

SYLABUSConcerning the cycle of education **2024-2030**

Academic year 2025/2026

1. BASIC INFORMATION CONCERNING THIS SUBJECT

Subject	Physiology
Course code *	Fj/B
Faculty of (name of the leading direction)	Faculty of Medicine, University of Rzeszow
Department Name	Faculty of Medicine, Department of Human Physiology
Field of study	Medicine
level of education	Uniform Master's Studies
Profile	General Academic
Form of study	Stationary
Year and semester	Year II, Semester III/IV
Type of course	Obligatory
Language	English
Coordinator	Filip Wołoszyn, PhD
First and Last Name of the Teachers	Agnieszka Gala-Błądzińska, MD, PhD, Prof. UR Prof. Maciej Machaczka, MD, PhD, DSc Marta Kopańska, PhD, Prof. UR Wojciech Barg, MD, PhD, Prof. UR Oliver Doerner, MD

*- According to the resolutions of Educational Unit

1.1. Forms of classes, number of hours and ECTS

Semester No.	Lecture	Exercise	Conversation	Laboratory	Seminar	Praktical	Other	Number of points ECTS
III	30	30	-	-	15	-	-	6
IV	30	30	-	-	15	-	-	5

1.2. The form of class activities

X classes are in the traditional form

X classes are implemented using methods and techniques of distance learning

1.3. Examination Forms (exam, credit with grade or credit without grade)

WRITTEN AND ORAL SYSTEM OF CONTINUA EVALUATION IN CLASS AND SEMINARS, AND WRITTEN COLLOQUIA ON THE COVERED MATERIAL. THE MODULE FINISHES WITH A MARKED WRITTEN EXAMINATION.

2. BASIC REQUIREMENTS

The aim of the module is: acquiring knowledge of the functions of a human organism and their control, and particularly familiarizing students with:

- basics of bodily fluids and water-electrolyte balance of the organism,
- notions of solubility, osmotic pressure, isotonia, colloidal solution and Gibbs-Donnan equilibrium,
- modes of intercellular and trans cellular communication and pathways of signal transmission in a cell
- the physiology of skeletal and smooth muscles and the function of circulating blood,
- basics of stimulation and conduction in the nervous system and higher nervous activities, as well as basics of activity of cerebral centers of sensory organs.
- laws of physics describing the flow of blood and gases, factors influencing vascular resistance of the blood flow and resistance of gas flow in airways,
- activities and regulation mechanisms of all organs and systems of a human body, including muscular, circulatory, respiratory, alimentary, urinary, endocrine and integumentary systems, and understanding their interrelationships,
- metabolic profiles of basic organs and systems,
- acid-base equilibrium and the mechanisms of buffer action and their significance,
- enzymes partaking in digestion, mechanisms of hydrochloric acid production in the stomach, pancreas activity, role of bile, the course of absorption of the products of digestion and disorders caused thereby,
- mechanisms of food intake and consequences of malnutrition, including starvation, overeating and watching an ill-balanced diet,
- action mechanisms of hormones, and consequences of disturbances in hormonal regulation,
- the course and regulation of reproductive functions in women and men,
- the basic quantitative parameters describing functions of systems and organs.
- knows the body aging mechanisms.
- describes changes in body functioning in states of homeostasis disturbances, and specifies its integral response to physical strain, exposure to high and low temperature, loss of blood or water, sudden verticalization, transition from sleep to awake.

Upon completion of the course, the student's knowledge includes:

- activities of the organism and their regulation, integration relations of the mechanisms regulating the functions of particular systems, and the basic methodology of function tests of organs and systems of the organism.

Student's skills include:

- deducing the relation between factors influencing sustaining biological processes and physiological and pathophysiological changes,
- ability to describe changes in the functioning of the organism experiencing homeostasis disorders, and particularly to determine its integrated response to physical effort, exposure to high and low temperatures, blood loss and water depletion, sudden assuming of erect position, proceeding from sleep to waking state, effects of stimulation of digestive glands and internal secretion,

- performing simple function tests estimating an individual as a system of stable regulation (loading test, exercise test),
- interpreting numerical data illustrating basic physiological variables,
- explaining physiological basics of patient's medical examination.

