is necessary for the integration of functions from the molecular-cellular level to the tissue-organ level, for the understanding of the functioning of different organs, systems and the interactions between them. During the physiology course, notions will be accumulated regarding the different categories of receptors, neurotransmitters, cytokines for the modern substantiation of the multiple physiological mechanisms. The acquired notions will be a basis for any preventive, diagnostic, curative or recovering medical act.

Mission of the curriculum (aim) in professional training

Human physiology aims to provide the student with fundamental data about the functional properties of cells, tissues, organs and systems, about the neurohumoral mechanisms of their regulation and control. The study duration of this discipline at the faculty is three semesters and covers the multitude of scientific notions that need to be learned, and for a better understanding of them it is necessary to correlate with medical practice and master the methods of assessing organ function. This knowledge will be used to understand the principles of functional disorders and their correction mechanisms.

Languages of the discipline: Romanian, Russian, English, French;

Beneficiaries: students of the 1st and 2nd year, faculty Medicine 2

II. MANAGEMENT OF THE DISCIPLINE

Code of discipline		**F.02.O.14/F.03.O.023/F.04.O.033**	
Name of the discipline		**Human Physiology**	
Person(s) in charge of the discipline		**Victor Vovc, Svetlana Lozovanu**	
Year	**I, II**	Semester/Semesters	**II, III, IV**
Total number of hours, including:			**360**
Lectures	**90**	Practical/laboratory hours	**65**
Seminars	**55**	Self-training	**150**

Form of assessment	E	Number of credits	12

III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study the student will be able to:

- ***at the level of knowledge and understanding:***

to accumulate information on the normal functioning of the body, following that on this "substrate"
to add basic knowledge in pathophysiology, morphopathology and clinical disciplines;
to know the physiological constants, their age variations in correlation with the new evolutions in the biomedical sciences;
develop skills in recording, measuring and interpreting data for verbal presentation and in writing of one's own findings and appreciation of biological and individual variations;
to understand the importance of mechanisms for regulating physiological functions in the coordination of separate organs and systems for the normal activity of the whole organism.

- ***at the application level:***

to record and analyze the parameters of different functional-instrumental tests (electromyogram, heart auscultation, blood pressure measurement, electrocardiogram, electoencephalogram, spirometry, etc.);
to determine the basal metabolism by calorimetric methods;
possess the method of collecting blood and interpret the results of laboratory tests;
to learn methods of studying and appreciating the activity of different organs and systems through virtual and computerized techniques of the BIOPAC system;
to master the training method based on the analysis of the problem (clinical case).

- ***at the integration level:***

to appreciate the importance of physiology in the context of general medicine and integration with related medical-biological disciplines;
to appreciate the importance of studying the functions of regulation and control of the activity of the organs, of the organ systems as well as of the interactions between them;
use the knowledge gained to understand the principles of functional disorders and their correction mechanisms;
to be aware of the need to continuously assimilate new knowledge in the field.

IV. PROVISIONAL TERMS AND CONDITIONS

Human physiology is a medical-biological discipline, the study of which at the university stage will provide students with a complex of fundamental information about the regulation and mechanisms of normal functioning of the body. The course is structured so that the functions are studied in stages, characterized by increasing the complexity of the information and begins with addressing various aspects of general physiology, including the structure and functions of cell membranes, specialized properties of different types of cells and tissues. Adjustment of functions and systems. This knowledge is the starting point for the next stage, which includes the study of functions at the level of systems (cardiovascular, respiratory, etc.), followed by another degree of integration of the body, namely, complex neuro-humoral responses to changing environmental conditions (changes in atmospheric pressure, overload, etc.).
Integral learning of the discipline human physiology requires horizontal and vertical integration with other fundamental medical-biological disciplines.

