COURSE DESCRIPTION CHART

Discipline code	12.6-3LEK-B2.5-FzC	
Name of discipline	Polish	Fizjologia z cytofizjologią
	English	**Physiology and cytophysiology**

1. POSITION OF DISCIPLINE IN THE STUDY SYSTEM

1.1. Study speciality	medicine
1.2. Form of study	Full-time
1.3. Level of study	Uniform Master's studies
1.4. Profile of study	Practical
1.5. Specialization	lack
1.6. Unit conducting the discipline	Faculty of Medicine and Health Sciences
1.7. Person preparing course description chart	dr hab. prof. UJK Anna Polewczyk prof. dr. hab. n. med. Robert Bucki
1.8. Person responsible for the discipline	dr hab. prof. UJK Anna Polewczyk
1.9. Person conducting the discipline	lek med Michalina Zagańczyk-Bączek dr hab. prof. UJK Anna Polewczyk lek med. Maciej Polewczyk dr n. med. Iwona Pałyga
1.10. Contact	AnnaPolewczyk@wp.pl

2. GENERAL CHARACTERISTICS OF THE DISCIPLINE

2.1. Affiliation to module	Scientific basis of medicine
2.2. Status of discipline	mandatory
2.3. Language of tuition	English
2.4. Semesters for performance of the discipline	3rd and 4th semester;
2.5. Preliminary requirements	Anatomy, Histology

3. FORMS, WAYS AND METHODS OF CONDUCTING CLASSES

3.1. Types of classes		LECTURE : 50 ,CLASSES – 90, LABORATORIES- 50
3.2. Way of conducting classes		Lecture /Classes/ Laboratories - Courses in the teaching rooms of the UJK
3.3. Way of obtaining credits for classes		LECTURE –exam, CLASSES – credit with grade, Laboratories - credit with grade
3.4.Didactic methods		Practical classes, conversational lecture, discussion. Computer programmes provided in the scope of Physiology classes
3.5 List of literature	**basic**	**1.Ganong W.F.: Review of Medical Physiology, Lange Medical Book, 21st ed., 2003, ISBN 0071402365**
	supplementary	**2.Guyton A.C.: Textbook of Medical Physiology, Saunders, 10th ed., 2000, ISBN 072168677**

4. AIMS, PROGRAMME CONTENT AND EDUCATION OUTCOMES

4.1. Aims

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.
3. 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.

4.2. Programme content

Lectures: 50 hours

I semester lectures - 25 hours

1. **Membrane Physiology, Nerve, and Muscle.** Transport of Substances Through Cell Membranes. Membrane Potentials and Action Potentials. Contraction of Skeletal Muscle Excitation of Skeletal Muscle: Neuromuscular Transmission and Excitation-Contraction Coupling. Excitation and Contraction of Smooth Muscle
2. **The Nervous System:** General Principles and Sensory Physiology. Organization of the Nervous System, Basic Functions of Synapses, and Neurotransmitters Sensory Receptors, Neuronal Circuits for Processing Information. Somatic Sensations: I. General Organization, the Tactile and Position Senses Somatic Sensations.
3. **The Nervous System**. The Special Senses. The Eye-Receptor and Neural Function of the Retina. Central Neurophysiology of Vision The Sense of Hearing The Chemical Senses Taste and Smell.
4. **The Nervous System: Motor and Integrative Neurophysiology.** Motor Functions of the Spinal Cord; the Cord Reflexes . Cortical and Brain Stem Control of Motor Function. Contributions of the Cerebellum and Basal Ganglia to Overall Motor Control. Cerebral Cortex, Intellectual Functions of the Brain, Learning, and Memory. Behavioral and Motivational Mechanisms of the Brain—The Limbic System and the Hypothalamus. States of Brain Activity—Sleep, Brain Waves, Epilepsy, Psychoses. The Autonomic Nervous System and the Adrenal Medulla. Cerebral Blood Flow, Cerebrospinal Fluid, and Brain Metabolism
5. **Cardiac Muscle;** The Heart as a Pump and Function of the Heart Valves. Rhythmical Excitation of the Heart. The Normal Electrocardiogram
6. **The Circulation.** Overview of the Circulation; Biophysics of Pressure, Flow, and Resistance. Vascular Distensibility and Functions of the Arterial and Venous Systems. The Microcirculation and Lymphatic System: Capillary Fluid Exchange, Interstitial Fluid, and Lymph Flow.
7. **Local and Humoral Control of Tissue Blood Flow**. Local and Humoral Control of Tissue Blood Flow. Nervous Regulation of the Circulation, and Rapid Control of Arterial Pressure. Role of the Kidneys in Long-Term Control of Arterial Pressure and in Hypertension: The Integrated System for Arterial Pressure Regulation. Cardiac Output, Venous Return, and Their Regulation.
8. Written test – 1st semester

