





Distance learning (asynchronous)																			
Summer Semester																			
Direct (contact) education				27															
Online learning (synchronous)	24			24															
Online learning (asynchronous)																			
TOTAL per year:																			
Direct (contact) education				54															
Online learning (synchronous)	48			48															
Online learning (asynchronous)																			
Educational objectives (max. 6 items) C1. C2. C3.																			
<b>Education result matrix for module/course in relation to verification methods of the intended education result and the type of class</b>																			
Number of course education result	Number of major education result	Student who completes the module/course knows/is able to	Methods of verification of intended education results (forming and summarising)	Form of didactic class <i>**enter the abbreviation</i>															
K 01	B.K1	describes water-electrolyte management in biological systems;	oral exam; written/oral test; presentation; report	L; MC															
K 02	B.K2	describes acid-base balance and action of buffers in maintaining of human body homeostasis;	oral exam; written/oral test; presentation; report	L; MC															
K 03	B.K5	knows the physical laws describing the flow of fluids and factors affecting the vascular resistance of blood flow	oral exam; written/oral test; presentation; report	L; MC															
K 04	B.K7	knows physicochemical and molecular basis of sensory organs	oral exam; written/oral test; presentation; report	L; MC															
K 05	B.K17	knows pathways of communication between cells; between cell an extracellular	oral exam; written/oral test; presentation;	L; MC															



		matrix and pathways of signals in the cell, and examples of their disorders, that lead to development of cancers and other disorders	report	
K 06	B.K20	describes basis of excitability and conduction in the nervous system, superior functions of nervous system, physiology of smooth and skeletal muscle, blood functions ;	oral exam; written/oral test; presentation; report	L; MC
K 07	B.K21	knows functions and regulatory mechanisms of all organs and systems in human body including: circulation, respiratory system, digestive system, urinary system and the skin, and understands interactions between them	oral exam; written/oral test; presentation; report	L; MC
K 08	B.K22	knows functions and control of reproductive system in male and female	oral exam; written/oral test; presentation; report	L; MC
K 09	B.K24	knows basic quantitative parameters describing the efficiency of individual systems and organs, including norm ranges and demographic factors that affect value of these parameters;	oral exam; written/oral test; presentation; report	L; MC
K 10	B.K25	describes the relationship between factors that disturb the balance of biological processes and physiological, and pathophysiological changes;	oral exam; written/oral test; presentation; report	L; MC
K 11	C.K49	knows the enzymes involved in digestion (together with biochemistry), the mechanism of the hydrochloric acid production in the stomach, the role of bile, the absorption of digestive products;		
K 12	C.K51	knows the mechanism of hormones effects;		
S 01	B.S7	is able to perform simple functional tests that evaluate	oral exam; written/oral test;	L; MC



		human body as a system of stable regulation (exercise tests, loading test) and interpret figures concerning basic physiological variables;	presentation; report	
S 02	B.S9	is able to operate simple measuring instruments and assess the accuracy of performed measurement;	oral exam; written/oral test; presentation; report	L; MC
S 03	C.S20	is able to describe changes in the functioning of the body in the event of homeostasis disorders, in particular define its integrated response to exercise, exposure to high and low temperature, loss of blood or water, sudden upright standing, transition from sleep to wakefulness		

\*\* L - lecture; SE - seminar; AC – auditorium classes; MC – major classes (non-clinical); CC – clinical classes; LC – laboratory classes; SCM – specialist classes (magister studies); CSC – classes in simulated conditions; FLC – foreign language course; PCP practical classes with patient; PE – physical education (obligatory); VP – vocational practice; SS – self-study, EL – E-learning .

Please mark on scale 1-5 how the above effects place your classes in the following categories:  
communication of knowledge, skills or forming attitudes:

Knowledge: ....5

Skills: ....5

**Student's amount of work (balance of ECTS points)**

Student's workload (class participation, activity, preparation, etc.)	Student Workload (h)
1. Contact hours:	54
2. Online learning hours (e-learning):	96
3. Student's own work (self-study):	141
Total student's workload	291
ECTS points for module/course	12.5
Comments	

**Content of classes** (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects)

**Lectures**

**Winter semester (12 x 2 hours)**

1. Introduction to physiology. Homeostasis.
2. Nervous system – introduction
3. Nervous system – sensory system
4. Nervous system – senses
5. Nervous system - motor system
6. Nervous system – brain function
7. Nervous system – autonomic nervous system



8. Muscle physiology
9. Hormones – part 1
10. Hormones – part 2
11. Reproduction and development
12. Metabolism (insulin/glucagon). Body temperature regulation.