V. THEMES AND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

1st year, 2nd semester

No. d/o	THEME	Number of hours		
		Lectures	Practical hours	Self-training
1.	Physiology as a medical-biological discipline. Functional organization of the human body and control of the "internal environment". The cell and its functions.	2	2	4
2.	Transport of substances across the cell membrane. Membrane potentials and action potentials.	2	2	4
3.	Physiology of neuron and nerve fibers. Fundamental functions of synapses, neurotransmitters and receptors. Neuroglia.	3	2	6
4.	Neural circuits for information processing. Principles of nervous system functioning based on reflexes.	3	2	6
5.	Neuromuscular transmission and excitation-contraction coupling. Skeletal muscle contraction.	2	2	6
6.	Motor unit. Summation of contraction. Skeletal muscle metabolism. Excitation and contraction of the smooth muscle.	2	2	5
7.	*Concluding test "Excitable tissues"*	0	2	0
8.	Body fluid compartments. Edema. Regulation of extracellular osmolarity and extracellular sodium concentration.	2	2	5
9.	Urine formation: I. Glomerular filtration, renal blood flow and their control.	3	2	5
10.	Urine formation: II. Tubular processing of glomerular filtrate Renal regulation of ion levels. Integrated actions for volume and volume control of extracellular fluid. Diuretics.	3	2	6
11.	Regulation of the acid-base balance. Erythrocytes, anemia and polycythemia.	3	2	6
12.	Blood groups; transfusion; tissue and organ transplantation Hemostasis and blood clotting.	2	2	6
13.	Resistance of the body to infections. Immunity and allergy.	3	2	6
14.	*Concluding test "Fluids. Blood"*	0	2	0
15.	*Assessment of individual activity..*	0	2	0
	2nd year, 3rd semester			
16.	Endocrine glands. The mechanism of action of hormones.	2	3	4
17.	Pituitary hormones and their control by the hypothalamus.	3	3	6
18.	Thyroid metabolic hormones. Parathyroid hormone, calcitonin, calcium-phosphates metabolism, vitamin D.	3	3	6
19.	Adrenal cortical hormones. Insulin, glucagon and diabetes mellitus.	2	3	4
20.	Reproductive and hormonal functions in men. Female hormones and the physiology of the female body before pregnancy. Pregnancy and lactation.	2	3	6

No. d/o	THEME	Number of hours		
		Lectures	Practical hours	Self-training
21.	Autonomic nervous system and adrenal medulla.	2	3	6
22.	*Concluding test "Endocrine system. Autonomic nervous system"*	0	3	0
23.	Heart muscle; heart pump function and heart valve function. Rhythmic excitation of the heart.	3	3	7
24.	Hemodynamics: pressure, flow and endurance. Vascular distensibility and functions of the arterial and venous systems.	3	3	7
25.	Microcirculation and lymphatic system. Local and humoral control of blood flow to tissues.	3	3	7
26.	Nervous regulation of circulation and rapid control of blood pressure. The dominant role of the kidneys in the long-term regulation of blood pressure and hypertension: the integrated system of blood pressure control.	3	3	7
27.	Cardiac output, venous return and their regulation. Muscle blood flow and cardiac output during physical exertion; coronary circulation. Heart valves and heart sounds.	2	3	7
28.	Normal electrocardiogram. Principles of vector analysis of the electrocardiogram. Electrocardiographic interpretation of heart disease.	2	3	8
29.	*Concluding test "Cardiovascular system"*	0	3	0
30.	*Assessment of individual activity.*	0	3	0
	2nd year, 4th semester			
31.	Pulmonary ventilation. Pulmonary circulation, pleural fluid.	2	3	6
32.	Gas exchange through the respiratory membrane. Transport of oxygen and carbon dioxide by the blood and interstitial fluid.	3	3	6
33.	Regulation of respiration. Breathing in physical exertion and hypo / hyperbaric condition. Sleep disturbances.	2	3	6
34.	Basic principles of gastrointestinal tract function. Motor and secretory functions.	2	3	6
35.	Absorption in the gastrointestinal tract. Liver as an organ. Nutritional balances; regulation of food intake; obesity and starvation.	3	3	6
36.	Energy metabolism. Body temperature, thermoregulation and fever.	2	3	6
37.	*Concluding test "Respiration, digestion, metabolism, thermoregulation"*	0	3	0
38.	Somatosensory system: General organization, tactile and positional sensitivity. Pain, and headache, thermal sensitivity.	3	3	7
39.	Motor functions of the spinal cord; spinal reflexes. Control of motor function by the cortex and brainstem.	3	3	7
40.	The contribution of the cerebellum and basal ganglia to the general control of motor function. Cerebral blood flow, cerebrospinal fluid and cerebral metabolism.	3	3	7
41.	Cerebral cortex, intellectual brain functions, learning and memory. Forms of brain activity - sleep, brain waves.	3	3	7
42.	The vision. Optics of the eye. Receiver function and	2	3	5