II semester lectures - 25 hours

1. **Blood Cells, Immunity, and Blood Coagulation** Red Blood Cells, Anemia, and Polycythemia. Resistance of the Body to Infection: I. Leukocytes, Granulocytes, the Monocyte- Macrophage System, and Inflammation. Resistance of the Body to Infection: II. Immunity and Allergy Innate Immunity. Blood Types; Transfusion; Tissue and Organ Transplantation, Hemostasis and Blood Coagulation
2. **Respiration.** Pulmonary Ventilation. Pulmonary Circulation, Pulmonary Edema, Pleural Fluid. Physical Principles of Gas Exchange; Diffusion of Oxygen and Carbon Dioxide Through the Respiratory Membrane. Transport of Oxygen and Carbon Dioxide in Blood and Tissue Fluids. Regulation of Respiration. Respiratory Insufficiency—Pathophysiology, Diagnosis, Oxygen Therapy.
3. **The Body Fluids and Kidneys** The Body Fluid Compartments: Extracellular and Intracellular Fluids; EdemaUrine Formation by the Kidneys: I. Glomerular Filtration, Renal Blood Flow, and Their Control Urine Formation by the Kidneys: II. Tubular Reabsorption and Secretion Urine Concentration and Dilution; Regulation of Extracellular Fluid Osmolarity and Sodium Concentration Renal Regulation of Potassium, Calcium, Phosphate, and Magnesium; Integration of Renal Mechanisms for Control of Blood Volume and Extracellular Fluid Volume Acid-Base Regulation Diuretics, Kidney Diseases
4. **Gastrointestinal Physiology**. General Principles of Gastrointestinal Function—Motility, Nervous Control, and Blood Circulation. Propulsion and Mixing of Food in the Alimentary Tract. Secretory Functions of the Alimentary Tract. Digestion and Absorption in the Gastrointestinal Tract. Physiology of Gastrointestinal Disorders
5. **Endocrinology and Reproduction.** Introduction to Endocrinology. Pituitary Hormones and Their Control by the Hypothalamus. Thyroid Metabolic Hormones. Adrenocortical Hormones. Insulin, Glucagon, and

Diabetes Mellitus. Parathyroid Hormone, Calcitonin, Calcium and Phosphate Metabolism, Vitamin D, Bone, and Teeth.Reproductive and Hormonal Functions of the Male (and Function of the Pineal Gland). Female Physiology Before Pregnancy and Female Hormones. Pregnancy and Lactation. Fetal and Neonatal Physiology.

6. **Sports Physiology.**
7. **Exam**

Classes: 90 hours

I semester 45 hours Classes

1. Physiology of the nerve cell. Functional potential of the nerve cell. Conductivity in synapses and neuromuscular junction . Muscles. Reflexes. The somatosensory feeling. The regulation of motor functions.
2. The autonomic nervous system. The organ of sight, hearing, balance, taste, smell.
3. A written exam including classes material in the field of neurophysiology.
4. Cardiac electrophysiology.Electrocardiography.
5. Systolic myocardial function.
6. Blood and body fluids circulation. Cardiovascular control Blood and body fluids circulation. Cardiovascular control.
7. A written exam including classes material in the field of electrophysiology.