3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

3.1. Objectives of this course

C1	Familiarizing with the proper activity of individual organs and their systems
C2	Understanding the general and detailed principles of regulation and control of the activities of human body systems
C3	Familiarizing with organ homeostasis, its analysis, indicating the disorders leading to the disease
C4	Acquiring the theoretical basis for differentiating physiological changes in medical reasoning
C5	Acquiring the ability to observe the organism, determine deviations and their interpretation
C6	Understanding the physiological biochemical (laboratory) and functional norms
C7	Acquiring the ability to measure parameters describing the physiological state of the human body and conducting standard clinical diagnostics tests
C8	Acquiring the ability to use textbooks, monographs and articles in the field of physiology and related sciences

3.2. Outcomes for the course

EK (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to directional effects ¹
EK_01	Describes water and electrolyte management in biological systems	B. W1
EK_02	Describes the acid-base balance and the mechanism of action of buffers and the importance of buffers in systemic homeostasis	B. W2
EK_03	Methods of communication between cells and between a cell and the extracellular matrix, as well as intracellular signal transduction pathways, including examples of disorders in these processes leading to cancer and other diseases.	B. W16
EK_04	Processes such as the cell cycle, proliferation, differentiation, aging of cells, apoptosis, and necrosis, and their significance for organism function.	B. W17

EK_05	Functions and applications of stem cells in medicine.	B. W18
EK_06	He knows the basis of stimulation and conduction in the nervous system and higher nervous functions, as well as the physiology of striated and smooth muscles and blood functions	B. W19
EK_07	Function and regulatory mechanisms of all human organs and systems, as well as their interrelations	B. W20
EK_08	Processes occurring during aging and organ function changes associated with aging.	B. W21
EK_09	Basic quantitative parameters describing the efficiency of individual systems and organs, including normal ranges and demographic factors influencing these parameters.	B. W22
EK_10	Genetic determinants of human blood groups and Rh incompatibility.	C.W4
EK_11	The impact of oxidative stress on cells and its significance in disease pathogenesis and aging processes.	C.W38
EK_12	Consequences of vitamin and mineral deficiencies and excesses.	C.W39
EK_13	Causes and consequences of improper nutrition, including prolonged insufficient and excessive food intake, unbalanced diets, as well as digestion and absorption disorders.	C.W40

Skills:		
EK_14	Perform simple functional tests assessing the human body as a stable regulatory system (load and exercise tests) and interpret numerical data related to basic physiological variables.	B. U7
EK_15	Use basic laboratory and molecular techniques.	B. U12
Social Competences		
EK_16	Methods of communication between cells and between a cell and the extracellular matrix, as well as intracellular signal transduction pathways, including examples of disorders in these processes leading to cancer and other diseases.	K.05
EK_17	Formulate conclusions from personal measurements or observations.	K.08
EK_18	Accept responsibility for decisions made within professional activities, including those related to personal and others' safety.	K.11

3.3. Content curriculum

A. Problems of the lecture

Course contents

1. General physiology internal environment of the organism, cell activity control, membrane transports, membrane rest potential and action potentials of excitable cells, action potential propagation, neuromuscular junction, synaptic phenomena, skeletal muscles, muscular tone, smooth muscles, skeletal and smooth muscle contractions and the mechanisms of their regulation, muscle weakness, autonomous nervous system.

2. Neurophysiology: organization of the nervous system, sensory receptors and sensory axis, motor neurons of the spinal cord and brain stem, sensory and motor pathways controlling functions of the higher and lower Moto neurons of the spinal cord, motor cortex, subcortical nuclei, cerebellum, speech and brain speech centers, neural control of impulses, emotions, and the processes of sleep and waking state (consciousness), learning and memory, regulation of body temperature. Centers in the central nervous system responsible for sensibility, sense of vestibular system, sense of hearing, sense of smell and taste. Modern methods of diagnostics of the diseases of nervous system.

3. Blood: functions of blood, composition of plasma, and blood cells, haematopoiesis, blood groups, blood clotting, immune system, fibrinolysis, lymphatic circulation.

4. Physiology of the cardiovascular system: principles of haemodynamics, electric activity of the heart muscle, electrocardiogram, mechanical activity of the heart muscle, cardiac cycle, regulation of the venous return to the heart and minute heart volume, arterial blood pressure and its regulation, capillary bed and its functions, systemic and local regulation of blood flow, cardiovascular reflexes, modern methods of examination of the cardiovascular system.

5. Physiology of the respiratory system: structure and function of the respiratory system, mechanics of breathing, spirometry, transportation of oxygen and carbon dioxide, gas exchange in lungs, control of breathing, methods of examination of the respiratory system, cardiopulmonary adaptation to exercise.

6. Physiology of kidneys: structure and functions of kidneys, renal blood flow and glomerular filtration, kidneys' participation in homeostasis, the processes of reabsorption in the proximal convoluted tubule, Henle's loop, distal convoluted tubule, connecting tubules, regulation of the osmolarity of systemic fluids and consequences of its disorders, renal regulation of potassium, calcium and magnesium levels in the organism, role of the kidneys in maintaining acid-base equilibrium.

7. Physiology of the alimentary system: regulation of food consumption, motor activity, secretion, digestion, and absorption in the alimentary tract, gastrointestinal hormones, mechanisms of intestinal transportation of electrolytes, water and digestion products, cerebro-visceral axis and methods of examining the alimentary system.

8. Physiology of the endocrine system: endocrine functions of hypothalamus, pituitary gland, thyroid gland, adrenal gland, pancreas, hormonal regulation of: systemic metabolism, calcium metabolism, body height, reproductive system, menstrual cycle, hormonal control of pregnancy and lactation process. Endocrine organs function tests, and the consequences of disorders in hormonal regulation.

