**description of the course of study**

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| **Course code** | 0912-7LEK-B2.5-PzC |
| **Name of the course in** | Polish | **Fizjologia z cytofizjologią** |
| English | Physiology and cytophysiology |

1. **LOCATION OF THE course OF STUDY within the system of studies**

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| **1.1. Field of study** | medicine |
| **1.2. Mode of study** | Full-time  |
| **1.3. Level of study** | Uniform Master’s studies |
| **1.4. Profile of study\*** | General academic |
| **1.5. Person preparing the course description** | dr. hab. n. med., prof. UJK Anna Polewczyk |
| **1.6. Contact** | apolewczyk@ujk.edu.pl |

1. **General characteristicS of the course of study**

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| **2.1. Language of instruction** | English |
| **2.2. Prerequisites\*** | Anatomy, Histology |

1. **DETAILED CHARACTERISTICS OF THE COURSE OF STUDY**

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| * 1. **Form of classes**
 | LECTURE : 60 (including 10 hours e-learning),CLASSES – 50 (including 10 hours e-learning), LABORATORIES- 60 (including 10 hours e-learning) |
| * 1. **Place of classes**
 | Lecture /Classes/ Laboratories - Courses in the teaching rooms of the UJK |
| * 1. **Form of assessment**
 | LECTURE –exam, CLASSES – credit with grade, Laboratories - credit with grade |
| * 1. **Teaching methods**
 | Practical classes, conversational lecture, discussion. Computer programmes provided in the scope of Physiology classes |
| * 1. **Bibliography**
 | **Required reading** | 1.Ganong W.F.: Review of Medical Physiology, Lange Medical Book, McGraw-Hill, 2019 ISBN: 1260122409 |
|  **Further reading** | 2.Guyton A.C.: Textbook of Medical Physiology, Saunders, 14th ed., 2020 ISBN 9780323597128 |

1. **Objectives, syllabus CONTENT and intended teaching outcomes**

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| * 1. **Course objectives *(including all forms of classes)***

**Physiology**- it is the study of phenomena, reactions, actions, mechanisms and laws of life. Not only does it explain individual molecular functions of subcellular structures, cells, tissues, organs and systems but it also explains how they depend on each other throughout the body. **The aim of the course:**1. Learn the basics of general human physiology including elementary aspects of cell physiology.
2. Enable to understand the principles of functioning of the human organism by developing habit of scientific thinking as well as logical interpretation of the facts.

**The aim is accomplished by:**1. Assimilation of theoretical information about the functions of individual organs and systems.
2. Assessment and interpretation of the outcomes of, conducted by the students, experiments as well as practical classes.

Independent computer work using interactive programs of the physiology of the nervous system, muscular, cardiovascular, respiratory, renal, acid-base balance and water-electrolyte, endocrine and digestive systems as well as multimedia computer simulation, experimental and laboratory programs. |

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| * 1. **Detailed syllabus *(including all forms of classes)***

**Interactive lectures with presentation of the clinical cases: 60 hours****I semester lectures - 30 hours (5 hours e-learning)****1.Cardiovascular system:** Cardiac Muscle. The Heart as a Pump and Function of the Heart Valves. Resting and functional potential of cardiomyocytes. Action potential of complex conducting tissue. 4 h **2.**Physiological basis of electrocardiography 4 h **3.** Normal electrocardiogram 5 h 4.Myocardial contraction. Cardiac cycle. Regulation of heart activity 3 h e-learning 5. [Overview of the Circulation; Biophysics of Pressure, Flow, and Resistance](https://evolve.elsevier.com/objects/elr/Guyton/physiology12e/PPT/Chapter_14.ppt). [Functions of the Arterial and Venous Systems](https://evolve.elsevier.com/objects/elr/Guyton/physiology12e/PPT/Chapter_15.ppt). The Microcirculation and Lymphatic System. 2h e-learning6. Test from lectures – cardiovascular system 2 h7 .**The Nervous System:** General Principles and Sensory Physiology. Organization of the Nervous System, Basic Functions of Synapses, and Neurotransmitters Sensory Receptors. 5 h 8. The Nervous System:Muscle. Regulation of motor functions. 4 h 9. Test from lectures – nervous system 1 h **II semester lectures - 30 hours (5 hours e-learning)**1. **The Body Fluids and Kidneys.** Water-mineral balance5h
2. **Hematology.** Physiology of hematopoietic system**.** Red blood cells.White blood cells.3h e-learning
3. Hematopoietic system. Platelets. Haemostasis 2h e-learning
4. **Sports Physiology.** Adaptive physiology. 2h
5. **Respiratory system**. Mechanism of breathing. 3h
6. **Gastrointestinal Physiology**. [General Principles of Gastrointestinal Function: gastrointestinal motility. 3 h](https://evolve.elsevier.com/objects/elr/Guyton/physiology12e/PPT/Chapter_62.ppt)
7. Secretory functions of the digestive glands. Liver function 2 h
8. **Endocrinology and Reproduction**. Introduction to Endocrinology. Pituitary Hormones and Their Control by the Hypothalamus. 4 h
9. Thyroid Metabolic Hormones. Adrenocortical Hormones (pancreatic hormones) 4h
10. Exam II semester 2h dr Maciej Polewczyk

