**Physiology Teaching Program of Lectures**

**second semester, first - year ELE students of medicine**

**2017/2018 academic year**

**(2 academic hours per week)**

1. Introduction to Physiology. Principles of control and regulation in the human body. Homeostasis. Function of the cell membrane. Transport through the cell membrane - passive and active transport. Transport through cellular sheets.

2. Excitable tissues. Resting membrane potential. Nerve action potentials. Propagation of the action potential.

3. Mechanisms of cell-to-cell signaling. Synaptic transmission. Functional anatomy. Chemical transmission of synaptic activity. Chemical substances - synaptic transmitters.

4. Skeletal muscle. Physiological anatomy of skeletal muscle. Mechanism of muscle contraction. Motor unit. Characteristics of whole skeletal muscle contraction. Length – tension and force – velocity curve.

5. Energy of muscle contraction. Smooth muscle. Types of smooth muscle. Morphology and function.

6. Cardio-vascular system. Cardiac muscle, morphology and function. Electrical activity of the heart. Electrocardiogram /ECG/.

7. Cardiac cycle. Function of the valves. Work output of the heart. Heart sounds. Intrinsic and extrinsic regulation of myocardial performance.

8. The circulation. Physical characteristics of the circulation. Dynamic of blood pressure, flow and resistance. Microcirculation. Veins and their functions.

9. Neuronal regulation of the circulation. Rapid control of the arterial pressure. Long-term regulation of arterial pressure. Circulation through special regions.

10. Blood components. Functional role of plasma proteins. Blood components. Red blood cells, hemoglobin. Hemopoiesis. Blood groups.

11. Resistance of the body to infection. Leukocytes. Hemostasis and blood coagulation.

12. Respiration. Pleural and alveolar pressure. Compliance of the lungs. Surfactant. Lung volumes and capacities. Pulmonary and alveolar ventilation.  Physical principles of gas exchange. Gas exchange through respiratory membrane. Gas transport between the lungs and tissues.

13. Regulation of respiration. Control of breathing - central organization of breathing, chemoreceptor control of breathing, chemical control of breathing. Effects of high altitude and sea diving physiology.

14. General principles of gastrointestinal tract. Neuronal and hormonal control of functions, blood flow. Propulsion and mixing of food in the alimentary tract. Secretory functions of the alimentary tract.

15. Digestion and absorption in the gastrointestinal tract. Functions of the liver. Physiology of gastrointestinal disorders.

**Physiology Teaching Program of Lectures**

**Third semester, second year - ELE students of medicine**

**2017/2018academic year**

**(3 academic hours per week)**

1. Metabolism of carbohydrates, and formation of adenosine triphosphate. Lipid and protein metabolism and their regulation. Energetics and metabolic rate. Body temperature regulation
2. Urine formation by the kidneys. Glomerular filtration, renal blood flow and their control. Tubular reabsorption and secretion. Urine concentration and dilution. Micturition
3. The body fluid compartments: extracellular and intracellular fluids. Regulation of the fluid volume and osmolarity – renal and hormonal control. Acid-base regulation
4. Introduction to endocrinology – chemical structure, synthesis, secretion, transport, and mechanism of action of hormones. Pituitary hormones and their control by the hypothalamus. Thyroid metabolic hormones
5. Insulin, glucagon and diabetes mellitus. Parathyroid hormone, calcitonin, vitamin D - calcium and phosphate metabolism
6. Adrenocortical hormones. Reproductive and hormonal functions of the male
7. Female physiology before pregnancy and female hormones. Pregnancy and lactation.
8. The nervous system: sensory receptors, neural circuits for processing information. Somatic sensations: general organization, the tactile and position senses, pain and thermal sensation
9. The eye: optics and vision, receptor and neural function of the retina. Central neurophysiology of vision
10. The sense of hearing. The chemical senses – taste and smell
11. The nervous system. Motor functions of the spinal cord. The cord reflexes. Cortical and brain stem control of motor function
12. Vestibular sensations and maintenance of equilibrium. Motor control by the cerebellum and basal ganglia
13. Cerebral cortex, intellectual functions of the brain, learning and memory. Behavioral and motivational mechanisms of the brain – the limbic system and hypothalamus. States of brain activity – sleep, brain waves
14. The autonomic nervous system and the adrenal medulla
15. Sports physiology. Changes in the organism during exercises