No. d/o	THEME	Number of hours		
		Lectures	Practical hours	Self-training
	retinal neuronal function.			
43.	The hearing. Chemical senses - taste and olfaction.	2	3	6
44.	*Concluding test "CNS. Sensory systems"*	0	3	0
45.	*Assessment of individual activity.*	0	3	0
Total		**90**	**120**	**150**

VI. PRACTICAL TOOLS PURCHASED AT THE END OF THE COURSE

Mandatory essential practical tools are:

- Working with the Biopac MP36 data acquisition system, which allows the recording of over 20 physiological parameters of the human body and their subsequent analysis. This data will allow students to form teams, share tasks, record results and follow a given protocol;
- acquiring the interactive simulation program of the PH.I.L.S. 4.0 (physiology interactive lab simulations);
- acquiring the Physioex 9.0 physiology laboratory simulation program (laboratory simulations in physiology);
- mastering the virtual physiology software that allows viewing movies with the presentation of physiological experiences or clinical methods of investigation;
- presentation of the clinical case - as a training method based on the analysis of the clinical situation of a virtual patient, role play "patient-student-teacher", which will allow the connection between theoretical and practical knowledge, which serve as a platform for clinical training.

(A compulsory compartment for specialized disciplines, for fundamental disciplines - as the case may be)

Note: The essential practical tools characteristic of the discipline, obligatory to be acquired by each student during the module, will be listed. These will serve as a basis for the stage of evaluating practical skills and will constitute their portfolio per study program.

VII. OBJECTIVES AND CONTENT UNITS

Objective	Content units
Theme (chapter) 1.	
• To define the notion of excitable tissue, transmembrane transport, electrochemical gradient, potential for rest and action, refraction; • To know the structure and functional aspects of biological membranes,	1 The structure and function of biological membranes. 2 Types of transmembrane transport. 3. Electrogenesis of the excitation process. 4. Physiological properties of excitable tissues. 5. Synapses in the CNS. Synaptic transmission. 6. Excitation in the central nervous system. Exciting neurotransmitters. 7. Inhibition in the central nervous system. Inhibitory neurotransmitters. Types of inhibition.

