

**Course description (syllabus) form for higher education, doctoral,  
postgraduate and skills development programs**

**A. General course description**

<b>FIELD NAME</b>	<b>COMMENTS</b>
Course title (in Polish and English)	<b>Fizjologia człowieka z elementami fizjologii klinicznej</b> <i>(Human physiology with elements of clinical physiology)</i>
Unit organising the course	<b>Department of Human Physiology</b> <b>Faculty of Medicine</b> <b>Collegium Medicum named after Ludwik Rydygier in Bydgoszcz</b> <b>Nicolaus Copernicus University in Toruń</b>
Unit for which the course is organised	<b>Faculty of Medicine, Collegium Medicum NCU</b> <b>Field of study: Medicine</b> <b>Paid Full-Time Studies in English</b>
Course ID	
ERASMUS code	<b>0912</b>
ECTS credit allocation	<b>5 (summer semester)</b> <b>7 (winter semester)</b>
Method of passing	<b>Exam</b>
Language of instruction	<b>English</b>
Indication whether attempts at obtaining course credit can be repeated	<b>No</b>
Affiliation of the course to a course group	<b>Science basics of medicine (Group B)</b>



<p>Total student workload</p>	<p>1. The workload related to classes requiring the direct participation of academic teachers is:</p> <ul style="list-style-type: none"> <li>- participation in lectures: 55 hours</li> <li>- participation in laboratory exercises: 100 hours</li> <li>- completion of the assessment: 8 hours</li> <li>- conducting the exam: 2 hours</li> </ul> <p>The workload related to classes requiring the direct participation of academic teachers is 165 hours, which corresponds to 6.11 ECTS points.</p> <p>2. Balance of student workload:</p> <ul style="list-style-type: none"> <li>- participation in lectures: 55 hours</li> <li>- participation in laboratory exercises: 100 hours</li> <li>- preparation for exercises (including reading the indicated literature: 50 hours</li> <li>- writing reports on exercises: 10 hours</li> <li>- preparation for and passing the exam: 72+8= 80 hours</li> <li>- exam preparation and exam: 28+2=30 hours</li> </ul> <p>The total student workload is 325 hours, which corresponds to 12 ECTS points.</p> <p>3. Balance of workload related to the implementation of learning outcomes in medical simulation conditions (group B): not applicable.</p> <p>4. Balance of workload related to the implementation of learning outcomes related to medical communication: not applicable.</p>
<p>Learning outcomes: knowledge</p>	<p>W1: Describes the mechanisms responsible for maintaining water and electrolyte balance in the human body (B.W1, B.W20)</p> <p>W2: Knows and explains the methods of communication between cells and between the cell and the extracellular matrix as well as the signal transmission pathways in the cell (B.W16)</p> <p>W3: Explains the basics of excitation and conduction in the nervous system and higher nervous activities, as well as the physiology of striated and smooth muscles (B.W16, B.W19)</p> <p>W4: Knows and explains the activities and mechanisms of regulation of all organs and systems of the human body and the relationships between them (B.W20)</p> <p>W5: Knows the basic quantitative parameters describing the performance of individual systems and organs, including normal ranges and demographic factors influencing the value of these parameters (B.W22)</p> <p>W6: Explains the consequences of improper nutrition, including vitamin and mineral deficiency, long-term starvation, eating too large meals and using an unbalanced diet, as well as disorders of digestion and absorption of digestive products (B.W20, C.W39, C.W40)</p> <p>W7: Knows the course and explains the role of metabolic changes taking place in organs (B.W15)</p>



Learning outcomes: practical skills	<p>U1: Is able to perform simple functional tests assessing the human body as a stable regulation system (static and dynamic exercise tests) (B.U7)</p> <p>U2: Is able to interpret numerical data regarding basic physiological variables (B.U7)</p>
Learning outcomes: social competence	<p>K1: Recognizes own limitations and self-assesses educational deficits and needs (K_K05)</p> <p>K2: Uses objective sources of information (K_K07)</p> <p>K3: Formulates appropriate conclusions from own measurements or observations (K_K08)</p>
Teaching methods	<p>Lectures:</p> <ul style="list-style-type: none"> <li>• problem lecture with multimedia presentation</li> <li>• informative lecture (conventional)</li> </ul> <p>Laboratory exercises:</p> <ul style="list-style-type: none"> <li>• laboratory</li> <li>• observations</li> <li>• classical problem-based exercise method</li> <li>• discussion</li> <li>• show</li> </ul>
Prerequisites	<p>A student starting education in the subject of Physiology should have basic knowledge of the anatomy and physiology of the nervous system, circulation, respiratory system, digestive system, endocrine system and the physiology of the kidney and blood.</p>
Brief course description	<p>The human physiology course enables the student to learn basic concepts and understand the processes that regulate the functioning of individual organs and systems. It also allows you to understand the relationships between individual elements of the human body.</p>