**Classes: 50 hours + 50 hours** **I semester 25 hours** **Classes (5 hours e-learning)** 1. **Cardiovascular system** Cardiac electrophysiology. Electrocardiography. 5h e-learning
2. Systolic myocardial function. 3 h
3. Blood and body fluids circulation. Cardiovascular control Blood and body fluids circulation.

 Cardiovascular control. 3h 1. Regulation of the circulation in the different organs and functional status of the organism 2 h
2. **Nervous system.** Physiology of the nerve cell. Functional potential of the nerve cell. Conductivity in synapses and neuromuscular junction. 3 h
3. Muscles. 3h
4. Reflexes. The somatosensory feeling. The regulation of motor functions. 2 h
5. The autonomic nervous system. The organ of sight, hearing, balance, taste, smell. 2h
6. Exam including classes material in the field of cardiovascular system. 1 h
7. Exam including classes material in the field of nervous system 1 h

**II semester 25 hours Classes (5 hours e-learning)** 1. **Nephrology.** The physiology of the kidney 3 h
2. The acid-base and water-electrolyte balance 2 h
3. **Hematology.** Blood components and the functions of the cellular elements. Blood groups. Haemostasis 3h
4. **Physical exertion** 2 h e-learning
5. Exam including classes material in the field of kidney and hematology 1 h + 1h
6. **Respiration.** Function of respiratory system. 3 h e-learning
7. Genesis of the respiratory rhythm and regulation of breathing 2h
8. **The digestive system**. Motor action, digestion, absorption. The energy balance of the body 3
9. **The hormonal system**: Hypothalamus. Hypophysis. Pancreas. Thyroid. Adrenal cortex. The adrenal medulla. Calcium homeostasis. Sex hormones. 4h
10. A written exam including classes material in the field of digestive system and hormonal system 1h

**Laboratory : 60 hours****I semester 30 hours Laboratory (5 hours e-learning)**1. Electrophysiology of the heart. ECG- practical aspects 6h
2. Practical assessment of systolic function of the heart and hemodynamic cycle 6h
3. Circulation of the blood and organ’s fluid 5h e- learning
4. Practical aspect of physiology of the nerve cells. The assessment of the conductivity in the neuromuscular junctions.5h
5. Muscles- examinations of sensation and reflexions- 4 h
6. The autonomic nervous system- examination of vision and hearing 4h

 **II semester 30 hours Laboratory (5 hour e-learning)** 1. Kidney. The acid-base and water-electrolyte balance- practical assessment 6h
2. Blood components. Main functions of morphotic elements 5 h
3. Respiratory system- genesis of the rhythm of respiration 5h e-learning
4. Respiratory system- spirometry 2h
5. Digestive system. Practical knowledge of the digestion mechanisms and gastrointestinal hormones 6h
6. Hormonal system- diagnostic aspect. Reproductive system. 6 h
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**4.3 Education outcomes in the discipline**