II semester 45 hours Classes

1. Blood components and the functions of the cellular elements. Blood groups. Haemostasis. Immunity
2. Function of respiratory system
3. The physiology of the kidney. The acid-base and water-electrolyte balance.
4. A written test covering classes material in the field of physiology of blood, respiratory system, kidney.
5. The digestive system. Motor action, digestion, absorption. The energy balance of the body.
6. The hormonal system: Hypothalamus. Hypophysis. Pancreas. Thyroid. Adrenal cortex. The adrenal medulla. Calcium homeostasis. Sex hormones.
7. Physical exertion.
8. A written exam including classes material in the field of digestive system, hormonal system and ophysical exertion

Laboratory : 50 hours

I semester 25 hours Laboratory

1. Practical aspect of physiology of the nerve cells . The assesment of the conductivity in the neuromuscular junctions. The examination of the reflexes and the somatosensory feeling.
2. The autonomic nervous system- examination of vision and hearing
3. An exam including laboratory material in the field of neurophysiology.
4. Electrophysiology of the heart. ECG- practical aspects

II semester 25 hours Laboratory

1. Blood components and the functions of the cellular elements. Blood groups. Interpretation of the results.
2. An exam including laboratory material in the field of cardiology and blood functions.
3. The acid-base and water-electrolyte balance- practical assesment.
4. Digestive system. The assessment of the amount of energy generated by the body in the diet (a composition of a sample diet) as well as the amount of energy expended by the body.
5. Hormonal system- diagnostic aspect.
6. An exam including laboratory material in the field of the acid-base and water-electrolyte balance- digestive system and hormonal system

4.3. Education outcomes in the discipline

Code	Student who obtained credit	Degree of saturation of outcome in discipline 1 [+] [++] [+++]	Reference to education outcomes	
			For disicpline	For area/ standard
Within the scope of **KNOWLEDGE:**				
W 1	knows basic cellular structures and their functional specifications;	+++	A.W4.	
W 2	describes the water and electrolyte balance in biological systems;	+++	B. W1	
W 3	describes acid-base homeostasis and mechanisms of buffers and their significance in systemic homeostasis;	+++	B.W2.	
W 4	knows and understands the concepts of solubility, osmotic pressure, isotonia, colloidal solutions and Gibbs-Donnan effect;	+++	B.W3.	
W 5	knows the physical, chemical and molecular basis of how the organs of the senses function;	+++	B.W7.	
W 6	characterizes the protein primary, secondary, tertiary and quaternary structures; knows the post-translational and functional protein modifications and their significance;	++	B.W12.	
W 7	knows the functions of nucleotides in the cell, RNA and DNA primary structure as well as chromatin structure;	++	B.W13.	
W 8	knows the functions of the human genome, transcriptome and proteome and basic methods used in their study; describes the processes of replication, repair and recombination of DNA, transcription and translation and degradation of DNA, RNA and proteins; knows the concept of the regulation of gene expression	++	B.W14.	
W 9	describes basic catabolic and anabolic pathways, methods of their regulation and the influence of genetic and environmental factors	++	B.W15.	
W10.	knows the metabolic profiles of basic organs and systems;	++	B.W16.	
W11	knows the concepts of oxidation potential of the organism and oxidative stress;	+++	B.W17.	
W12.	know 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 and disorders associated with them	+++	B.W18.	
W13	Knows the consequences of poor nutrition including long-term starvation, taking too large meals and the use of unbalanced diet.	++	B.W19.	
W14.	Knows the consequences of deficiency of vitamins or minerals, as well as their excess in the body.	++	B.W20.	
W15	Knows the methods of communication between the cells, between the cell and the extracellular matrix as well as transduction pathways of signal in the cell and the examples in these processes leading to the development of tumors and other diseases.	++	B.W21.	
W16.	knows the processes such as cell cycle, proliferation, differentiation, and cell aging, apoptosis and necrosis, and their importance for the functioning of the body;	++	B.W22.	
W17	knows basic problems concerning stem cells and their	++	B.W23.	