<p>Full course description</p>	<p>The aim of the Physiology course is to familiarize students with the physiological processes and mechanisms responsible for the homeostasis of the human body. Lectures on Physiology are intended to present and consolidate knowledge of the basics of physiology: acquiring basic knowledge of the physiology of the nervous system. The student will become acquainted with the basic mechanisms of nerve cell functioning, will learn about the properties of the nerve cell's cell membrane and its role in the genesis of the resting potential and action potential as well as synaptic transmission. Lectures on Physiology also aim to present and consolidate knowledge of the basics of physiology: acquiring basic knowledge of the physiology of the circulatory system, internal secretion, urinary and digestive system and acid-base balance. The student will also learn about water and electrolyte management, kidney physiology and intrarenal regulation mechanisms. The student will also gain knowledge about hemostatic mechanisms and the effects of hemostatic disorders. Additionally, you will gain knowledge about the regulation of the digestive system and its physiology.</p> <p>The exercises are laboratory in nature and are partially related to the issues discussed during lectures. The student will learn about the importance of the appropriate composition of extracellular fluid in the formation and transmission of information in the nervous system and the operation of chemical and electrical synapses. Then the student will learn the mechanism of skeletal muscle contraction, types of contraction and mechanisms regulating the force of contraction of these muscles. At the end of the physiology course, the student will become familiar with the neurobiological basis of reflexes and the operation of the movement control system. The student will also gain knowledge about the impact of environmental factors on the functioning of the respiratory system and the importance of spirometry in assessing the functioning of the respiratory system. The aim of the exercises is also to become familiar with ECG examination, blood pressure measurement, as well as functional changes occurring in the circulatory system as a result of changes in body position and after dynamic and static physical exercise. The student will also gain knowledge of the physiology of the hematopoietic system and basic blood laboratory parameters. The student will become familiar with the mechanisms of glomerular filtration, intrarenal regulation, and the mechanisms of action of hormones influencing the volume, concentration and composition of urine. He will also become acquainted with the mechanism of action of buffers and acid-base management, and their importance in body homeostasis. The aim of the exercises is also to learn the mechanism of action of hormones and the consequences of hormonal disorders. Additionally, you will learn about the course and regulation of reproductive functions in women and men. During classes on the physiology of the digestive system, he will learn about the operation of enzymes involved in digestion, the mechanism of hydrochloric acid production in the stomach, the role of bile, and the course of absorption of digestion products. In addition, he will become acquainted with the types of metabolic changes. The analysis of energy balance and neurohormonal mechanisms of body weight control will help to understand the principles of proper nutrition and the elimination of erroneous behaviors leading to metabolic disorders and the so-called lifestyle diseases. During the seminar classes, the student will learn the basics of neurophysiology with elements of pathophysiology.</p>
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Literature	<p><b>Basic literature:</b></p> <ol style="list-style-type: none"> <li>1. The Textbook of Medical Physiology, . Guyton AC, Hall JE: Elsevier Saunders, 2021, 14th edition.</li> <li>2. Medical Physiology, Walter F. Boron, Emile L. Boulpaep, Elsevier Health Sciences, 2021.</li> </ol> <p><b>Additional literature:</b></p> <ol style="list-style-type: none"> <li>1.</li> </ol>
Assessment methods and criteria	<p>Written entry ticket (<math>\geq 55\%</math>): W1-W7</p> <p>Exercise report (<math>\geq 60\%</math>): W1- W7, U1, U2</p> <p>Written test (<math>\geq 60\%</math>): W1-W7, U2.</p> <p>Prolonged observation (<math>&gt;50\%</math>): K1-K3</p> <p>Theoretical exam (<math>(\geq 60\%)</math>): W1-W7, U2</p> <p><i>The condition for taking the exam is to obtain 55% of correct answers from all entrance exams (this percentage is calculated separately for each block of classes) and a positive grade from all tests.</i></p>
Work placement	Not applicable