**Summer semester (12 x 2 hours)**

1. Cardiovascular system – cardiac muscle
2. Cardiovascular system – cardiovascular hemodynamics
3. Cardiovascular system – regulatory mechanisms
4. Cardiovascular system – blood flow in specific regions of the body
5. Respiratory system – ventilation
6. Respiratory system – gas exchange, regulation of respiration
7. Exercise
8. Blood – red blood cells, hemostasis
9. Immune system
10. Physiology of kidneys
11. Acid-base balance

Physiology of digestive system.

**Classes**

**Winter semester**

**Homeostasis. Membrane dynamics. Cell-to-cell communication. 5 hours**

- Definition of homeostasis, local and long-term mechanisms
- Internal environment of human body; water areas, ion composition
- Contribution of individual system in maintaining homeostasis
- Dynamics of biological membrane, membrane transport

**Nervous system: Excitability. 5 hours**

- Nervous system; function, structure, pathways of signal conduction
- Neuron: structure, types
- Resting membrane potential and action membrane potential
- Conduction of a signal in a neuron
- Synapse: structure, types, conduction in the synapse

**Nervous system: sensory system. Senses. 5 hours**

- Properties of sensory systems
- Sensory receptors: general properties and types of receptors, transduction
- Somatic senses: touch, temperature, proprioception, pain
- Special senses: vision, hearing, smell, taste

**Nervous system: motor control system. 5 hours**

- Spinal cord: structure, properties of conduction, spinal reflexes
- Muscle spindle
- Piramidal and extrapyramidal system
- Cerebellum: functional arrangement, role of cerebellum
- Equilibrium

**Nervous system: functions of the brain. 5 hours**

- Function of cerebral cortex: sleep/awakeness, language
- Limbic system: emotions, memory, learning
- Circadian rhythms

**Autonomic nervous system (ANS). 5 hours**

- Division of the autonomic nervous system,
- Neurotransmitters and receptors
- Effectors, neuromodulators of ANS



- Control of ANS by CNS
- Autonomic reflexes
- Ways of evaluation of ANS activity

**Muscle physiology. 5 hours**

- Skeletal muscles: structure of sarcomere, neuromuscular junction, types of skeletal muscles, excitation-contraction coupling, types of skeletal muscle contraction, sources of energy in skeletal muscle, factors affecting the strength of contraction, mechanics of contraction
- Smooth muscles: structure, types of smooth muscles, mechanics of contraction and relaxation, types of contractions

**Hormones. 5 hours**

- Hypothalamic and pituitary gland hormones, thyroid gland hormones, parathyroid gland, adrenal gland hormones
- Sex hormones

**Metabolism. Body temperature regulation. 5 hours**

- Metabolism: definition, variety, determinants, control, methods of measurement
- Endocrine function of the pancreas: insulin, glucagon
- Mechanisms of body Temperature regulation

**Clinical issues. 6 hours**

Cystic fibrosis as an example of impaired membrane transport.

Selected demyelinating diseases as an example of nerve conduction disorders.

Menier's disease. Parkinson's disease. Epilepsy as an example of a disease caused by brain disorders.

Osteoporosis. Diabetes.

**Summer semester**

**Physiology of cardiovascular system – cardiac muscle. 5 hours**

- Physiological properties of cardiac muscle, regulation of heart activity
- Basics of ECG tracing
- Cardiac cycle

**Physiology of cardiovascular system - vascular system. 5 hours**

- Functional differentiation of cardiovascular system
- Principles of cardiovascular hemodynamics
- Blood pressure, heart rate, venous pressure

**Physiology of cardiovascular system – regulation. Venous blood flow. Capillary blood flow. 5 hours**

- Regulation of circulation: local, nervous, reflex, hormonal regulation
- Venous circulation
- Capillary circulation

**Physiology of cardiovascular system – blood flow in specific regions. Exercise. 5 hours**

- Properties of circulation and control mechanisms of blood flow in specific regions: coronary circulation, cerebral circulation, pulmonary circulation, blood flow in the skin, visceral circulation, blood flow in the skeletal muscles.

- Exercise; ventilatory and cardiovascular responses to exercise, metabolism and exercise, temperature regulation during exercise. Exercise tests.

**Respiratory system. 5 hours**

- Mechanics of respiration: ventilation in the lungs
- Spirometry
- Exchange of gases in the lungs. Gas transport.
- Nervous and chemical control of respiration

**Blood: Erythrocytes (RBCs). 5 hours**

- Composition and functions of blood; erythropoiesis
- Properties and functions of erythrocytes
- Hemoglobin: structure, types, properties and combinations of hemoglobin
- Gas transport in the blood



**Blood: Leucocytes (WBCs). Hemostasis and coagulations. 5 hours**

- Leucocytes: types, functions
- Immunity: types, mechanisms
- Hemostasis

**Fluid-electrolyte balance. Physiology of the kidney. 5 hours**

- Functional anatomy of the kidneys
- Glomerular filtration, reabsorption and secretion in the kidneys. Kidneys function test - measurement of renal clearance
- Micturition
- Water-electrolyte balance and acid-base balance of the body.
- Vasopressin. Aldosterone. RAS system.