Objective	Content units
neurons, nerve fibers, striated and smooth muscle fibers, as well as the classes of receptors and neurotransmitters; • To demonstrate the mechanism of generation and propagation of the action potential through nerve fibers, muscle contraction and relaxation, synaptic transmission; • To apply the laws of excitability in the functioning of excitable tissues; • To integrate the knowledge on the structural aspects and the functioning of the excitable tissues in the integral functioning of the organism.	8. Information processing in neural circuits. 9. Structure and function of neuro-muscular synapses.
Theme (chapter) 2. Fluids. Blood	
• To define the notion of osmolarity, volume, diuresis, hematopoiesis; • To know the structure of the nephron, the mechanism of urine formation: filtration, reabsorption and tubular secretion, figurative elements of the blood, blood groups, coagulant-anticoagulant system; • To demonstrate the role of the countercurrent multiplier phenomenon in the formation of final urine, the coagulant-anticoagulant system in maintaining the homeostasis of the whole organism and the role of volume and pressure diuresis in regulating blood pressure; • To apply the knowledge obtained in determining the total, intra- and extracellular water volume of volume,	1. Formation of primary urine - glomerular filtration. 2. Tubular reabsorption and secretion - formation of final urine. 3. Urinary flow, regulation of diuresis. 4. Blood plasma, composition, constants. 5. Volume, regulation of normovolemia. 6. Erythrocytes, hemoglobin. 7. Leukocytes, immunity. 8. Blood groups, Rh factor. 9. The vasothrombocytar and clotting mechanism of hemostasis. 10. Anticoagulant system. 11. Intra- and extracellular fluid, composition. 12. Regulation of water intake and loss from the body. 13. Metabolism of microelements, its regulation.

Objective	Content units
urinary clearance, blood groups, Rh in explaining the rules of blood transfusion; • To integrate the knowledge gained to interpret the results of laboratory tests of blood and urine samples.	
Theme (chapter) 3. Endocrine system. Autonomic nervous system.	
• To define the notion of hormone, hormone receptor, chemical messenger, endocrine gland, negative feedback, positive feedback; • To know the chemical structure and synthesis of hormones, coordination of body functions through chemical messengers, the mechanism of secretion; • Explain the transport and elimination of hormones from the circulation; • To know the mechanism of hormone transport in the blood as well as the control of hormone secretion through the Feedback mechanism; • To know the mechanism of action of hormones, the activation of hormone receptors and intracellular signaling after the activation of the hormone receptor; • To know the mechanisms of intracellular mediation of hormonal functions through second messengers and the elimination of hormones from the circulation; • To know the mechanism of action of hormones, hormonal and reproductive functions in men, as well as female hormones; • To demonstrate the role of mediator and receiver	1. Endocrine glands. The mechanism of action of hormones. 2. Second messenger system. 3. Pituitary hormones and control of the hypothalamus. The hypothalamic-pituitary system. Pituitary hormones and control of the hypothalamus. 4. Thyroid metabolic hormones. 5. Parathyroid hormone, calcitonin, vitamin D. 6. Phospho-calcium metabolism in bone tissue. 7. Endocrine pancreas. Insulin, glucagon and diabetes. 8. Adrenal cortical hormones. 9. Hormonal and reproductive functions in men. Female hormones. 10. Vegetative nervous system, sympathetic and parasympathetic neurons. 11. The medullary substance of the adrenal glands. 12. Neurotransmitters of the sympathetic and parasympathetic system. Adreno- and choline receptors of the sympathetic and parasympathetic system 13. Neurotransmitters of the sympathetic and parasympathetic system. Adreno- and choline receptors of the sympathetic and parasympathetic system.