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| **Code** | **A student, who passed the course** | **Relation to teaching****outcomes** |
| within the scope of **knowledge**the graduate knows and understands : |
| **W 1** | basic cellular structures and their functional specifications; | A.W4. |
| **W 2** | the water and electrolyte balance in biological systems;  | B. W1 |
| **W 3** | acid-base homeostasis and mechanisms of buffers and their significance in systemic homeostasis; | B.W2. |
| **W 4** | the concepts of: solubility, osmotic pressure, isotonia, colloidal solutions and Gibbs-Donnan effect; | B.W3. |
| **W 5** | the physical, chemical and molecular basis of how the organs of the senses function;  | B.W7. |
| **W 6** | the metabolic profiles of basic organs and systems; | B.W16. |
| **W 7** | the influence of the oxidative stress on cells and its importance in the pathogenesis of diseases and in aging processes; | C.W47. |
| **W 8** | the enzymes involved in digestion, the mechanism of production of hydrochloric acid in the stomach, the role of bile, the course of absorption of the products of digestion; | C.W49 |
| **W 9** | the consequences of inadequate nutrition, including long-term starvation, taking too large meals and the use of unbalanced diet as well as digestive disorders and malabsorption; | C.W50 |
| **W 10** | the consequences of vitamins or minerals deficiency and their excess in the body; | C.W48. |
| **W 11** | the processes such as: cell cycle, proliferation, differentiation, and cell aging, apoptosis and necrosis, and their importance for the functioning of the body; | B.W18. |
| **W 12** | basic problems concerning stem cells and their use in medicine;  | B.W19. |
| **W 13** | basic principles of stimulation and conduction in the nervous system and higher nervous functions, as well as physiology of striated and smooth muscles and functions of blood; | B.W20. |
| **W 14** | the functions and mechanisms of regulation of all organs and systems of the human body, including the circulatory, respiratory, digestive, and urinary systems as well as skins and the dependence between them; | B.W21. |
| **W 15** | the mechanism of hormones’ functioning;  | C.W51. |
| **W 16** |  the reproductive function in women and men; | B.W22. |
| **W 17** |  the mechanisms of aging; | B.W23. |
| **W 18** | the basic quantitative parameters describing the performance of individual systems and organs, including the range of norms and demographic factors affecting the value of these parameters;  | B.W24. |
| **W 19** | the relationship between the factors that disrupt the equilibrium of biological processes and physiological and pathophysiological changes; | B.W25. |
| **W 20** | the genetics of blood groups and serological conflict in Rh system; | C.W6. |
| within the scope of **ABILITIES**the graduate knows how to**:** |
| **U1.** | operate the optical microscope, also making use of immersion, | A.U1. |
| **U2.** | describe changes in the functioning of the organism in case of disruption of homeostasis, in particular determines its integrated response to exercise, exposure to high and low temperature, loss of blood or water, sudden vertical position, transition from sleep to wakefulness. | C.U20.  |
| **U3.** | perform a simple function tests evaluating the human body as a system stable regulation (stress tests); interprets the figures on the basic physiological variables; | B.U7. |
| **U4.** | apply basic laboratory techniques, such as: qualitative analysis, titration, colorimetry, pehametry, chromatography, electrophoresis of proteins and nucleic acids; | B.U8. |
| **U5.** | operate simple measuring instruments and evaluates the accuracy of measurements; | B.U9. |
|  | within the scope of **SOCIAL COMPETENCE**, the graduate is able to: |  |
| K01 | establish and maintain deep and respectful contact with the patient and show understanding towards ideological and cultural differences;  | H.S1 |
| K02 | do what is right for the patient; | H.S2 |
| K03 | respect medical confidentiality and patient’s rights; | H.S3 |
| K04 | take actions concerning the patient on the basis of ethical principles, being aware of social conditions and restrictions resulting from illness; | H.S4 |
| K05 | recognize his/her own limitations and self-evaluate educational deficiencies and needs; | H.S5 |
| K06 | promote healthy lifestyle; | H.S6 |
| K07 | use reliable information sources; | H.S7 |
| K08 | conclude on the basis of own surveys and observations; | H.S8 |
| K09 | introduce rules of social conduct and teamwork to the group of specialists, including specialists form other medical professions also in the multicultural and multinational environment; | H.S9 |
| K10 | give opinions concerning various aspects of professional activity; | H.S10 |
| K11 | take responsibility for own decisions made during professional activities including own safety and safety of otherpeople; | H.S11 |