**Digestive system. The liver. 5 hours**

- Control of food intake
- Function and regulation of motility and secretion in the digestive system
- Digestion and absorption of nutrients
- Function of the liver

**Clinical issues. 6 hours**

**Essential hypertension. Edema - types, mechanism of formation. High-altitude hypoxia.**

Serological conflict. Gout. Gastroparesis.

**Basic literature** (list according to importance, no more than 3 items)

1. Dee Unglaub Silverthorn. Human Physiology. Integrated Approach.

**Additional literature and other materials** (no more than 3 items)

1. Guyton and Hall. Textbook of Medical Physiology
2. William F. Ganong Review of Medical Physiology 22e 2.

**Didactic resources requirements** (e.g. laboratory, multimedia projector, other...)

Computer lab, multimedia projector, TV with DVD player, daylight projector, blackboard, whiteboard, stationery, esthesiometer, TIP THERM device, neurological hammer, Piórkowski apparatus, ECG unit, apparatus for blood pressure measuring, device for hemodynamic measurements, spring dynamometer, infrared thermometer, weight evaluating fat content, measuring tape, stethoscope, spirometer, pickflowmeter, hematological lancets, hematocrit centrifuge, hematocrit tubes, serum with antibodies, light microscope, microscope slides, tissue/lignin, Petri dish, didactic films, hydrogen breath test gauge, glasses with stearin, hollowed slides, pulsoximeter, stopwatch, body composition weight, metronome,

**Preliminary conditions** (minimum requirements to be met by the student before starting the module/course)

Student has to know human anatomy, histology and the course of basic chemical reactions and biochemical processes taking place in the human body.

**Conditions to receive credit for the course** (specify the form and conditions of receiving credit for classes included in the module/course, admission terms to final theoretical or practical examination, its form and requirements to be met by the student to pass it and criteria for specific grades)

Conditions required for getting credit for classes:

- attendance at all classes
- obtaining at least a satisfactory grade for each partial test
- obtaining at least a satisfactory grade for each semester, which is calculated from the average of all grades obtained in a given semester

Every absence from classes must be made up, including rector days and dean's hours (in this case, a form of



presentation or essay prepared by the student as part of self-study is recommended).

Conditions required for admitting the student to the final exam:

- Student is obliged to obtain credit for each semester.

Form of the final exam: oral

To take the final exam it is necessary to obtain at least a satisfactory grade for each semester according to the criteria given below:

<b>Grade:</b>	<b>Criteria</b> (only for courses/modules ending with an examination)
Very Good (5.0)	if the average grade for the semester ranges from 4.76 - 5.0
Good Plus (4.5)	if the average grade for the semester ranges from 4.26 – 4.75
Good (4.0)	if the average grade for the semester ranges from 3.76 – 4.25
Satisfactory Plus (3.5)	if the average grade for the semester ranges from 3.26 – 3.75
Satisfactory (3.0)	if the average grade for the semester ranges from 3.00 – 3.25
	<b>Criteria</b> (only for courses/modules ending with e credit)
Credit	Does not apply to the Faculty of Medicine

<b>Grade:</b>	<b>Criteria</b> (examination evaluation criteria)
Very Good (5.0)	if the obtained average of two positive grades is in the range of 4.75 - 5.0
Good Plus (4.5)	if the obtained average of two positive grades is in the range of 4.25 – 4.50
Good (4.0)	if the obtained average of two positive grades is in the range of 3.75 – 4.00
Satisfactory Plus (3.5)	if the obtained average of two positive grades is in the range of 3.25 – 3.50
Satisfactory (3.0)	if the obtained average of two positive grades is 3.00 or if the grade for the answer to one question is positive and the second one is unsatisfactory, a positive grade (3.0; 3.5; 4.0; 4.5; 5.0) is obtained for the answer to the third question
Unit realizing the subject	Department of Physiology
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List of persons conducting specific classes				
Full name	Degree/scientific or professional title	Discipline	Performed profession	Form of classes
Agnieszka Buldańczyk	dr n.med.	medicine	academic	classes, lectures
Bartłomiej Paleczny	dr hab. n. o zdrowiu	health science	academic	classes, lectures
Agnieszka Siennicka	dr n. o zdrowiu	health science	academic, physician	classes, lectures
Robert Skalik	dr n.med.	medicine	academic	classes, lectures
Rafał Seredyński,	dr biol.	biology	academic	classes, lectures
Małgorzata Wyciszkiwicz	dr mgr inż.	biotechnolog y	academic	classes,
Adrianna Nowicka	mgr inż.	biotechnolog y	academic	classes,

**Date of Syllabus development**

28.10.2020

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**Syllabus developed by**

dr n. med. Agnieszka Buldańczyk.

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...

**Signature of Faculty Dean**

Wrocław Medical University  
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