Objective	Content units
systems in regulating the activity of different organs and systems; • To apply knowledge in dosing hormonal concentrations in the blood.	
Theme (chapter) 4. Cardiovascular system.	
• To define the notion of heart pump, microcirculation, blood pressure, vascular resistance, colloid osmotic pressure; • To know the pulmonary and systemic circulation, the structure of the cardiomyocyte, the laws of hemodynamics, the cardiac nerves, the structure and function of the cardiovascular center, the clinical aspect of the constants of the hemodynamic system; • To demonstrate the role of SNV and hormones in the mechanisms of extrinsic regulation of cardiac activity and the mechanisms for maintaining blood pressure; • To apply the knowledge gained in measuring blood pressure, listening to the heart, recording and analyzing the electrocardiogram; • To integrate the knowledge obtained in order to explain and formulate conclusions regarding cardiovascular pathologies.	1. The heart muscle: the pump function of the heart and the function of the heart valves. 2. Cardiac cycle dynamics. 3. Rhythmic excitation of the heart. 4. Conducting system of the heart. 5. Physiological properties of the heart muscle. 6. Regulation of cardiac activity. Nervous and humoral influence on cardiac activity. 7. Hemodynamics: pressure, flow and endurance. Vascular distensibility and functions of the arterial and venous systems. 8. Blood pressure, Nervous regulation of circulation and rapid control of blood pressure. Integrated voltage control system. 9. Microcirculation and lymphatic system. Local and humoral control of blood flow to tissues. 10. Capillary fluid exchange. Control of local blood flow through tissues. 11. Mechanisms of regulation of blood circulation. 12. Normal electrocardiogram. Principles of vector analysis of the electrocardiogram. Electrocardiographic interpretation of heart disease. 13. Heart valves and heart sounds.
Theme (chapter) 5. Respiration, digestion, metabolism, thermoregulation	
• To define the notions of intestinal peristalsis, exocrine secretion, enteric nervous system, appetite, compliance, surface tension, surfactant, partial gas pressure, closed,	1. Digestion in the oral cavity and stomach. 2. Digestion in the intestines. Parietal digestion. 3. Mechanisms of absorption of nutrients. 4. The physiological basis of feelings of hunger and satiety. 5. Pleural, alveolar and transpulmonary pressures during respiration. Pleural fluid, pleural pressure.

Objective	Content units
open and valvular pneumothorax, blood oxygen capacity, lung volume and capacity, forced expiratory volume; • To know the juices of the gastrointestinal tract, the types of neurotransmitters secreted by enteric neurons, types of glands, gastrointestinal reflexes, the structure of the respiratory membrane, the factors that affect the diffusion of gases, the mechanisms that affect the resistance of the airways; • To learn the methods of examining the respiratory function in the clinic, the factors that determine the saturation of oxyhemoglobin and the clinical significance; • To demonstrate principles of secretion and motility regulation at the TGI level, • To apply the knowledge gained in determining the presence of TGI secretions; • To integrate the knowledge obtained in order to develop their own opinions regarding the medical significance of the studied phenomena; • To know the mechanism of chewing, swallowing, types of contractions, digestion products, absorption mechanisms; • To demonstrate principles for regulating gastrointestinal absorption; • To apply the knowledge to highlight physiological aspects in TGI diseases; • To apply the knowledge received for the evaluation of	6. Compliance of the chest and lungs. 7. Spirometry and helium dilution method. 8. Nervous and humoral control of bronchial tone. 9. Blood flow in the pulmonary circulation. 10. Control of pulmonary circulation. 11. Exchange of gases in the lungs and tissues. 12. Blood transport of oxygen. 13. Transport of carbon dioxide. 14. Respiratory center in the brainstem. 15. Spinal centers, cortex of the hypothalamus and limbic system in the regulation of respiration. 16. Nervous and chemical control of respiration. 17. Respiratory control in hypoxemia, hypercapnia, hypocapnia and changes in blood pH. 18. Respiratory tract and lung receptors (stretching, irritants and J-receptors). Hering-Breuer reflexes. 19. Sleep apnea.