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| **Methods of assessment of the intended teaching outcomes** |
| **Teaching** **outcomes*****(code)*** | **Method of assessment (+/-)** |
| **Written exam -test\*** | **Test\*** | **Project\*Prezentation** | **Effort** **in class\*-discussion** | **Practical test\*** | **Group work\*** | **Others\*Attendance** | **Others****Observation** |
| ***Form of classes*** | ***Form of classes*** | ***Form of classes*** | ***Form of classes*** | ***Form of classes*** | ***Form of classes*** | ***Form of classes*** | ***Form of classes*** |
| *L* | *C* | *...* | *L* | *C* | *Lab* | *L* | *C* | *...* | *L* | *C* | *Lab.* | *L* | *C* | *Lab.* | *L* | *C* | *...* | *L* | *C* | *Lab* | *L/C/Lab* |
| W 1 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W 2 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W 3 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W 4 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W 5 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W 9 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W10. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W11 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W12. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W13 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W14. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W16. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W17 | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W18. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W19. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W20. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W 21. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W22. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W23. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W24. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| W25. | ***+*** | ***+*** |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |  |
| U01 | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  | ***+*** | ***+*** | ***+*** |  |
| U02 | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  | ***+*** | ***+*** | ***+*** |  |
| U03 | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  | ***+*** | ***+*** | ***+*** |  |
| U04 | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  | ***+*** | ***+*** | ***+*** |  |
| U05 | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  |  |  | ***+*** | ***+*** | ***+*** |  |
| K01K11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** |

***\*delete as appropriate***

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| * 1. **Criteria of assessment of the intended teaching outcomes**
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| **Form of classes** | **Grade** | **Criterion of assessment** |
|  **lecture (L)** | **3** | From 61%-68% correct test answers |
| **3,5** | From 69%-76% correct test answers |
| **4** | From 77%-84% correct test answers |
| **4,5** | From 85%-92% correct test answers |
| **5** | From 93% -100% correct test answers |
| **classes (C)\*** | **3** | From 61%-68% learning programme content on the basic level, replies chaotic, leading questions necessary.  |
| **3,5** | From 69%-76% learning programme content on the basic level, answers systematized, requires assistance from the teacher. |
| **4** | From 77%-84% learning programme content on the basic level, answers systematized, independent. Solving of problems in typical situations. |
| **4,5** | From 85%-92% the scope of presented knowledge exceeds the basic level based on the supplementary literature provided. Solving of problems in new complex situations. |
| **5** | From 93% -100% the scope of presented knowledge exceeds the basic level based on independently acquired scientific sources of information. |
| **laboratories\*** | **3** | From 61%-68% learning programme content on the basic level, replies chaotic, leading questions necessary.  |
| **3,5** | From 69%-76% learning programme content on the basic level, answers systematized, requires assistance from the teacher. |
| **4** | From 77%-84% learning programme content on the basic level, answers systematized, independent. Solving of problems in typical situations. |
| **4,5** | From 85%-92% the scope of presented knowledge exceeds the basic level based on the supplementary literature provided. Solving of problems in new complex situations. |
| **5** | From 93% -100% the scope of presented knowledge exceeds the basic level based on independently acquired scientific sources of information. |

* [**Thresholds**](https://pl.bab.la/slownik/angielski-polski/thresholds) **are valid from 2018/ 2019 academic year**
1. **BALANCE OF ECTS CREDITS – STUDENT’S WORK INPUT**

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| **Category** | **Student's workload** |
| **Full-time****studies** |
| *NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/* | **170** |
| *Participation in lectures\** | **50** |
| *Participation in classes, seminars, laboratories\** | **90** |
| *Preparation in the exam/ final test\** |  |
| *Others\** | **301** |
| *INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/* | **230** |
| *Preparation for the lecture\** | **60** |
| *Preparation for the classes, seminars, laboratories\** | **135** |
| *Preparation for the exam/test\** | **35** |
| *Gathering materials for the project/Internet query\** |  |
| *Preparation of multimedia presentation* |  |
| *Others\** |  |
| *TOTAL NUMBER OF HOURS* | **400** |
| ECTS credits for the course of study | **16** |

1 e-learning (without participation of the lecturer)

***Accepted for execution*** *(date and signatures of the teachers running the course in the given academic year)*

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