

Level: bachelor
Course title: Basics of Cell Physiology and Biology
Status: obligatory/elective
ECTS: 4
Requirements: none
Learning objectives Introducing students to the basis of functioning of the cells and organs, and the systems of organs and aspects of their organisation in complex functional systems.
Learning outcomes Student will learn about mechanisms of cell and organs function especially when the cell is exposed to various diagnostic methods like ultrasound imagining, MRI, EEC, ECG, EMG, PET. Student will be able to explain which cells and organs take part in the interaction with mechanical waves (sound and ultrasound) and electromagnetic waves (IC and UV radiation), as well as in the thermodynamic, transport and bioelectrical processes.
Syllabus <i>Theoretical instruction</i> Introduction to Physiology: Functional organisation of human body and control of homeostasis. Cells as basic living units of human body and their function. Homeostatic mechanisms of main functional systems. Respiration: Characteristics of gases. Ventilation. Lung volume and capacity. Physiological characteristics of pulmonary circulations. Transport of gases to the cells. Main and ancillary respiratory musculature. Intrapleural pressure. Regulation of respiration. Kinds and types of respiration. Respiration in the conditions of decreased and increased atmospheric pressure. Blood: Basic characteristics of blood. Blood plasma. Red blood cells. White blood cells. Immunity and immune bodies. Platelets. Coagulation and hemostasis. Blood types. Transfusion and transplantation. Metabolism: Role of nutrients. Minerals and vitamins. Methods of investigation of the metabolism. Respiratory quotient. Basal metabolism. Metabolism in physical activity. Design of the daily menu. Thermoregulation: Mechanisms of maintenance of the temperature balance of the body core. Physical and chemical thermoregulation. Physiological basis of hypo- and hyperthermia. Excitable Tissue: Resting potential. Action potential. Laws of excitation. Accommodation. Laws of excitation polarity. Electrotonus. Polarisation currents. Senses: Senses. Receptors. Vision. Lenses and ophthalmoscopy. Hearing. Equilibrium. Muscle-joint perception. Tactile and thermal perception. Visceroreception. Smell and taste. Pain. Muscles: Neuro – muscular synapses. Mediators and basic mechanisms of synaptic transmission. Types of muscles. Morpho-physiological characteristics of striated muscle. Types of striated muscle actions. Motor unit. Tone and thermogenesis of muscle. Work, power and muscle fatigue. Smooth muscle. <i>Practical instruction</i> Excitable tissue (reobasis, chronaction, useful time, anelectrotone, catelectrotone, polarization current, Pflüger laws). Muscles (basic and complex muscle contraction, summation, influence of intensity of stimuli on the size of muscle contraction, maximal muscle contraction with different loads, ergography, influence of temperature and fatigue on muscle contraction). Breathing (model of the ribs, Donders model, spirometry, spirometry, pneumography, forced spirometry, air content). Digestion (digestion in the mouth, digestion in the stomach). Heart and the circulation (heart regulation, ECG, measurement of the blood pressure, auscultation, polycardiography, capillaries). Blood (plasma buffers, sedimentation,

hematocrit, hemolysis, red blood and white blood cell count, white blood cell formula, time of coagulation and bleeding).

Senses (examination of the eyes, ears and hearing, balance, surface and deep sensibility).

CNS (spinal reflexes of the decapitated frog, spinal shock, testing of the reflex arc, examination of the reflexes of clinical significance, EEG, neuronal activity, EMNG, EP, reaction.)

Weekly teaching load				Other:
Lectures: 3	Exercises: 2	Other forms of teaching:	Student research:	