	use in medicine;			
W18.	knows 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.W24.	
W19.	knows 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 understands the dependence between them;	+++	B.W25.	
W20.	knows the mechanism of hormones' functioning and the consequences of disorders of hormonal regulation;	+++	B.W26.	
W 21.	knows the reproductive function in women and men;	+++	B.W27.	
W22.	knows the mechanisms of aging;	+++	B.W28.	
W23.	knows 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.W29.	
W24.	knows the relationship between the factors that disrupt the equilibrium of biological processes and physiological and pathophysiological changes;	++	B.W30.	
W25.	knows the genetics of blood groups and serological conflict in Rh system	++	C.W6.	
Within the scope of **SKILLS:**				
U1.	operates the optical microscope, also making use of immersion;	++	A.U1.	
U2.	describes 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;	+++	B.U7.	
U3.	performs a simple function tests evaluating the human body as a system stable regulation (stress tests); interprets the figures on the basic physiological variables;	+++	B.U8.	
U4.	applies basic laboratory techniques, such as: qualitative analysis, titration, colorimetry, pehametry, chromatography, electrophoresis of proteins and nucleic acids;	+++	B.U9.	
U5.	operates simple measuring instruments and evaluates the accuracy of measurements;	+++	B.U10.	

a. Criteria for evaluation of obtained education outcomes				
Grade 3	**Grade 3,5**	**Grade 4**	**Grade 4,5**	**Grade 5**
lecture				
Learning programme content on the basic level, replies chaotic, leading questions necessary.	Learning programme content on the basic level, answers systematized, requires assistance from the teacher.	Learning programme content on the basic level, answers systematized, independent. Solving of problems in typical situations. .	The scope of presented knowledge exceeds the basic level based on the supplementary literature provided. Solving of problems in new complex situations	The scope of presented knowledge exceeds the basic level based on independently acquired scientific sources of

				information.
Classes/ practical classes/laboratories				
From 50% Learning programme content on the basic level, replies chaotic, leading questions necessary. .	From 62,5% Learning programme content on the basic level, answers systematized, requires assistance from the teacher.	Od 75% Learning programme content on the basic level, answers systematized, independent. Solving of problems in typical situations.	Od 82,5% The scope of presented knowledge exceeds the basic level based on the supplementary literature provided. Solving of problems in new complex situations	Od 90% The scope of presented knowledge exceeds the basic level based on independently acquired scientific sources of information.

Conditions for obtaining credit:

1. Condition for admission to the examination is the completion of all classes (including written tests) as well as presence in all lectures.
2. Practical and theoretical knowledge required, not only the current subject, but also aspects previously discussed and related to the course subject.
3. All students will be assessed during each class.
4. The grade, including insufficient can be improved only once within 14 days, during subsequent classes. Test correction will be performed within two weeks.
5. Study Regulations do not allow an unexcused absence. An unexcused absence can be fulfilled during next class.
6. The assistant conducting classes with the group of students is responsible for the above mentioned organizational matters.
7. A final written exam.

Criteria for evaluation of oral answer

1. Provision of a comprehensive answer to the problem (task)
2. Skill of integration of knowledge from allied domains (disciplines)
3. Independence and/or creativity in the presentation of the scope of problems, proposals of solutions
4. Presentation of the current knowledge related with the discipline (domain)
5. Recognition of problems resulting from the task

Criteria for evaluation of written answer

1. Compliance with the essence of the subject matter of work (task) /
2. Provision of a comprehensive answer to the problem (task) /
3. Skill of integration of knowledge from allied domains (disciplines) /
4. Independence and/or creativity in the presentation of the scope of problems
5. Presentation of the current knowledge related with the discipline (domain), pertinent selection of literature.

b Evaluation methods							
Oral examination	**Written examination**	**Project**	**Colloquium - with grade**	**Homework**	**Presentation report**	**Discussions**	**Others**
	X		X			X	

5. TOTAL ECTS CREDIT POINTS – STUDENT'S WORK LOAD

Category	Student's work load
	Full-time study
Participation in didactic classes specified in the study plan (contact hours)	**190**
- Participation in lectures	**50**
- Participation in classes, discussion sessions, laboratories, etc.	**140**
Participation in consultations/ PRACTICAL CLASSES	
Preparation for examination/participation in examination, final test, etc.	
Others	
Independent student's work (non-contact hours)	**210**
Preparation for lecture	**20**
Preparation for classes, discussion sessions, laboratory, etc.	**155**
Preparation for examination/colloquium	**35**
Collection of material for the project, web query	
Elaboration of multimedia presentation	
Preparation of entry for wikipedia	
Others	
Total number of hours	**400**
ECTS credit points for discipline	**16**