### B1. Description of the subject of the series

FIELD NAME	COMMENTS
Period of instruction	<b>2024/2025 - summer semester/ II semester</b>
Form of assessment of course completion in the period of instruction	ungraded credit
Form(s) of classes, number of hours and completion assessment methods	Lectures: 25h – ungraded credit Tutorials: 45h - ungraded credit
Name of course coordinator in the period of instruction	Prof. dr hab. n. med. Wojciech Kaźmierczak



Names of persons managing student groups for the course	<p><b>Lectures:</b> prof. dr hab. n. med. Wojciech Kaźmierczak</p> <p><b>Tutorials:</b> prof. dr hab. n. med. Wojciech Kaźmierczak dr Wieńczysława Adamczyk mgr Monika Bejtka dr Mirosława Cieślicka dr Blanka Dwojaczny dr n. med. Łukasz Kluczyński dr n. med. Jerzy Kochan dr Monika Zawadka - Kunikowska dr Piotr Złomańczuk Mgr Katarzyna Stranz</p>
Course attributes	Obligatory
Course groups including description and limit to the number of students within the groups	<p>Lectures: all year round</p> <p>Exercises: groups of up to 12 people</p>
Time and place of classes	The dates and places of classes are in accordance with the schedule published by the Dean's Office of the Faculty of Medicine



<p>Learning outcomes defined for a given form of classes within the course</p>	<p style="text-align: center;"><b>Lectures:</b></p> <p>W2: Knows and explains the methods of communication between cells and between the cell and the extracellular matrix, as well as the signal transduction pathways in the cell (B.W16)</p> <p>W3: Explains the basics of excitation and conduction in the nervous system and higher nervous activities, as well as the physiology of striated and smooth muscles (B.W16, B.W19)</p> <p>W4: Knows and explains the activities and mechanisms of regulation of all organs and systems of the human body and the relationships between them (B.W20)</p> <p>W5: Knows the basic quantitative parameters describing the performance of individual systems and organs, including normal ranges and demographic factors influencing the value of these parameters (B.W22)</p> <p>U2: Is able to interpret numerical data on basic physiological variables (B.U7)</p> <p>K1: Recognizes own limitations and self-assesses educational deficits and needs (K_K05)</p> <p style="text-align: center;"><b>Exercises:</b></p> <p>W2: Knows and explains the methods of communication between cells and between the cell and the extracellular matrix, as well as the signal transduction pathways in the cell (B.W16)</p> <p>W3: Explains the basics of excitation and conduction in the nervous system and higher nervous activities, as well as the physiology of striated and smooth muscles (B.W16, B.W19)</p> <p>W4: Knows and explains the activities and mechanisms of regulation of all organs and systems of the human body and the relationships between them (B.W20)</p> <p>W5: Knows the basic quantitative parameters describing the performance of individual systems and organs, including normal ranges and demographic factors influencing the value of these parameters (B.W22)</p> <p>U2: Is able to interpret numerical data on basic physiological variables (B.U7)</p> <p>K1: Recognizes own limitations and self-assesses educational deficits and needs (K_K05)</p> <p>K2: Uses objective sources of information (K_K07)</p> <p>K3: Formulates appropriate conclusions from own measurements or observations (K_K08)</p>
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<p>Methods and criteria for assessing a given form of classes within a subject</p>	<p><b>Lectures:</b>  Written test (<math>\geq 60\%</math>): W2-W5, U2  Written entry ticket (<math>\geq 55\%</math>): W2-W5  Prolonged observation (<math>&gt; 50\%</math>): K1</p> <p><b>Exercises:</b>  Written test (<math>\geq 60\%</math>): W2-W5, U2  Written entry ticket (<math>\geq 55\%</math>): W2-W5,  Exercise report (<math>\geq 60\%</math>): W2-W5, U2  Prolonged observation (<math>&gt; 50\%</math>): K1-K3</p>
<p>Course content</p>	<p><b>Lectures:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to the subject of human physiology.</li> <li>2. Physiology of the organ of vision.</li> <li>3. Physiology of the urinary system.</li> <li>4. Physiology of kidney function.</li> <li>5. Physiology of hypothalamus, pituitary and thyroid function.</li> <li>6. Physiology of the endocrine system part II.</li> <li>7. Physiology of the hearing organ.</li> <li>8. Physiology of the balance system.</li> <li>9. Function of the peripheral nervous system.</li> <li>10. Central nervous system.</li> <li>11. Higher activities of the central balance system.</li> <li>12. Physiology of the urogenital system.</li> <li>13. Sex hormones. Reproductive physiology.</li> <li>14. Introduction to human physiology disorders - clinical cases.</li> <li>15. Summary – resume of lectures.</li> </ol> <p><b>Exercises:</b></p> <ol style="list-style-type: none"> <li>1. Basics of cell electrophysiology - neuron structure, cell membrane structure, types of ion channels, ion pumps; Origin and features of the resting potential (PhysioEx simulation program).</li> <li>2. Origin and features of the action potential - excitability of the nerve cell, the role of ion channels, the phenomenon of refraction in the neuron (PhysioEx simulation program).</li> <li>3. Synaptic conduction and conduction velocity. "voltage clamp" and "patch-clamp" techniques. <ol style="list-style-type: none"> <li>1. Neuron simulation program - repeater.</li> </ol> </li> <li>5. Physiology of sense organs - transduction, receptor potential.</li> <li>6. Physiology of skeletal and smooth muscles - mechanism of contraction and regulation of its strength. part 1</li> <li>7. Physiology of skeletal and smooth muscles - mechanism of contraction and regulation of its force. part 2</li> <li>8. Functional organization of the brain. Higher CNS functions. Cognitive functions.</li> <li>9. Vestibulo-ocular reflexes and vestibulospinal reflexes. The role of the reticular formation in the control of muscle tension.</li> <li>10. Caloric nystagmus, rotational and post-rotational nystagmus. Testing of vestibulospinal reflexes. Examination of selected spinal reflexes.</li> <li>11. Blood composition. The role of morphotic elements and plasma proteins. Lipidogram.</li> <li>12. Thyroid hormones and metabolism.</li> <li>13. Hormonal regulation of blood glucose concentration. Cortisol and ACTH.</li> <li>14. Female sex hormones. Reproductive physiology.</li> </ol>