B. Problems of auditorium, seminar, laboratory and practical classes

Course contents
Physiological mechanisms of the body's functioning at the level of cells and organs using the Virtual Physiology (SimMuscle, SimNerv, SimNeuron, SimHeart & SimVessel), EEG-Neurofeedback therapy – practical exercises, seminar, spirometry, spiroergometry
Physiology of the respiratory system- practical exercises,
seminar, Sensory receptors and sensory axis-practical exercises,
seminar Regulation of Human Metabolism

3.4. Didactic methods

Lecture: problem lecture, lecture with multimedia presentation

Seminars/Exercises: text analysis with discussion, project method (research, implementation, practical project), group work (task solving, discussion), didactic games, distance learning methods, Virtual Physiology program, medical equipment

4. METHODS AND EVALUATION CRITERIA

4.1. Methods of verification of learning outcomes

Effect symbol | Methods of assessing learning outcomes (e.g.: colloquium, oral exam, written exam, project, report, observation during classes) | Form of teaching (lectures, exercises, etc.)

EK_01 – EK_13 | report, colloquium, oral exam | lectures, seminars, exercises

EK_14, EK_15, EK_17 | observation during classes, practical exam | exercises

EK_16, EK_18 | observation during classes | seminars, exercises

4.2. Conditions for completing the course (evaluation criteria)

The student gets a credit from the subject based on a point system, which has its mapping on the scale of grades.

Exercises - credit with grade including: attendance, theoretical preparation for classes, student's skills.

Seminars - credit including: attendance, theoretical preparation for classes, student's activity and skills

Each semester ends with a semester test covering the scope of material from the entire semester. Whole course ends with year test.

Knowledge assessment:

5.0 - has knowledge of each of the contents of education at the level of 90% -100%

4.5 - has knowledge of each of the content of education at the level of 84% -89%

4.0 - has knowledge of each of the content of education at the level of 77% -83%

3.5 - has knowledge of each of the content of education at the level of 70% -76%

3.0 - has knowledge of each of the content of education at the level of 60% -69%

2.0 - has knowledge of each of the contents of education below 60%

Skill assessment:

5.0 - the student actively participates in the classes, is well prepared, correctly interprets the dependencies and is able to draw the right conclusions, flawlessly performs experiments and simple functional tests assessing the human body

4.5 - the student actively participates in classes, with little help from the teacher, correctly interprets the occurring phenomena, is able to perform experiments and simple functional tests assessing the human body

4.0 - the student actively participates in the classes, does not fully interpret the occurring phenomena, with the help of the teacher performs experiments and simple functional tests assessing the human body

3.5 - the student participates in the classes, his scope of preparation does not allow for a comprehensive presentation of the discussed problem, formulates conclusions requiring correction from the teacher, often erroneously performs experiments and simple functional tests assessing the human body

3.0 - the student participates in classes, his scope of preparation does not allow for a comprehensive presentation of the discussed problem, formulates conclusions requiring correction from the teacher, commits minor mistakes, not fully understanding dependencies and causal links, incorrectly performs experiments and simple functional tests assessing the body human

2.0 - the student passively participates in classes, commits blatant errors in the diagnosis and proper naming of anatomical units, and can not link knowledge of the detailed human anatomical structure with the function and tasks of individual organs.

5. Total STUDENT WORKLOAD REQUIRED TO ACHIEVE THE DESIRED RESULT IN HOURS AND ECTS CREDITS

Activity	The average number of hours to complete the activity
Contact hours (with the teacher) resulting from the study schedule of classes	150
Contact hours (with the teacher) participation in the consultations, exams	15
Non-contact hours - student's own work (preparation for classes, exam, writing a paper, etc.)	165
SUM OF HOURS	330
TOTAL NUMBER OF ECTS	11

** It should be taken into account that 1 ECTS point corresponds to 25-30 hours of total student workload.*

6. TRAINING PRACTICES IN THE SUBJECT

NUMBER OF HOURS	-
RULES AND FORMS OF APPRENTICESHIP	-

7.LITERATURE

Basic literature: <ol style="list-style-type: none">1. Guyton and Hall Textbook of Medical Physiology, by John E. Hall; 14th ed., Elsevier 2021;2. Ganong's Review of Medical Physiology, by K.E. Barrett, S.M. Barman, S. Boitano, H.L. Brooks, 27th ed., Lange/MacGraw Hill 2022
Additional literature <ul style="list-style-type: none">-Human Physiology: An Integrated Approach, Global Edition. Silverthorn. Pearson, 2018-Physiology, by Linda S. Costanzo, 6th ed., Saunders/Elsevier 2018-Literature sources provided in exercise and seminar materials and made available by instructors.-Articles from the PubMed database.

Acceptance Unit Manager or authorized person