Objective	Content units
basal metabolism data in norm and pathology.	
Theme (chapter) 6. CNS. Sensory systems.	
• To understand the hierarchical organization and the general principles of operation of the SN; the mechanism of propagation of the action potential through neurons, neuroglia, nerve fibers and synapses; • To define the muscular sensory receptors (muscle spindles and Golgi tendon organs), muscle tension reflex, Golgi tendon reflex; • To apply the knowledge about the muscular tension reflex in understanding the clinical application of the osteotendinous reflexes appreciated with the help of the neurological hammer; the knowledge obtained for the understanding of nystagmography and the reflex caloric test, their clinical utility; • To know the clinical manifestations that appear after the damage of the cerebellum; • To understand the mechanisms of vestibular sensations and maintaining balance; the role and importance of specific neurotransmitters in the basal ganglia in the occurrence of pathologies; • To know the functions of specific cortical areas and their role for the cognitive functions of the brain (memory, learning, language, thinking); • To understand the neuro-humoral foundation of the	1. Motor organization of the spinal cord. 2. Reciprocal inhibition and reciprocal innervation. Posture and locomotion reflexes. The grate reflex. Medullary reflexes that produce muscle spasms. Autonomous medullary reflexes. 3. Muscular sensory receptors (muscle spindles and Golgi tendon organs) and their roles in muscle control. 4. The role of the cerebellum in overall motor control. 5. Clinical manifestations of cerebellar damage 6. The role of the basal ganglia in: the execution of the motor activity patterns - the putamen circuit; in the cognitive control of the sequence of motor patterns - the caudate circuit; in the emotional control of motor patterns; in synchronizing and adapting the speed and amplitude of movements, respectively. 7. Primary motor cortex. Premotor area. Additional motor area. 8. Vestibular sensations and maintaining balance. Vestibular apparatus. 17. Physiological anatomy of the cerebral cortex, architecture of the cerebral cortex. 18. Anatomical and functional relationships between the cerebral cortex and subcortical structures. 19. Mechanisms of short- and long-term memory. 20. Brain waves, their significance and recording by electroencephalography. 21. The neurophysiological basis of circadian rhythm, wakefulness. 22. The neurophysiological mechanisms of sleep. 23. Somatosensory, taste and olfactory sensory systems. 24. Visual, auditory and vestibular sensory systems.

Objective	Content units
functions of punishment, reward and their importance for learning and memorization; • To know the functional anatomy and the neurophysiological mechanisms underlying the generation of circadian rhythm, wakefulness and sleep.	

VIII. VII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY FINALITIES

✓ **Professional (specific) (SC) competences**

✓ • SC1. - Responsible execution of professional tasks with the application of the values and norms of professional ethics, as well as the provisions of the legislation in force.

✓ • SC2 - Adequate knowledge of the sciences about the structure of the body, physiological functions and behavior of the human body in various physiological and pathological states, as well as external relations between health, physical and social environment.

✓ • SC7 - Promoting and ensuring the prestige of the medical profession and raising the professional level.

✓ **Transversal competences (TC)**

• TC1. Autonomy and responsibility in the activity.

✓ **Study finalities**

Educating students in the spirit of the rigor of the medical act and of understanding the determining role of the fundamental sciences for the given level, as well as for their professional training;

The acquisition by students of practical skills regarding the correct execution of some functional explorations, based on the understanding not only of the procedures, but also of the explored phenomena, as well as of the principles of the respective techniques;

Explaining some theoretical notions by demonstratively presenting some classic experiments in practical and laboratory work;

Theoretical training of students to be able to assimilate knowledge, through systematized information on the phenomena of functional integration, from cell to organ, organ systems and the whole body.

All this will allow students to gain knowledge about the normal functions of the human body, so they will be able to understand in an integrative way the physiological processes, from cell to body, thus gaining a solid foundation for clinical medical sciences.

IX. STUDENT'S SELF-TRAINING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Filling the practical workbook	Perform the tasks outlined in the notebook using the Ph.I.L.S. 4.0 (Physiology Interactive Lab Simulations); Physio Laboratory Simulation Program PhysioEx 9.0 (Laboratory Simulations in Physiology); and Virtual physiology software that allows viewing of movies with the presentation of physiological experiences or clinical methods of investigation; Complete the worksheet in the laboratory. Make conclusions at the end of each paper.	Ability to formulate conclusions, correctness of completing the worksheet in the laboratory.	During semester
2.	Presentations, posters and case reports	Studying the literature to research, analyzing the clinical case, establishing the work plan and deadline. Presentation, explanation and formulation of conclusions regarding the given clinical case, in the form of Power Point presentations, poster or report.	The level of knowledge and understanding of the project theme, the way of scientific argumentation and data presentation, the quality of conclusions, elements of creativity, the formation of personal attitude, coherence of presentation and scientific correctness, graphic presentation.	Till the end of semester
3.	Learning techniques and strategies	Try to understand the key notions, argue each piece of information with examples, form an inner dialogue with yourself, use different methods of engaging in active reading and resources, which challenge critical thinking to solve situational problems.	The degree of penetration in the essence of different topics, the level of exposition and argumentation of the information, the quality of the conclusions, elements of creativity, the way of solving the situation problem, the capacity to systematize the information	During semester

X. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

XI. Teaching and learning methods used

Discipline Human physiology is a compulsory subject and is taught in accordance with the classical university standard: lectures, seminars and practical works.

The theoretical course in lectures is given by the course holders.

At the practical works, initially, the basic theoretical notions are discussed, using virtual techniques

applied to the respective topic, followed by laboratory works: animal experiments, virtual and using the computerized system "BIOPAC". The paper ends with the completion of the minutes.

The training method based on the analysis of the problem (clinical case) is applied to the totalization lessons on certain chapters.

XII. Applied (specific to the discipline) teaching strategies / technologies

Try to understand the key notions, explained by the teacher, but do not focus on the assessment methods, learn not to take the totals and be admitted to the session, but to gain knowledge, which you will then use in other disciplines.

The course is designed to meet the needs of students for training and professional development, so ask the teacher, that each information is argued through examples, applications, theoretical and practical problems, this will ensure an active way of learning.

Develop metacognition - inner dialogue with yourself, it will help you build learning skills that will allow you to control your training.

Use various nonverbal resources such as schemes, documents, experiences, devices, they support the formation of professional skills, create work tasks, the solution of which will have real consequences.

Use different methods of engaging in active reading and resources, which challenge critical thinking to solve situational problems, they increase the student's ability to systematize.

"Try to be a teacher", explains to the colleague / colleagues the key moments from the studied topic, gives their own examples, explains the difficult moments, and listens to their opinions. The ability to explain material to colleagues will develop your ability to think and express yourself.

XIII. • Methods of assessment (including the method of final mark calculation)

Current: at the Department of Human Physiology and Biophysics for students of the first year semester 2 and year II semesters 3-4 includes 2 concluding tests in each semester in the form of computer multiple-choice tests, which consist of variants of 20 questions each (simple compliment and multiple compliment). The student has 20 minutes to answer the test. The evaluation is performed according to the criteria of the concordance system (MOODLE variant). The test is graded from 0 to 10. At the end of the semester the individual activity is assessed according to the tasks form the Exercise book of physiology. The average grade for each semester is calculated from 3 grades.

Students with a grade point average of less than 5 and students who have not recovered from absences from lectures and laboratory work are not admitted to the passing exam in the discipline of Human Physiology.

Final: takes place in the USMF computerized assessment room. The computerized multiple-choice test of the final evaluation consists of variants of 50 tests each of all the topics of the Human Physiology course, of which 20 tests are simple compliments, 30 tests are multiple compliments. The student has 50 minutes to answer the tests. The test is graded with grades from 10 to 0. The final grade consists of 2 components: the mean annual grade (coefficient 0.5), the test-computerized grade (coefficient 0.5). The assessment of knowledge is assessed with marks from 10 to 1, as follows:

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	**2**	**F**

3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-9,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations in the failed exam.

XIV. RECOMMENDED LITERATURE:

A. Compulsory :

1. Guyton and Hall. Textbook of medical physiology.13th ed. Saunders, 2016
2. Vovc V. et al. Experimental physiology

B. Additional

1. Silbernagl, Despopoulos. Color atlas of physiology. 7th ed. Thieme, 2015
2. Boron, Boulpaep. Medical physiology. 3rd ed. Elsevier, 2017.