Teaching methods	Identical to part A
Literature	Identical to part A

## B2. Description of the subject of the series

FIELD NAME	COMMENTS
Period of instruction	<b>2025/2026 winter semester/ III semester</b>
Form of assessment of course completion in the period of instruction	<b>Exam</b>
Form(s) of classes, number of hours and completion assessment methods	Lectures - <b>30 godzin</b> : exam Tutorials - <b>55 godzin</b> : ungraded credit
Name of course coordinator in the period of instruction	prof. dr hab. n. med. Wojciech Kaźmierczak
Names of persons managing student groups for the course	<b>Lectures:</b> prof. dr hab. n. med. Wojciech Kaźmierczak  <b>Tutorials:</b> prof. dr hab. n. med. Wojciech Kaźmierczak dr Wieńczysława Adamczyk mgr Monika Bejtka dr Mirosława Cieślicka dr Blanka Dwojaczny dr n. med. Łukasz Kluczyński dr n. med. Jerzy Kochan dr Monika Zawadka - Kunikowska dr Piotr Złomańczuk Mgr Katarzyna Stranz
Course attributes	Obligatory
Course groups including description and limit to the number of students within the groups	Lectures: all year round Exercises: groups of up to 12 people
Time and place of classes	The dates and places of classes are in accordance with the schedule published by the Dean's Office of the Faculty of Medicine
Number of hours conducted using distance techniques	Not applicable
Subject website	Not applicable



Learning outcomes defined for a given form of classes within the course

**Lectures:**

W1: Describes the mechanisms responsible for maintaining water and electrolyte balance in the human body (B.W1, B.W20)

W2: Knows and explains the methods of communication between cells and between the cell and the extracellular matrix, as well as the signal transduction pathways in the cell (B.W16)

W3: Explains the basics of excitation and conduction in the nervous system and higher nervous activities, as well as the physiology of striated and smooth muscles (B.W16, B.W19)

W4: Knows and explains the activities and mechanisms of regulation of all organs and systems of the human body and the relationships between them (B.W20)

W5: Knows the basic quantitative parameters describing the performance of individual systems and organs, including normal ranges and demographic factors influencing the value of these parameters (B.W22)

W6: Explains the consequences of improper nutrition, including vitamin and mineral deficiency, long-term starvation, eating too large meals and using an unbalanced diet, as well as disorders of digestion and absorption of digestive products (B.W20, C.W39, C.W40)

W7: Knows the course and explains the role of metabolic changes taking place in organs (B.W15)

U2: Is able to interpret numerical data on basic physiological variables (B.U7)

K1: Recognizes own limitations and self-assesses educational deficits and needs (K\_K05)

**Exercises:**

W1: Describes the mechanisms responsible for maintaining water and electrolyte balance in the human body (B.W1, B.W20)

W2: Knows and explains the methods of communication between cells and between the cell and the extracellular matrix, as well as the signal transduction pathways in the cell (B.W16)

W3: Explains the basics of excitation and conduction in the nervous system and higher nervous activities, as well as the physiology of striated and smooth muscles (B.W16, B.W19)

W4: Knows and explains the activities and mechanisms of regulation of all organs and systems of the human body and the relationships between them (B.W20)

W5: Knows the basic quantitative parameters describing the performance of individual systems and organs, including normal ranges and demographic factors influencing the value of these parameters (B.W22)

W6: Explains the consequences of improper nutrition, including vitamin and mineral deficiency, long-term starvation, eating too large meals and using an unbalanced diet, as well as disorders of digestion and absorption of digestive products (B.W20, C.W39, C.W40)



<p>Methods and criteria for assessing a given form of classes within a subject</p>	<p style="text-align: center;"><b>Lectures:</b></p> <p>Written test (<math>\geq 60\%</math>): W1-W7, U2          Written entry ticket (<math>\geq 55\%</math>): W1-W7          Prolonged observation (<math>&gt; 50\%</math>): K1          Theoretical exam (<math>\geq 60\%</math>): W1-W7, U2</p> <p style="text-align: center;"><b>Exercises:</b></p> <p>Written test (<math>\geq 60\%</math>): W1-W7, U2          Written entry ticket (<math>\geq 55\%</math>): W1-W7          Exercise report (<math>\geq 60\%</math>): W1-W7, U1, U2          Prolonged observation (<math>&gt; 50\%</math>): K1-K3          Theoretical exam (<math>\geq 60\%</math>): W1-W7, U2</p> <p><i>The condition for taking the exam is passing all tests in the third semester.</i></p>
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Course content	<p style="text-align: center;"><b>Lectures:</b></p> <ol style="list-style-type: none"> <li>1. Physiology of other organs with endocrine activity.</li> <li>2. Physiology of the digestive tract</li> <li>3. Physiology of the pancreas and liver.</li> <li>4. Post-digestive functions of the digestive tract.</li> <li>5. Skin and appendages.</li> <li>6. Breathing mechanics</li> <li>7. Basics of respiratory system physiology.</li> <li>8. Physiology of cardiac muscle function part AND</li> <li>9. Physiology of heart muscle function part II.</li> <li>10. Physiology of the circulatory system.</li> <li>11. Water and electrolyte balance.</li> <li>12. Acid-base balance.</li> <li>13. Introduction to human physiology disorders - clinical cases.</li> <li>14. Summary – resume of lectures.</li> <li>15. How to pass the human physiology test exam.</li> </ol> <p style="text-align: center;"><b>Exercises:</b></p> <ol style="list-style-type: none"> <li>1. Physiology of the digestive system.</li> <li>2. The mechanism of hydrochloric acid production in the stomach, the role of bile, and the course of absorption of digestion products. Metabolism. Metabolic rate.</li> <li>3. The impact of physical exercise on the human body</li> <li>4. Electrical activity of the heart. The influence of the autonomic system on electrical activity</li> <li>5. Structure and role of the cardiac stimulus system. The influence of the autonomic nervous system on the conduction velocity in this system. The influence of selected drugs on heart function.</li> <li>6. Electrocardiography.</li> <li>7. Blood pressure and its regulation. Hemodynamic cycle. Regulation of the force of heart muscle contraction. Pressure-blood volume curve in the left ventricle of the heart.</li> <li>8. The influence of body position on the circulatory system - orthostatic test. Microcirculation - reactive and passive hyperemia.</li> <li>9. The impact of static and dynamic physical exercise on the circulatory system. Hormonal regulation of circulatory system functions.</li> <li>10. Breathing mechanics.</li> <li>11. Spirometry - method of performance and interpretation of results.</li> <li>12. Regulation of the respiratory system.</li> <li>13. Water and electrolyte management. The influence of drinking solutions of different osmolarity on diuresis.</li> <li>14. Autoregulatory mechanisms in the kidney. Mechanisms of tubular transport.</li> <li>15. Parameters for assessing the functional state of the kidneys.</li> </ol>
Teaching methods	Identical to part A
Literature	Identical to part A