

Study program: Integrated academic studies of Pharmacy				
Type and level of the study program: integrated academic studies				
Course title: Physiology (PhII-PHYSL)				
Teacher: Nada M. Naumović, Damir D. Lukač, Miodrag P. Drapšin, Otto F. Barak, Dea I. Karaba Jakovljević, Jelena Ž. Popadić Gaćeša, Aleksandar V. Klačnja				
Course status: compulsory				
ECTS Credits: 20				
Condition: -				
Course aim Basic goals of education in the field of physiology are introducing students with basis of functioning of organs and systems of organs and aspects of their organisation in complex functional systems.				
Expected outcome of the course: Introduction with basic mechanisms of functioning of different systems of organs and aspects of organisation of regulatory mechanisms of complex homeostatic parameters in the functional systems. Introduction with complex neural and humoral regulatory mechanisms of different functional systems. Students need to learn basic principles and rules of laboratory usage and to get acquainted with principal laboratory procedures. Also, students will be trained to perform daily laboratory routines by themselves. Students will learn to use animal models and animal tissue for demonstration of physiological processes. Students will be trained in detail for sampling and preparation of body liquids (blood, urine) as well as with the methods of basic laboratory analysis used in daily practice (sedimentation, hematocrit, red blood and white blood cell count, white blood cell formula, time of bleeding and coagulation, general and chemical characteristics of urine). Student will learn basic electrophysiological methods (ECG, EEG, EMNG, EP), and will be trained to perform the recordings and explain the basic parameters of the recordings. Student will learn to perform blood pressure measurement and heart auscultation. Also student will learn to determine the respiratory volumes and capacities.				
Course description				
<i>Theoretical education</i>				
1. EXCRETION: Physiology of the kidneys. Ultrastructure of the nephrons. Filtration, secretion and reabsorption in the kidneys.				
2. EXCITABLE TISSUE: Resting potential. Action potential.				
3. ANALYZER: Analyzer. Receptors. Analyzer for vision. And ophthalmoscopy lenses and additional camera eye. Analyzer for the hearing. The vestibular system.				
4. MUSCLES: Neuro – muscular synapses. Mediators and basic mechanisms of synaptic transmission. Types of muscles.				
5. AUTONOMOUS NERVOUS SYSTEM: Sympathetic and parasympathetic nervous system: structure, classification, of the vegetative ganglia and their function, specific mediators.				
6. ENDOCRINOLOGY: Basic characteristics of hormones and methods of investigation of endocrine glands. Thyroid gland. Parathyroid gland. Pancreas. Suprarenal gland. Male and female gonades.				
7. PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM: Neuron. Types of synapsis in CNS. Neuromediators. Neuroglia. Nervous center. Inhibition in CNS. Spinal cord. Medulla oblongata and pons. Reflex function. Functional significance of conductive pathways in medulla oblongata. Theory of sleep.				
8. CONTROL SYSTEMS OF THE HUMAN BODY: Systems theory in physiology, feedback and shunt.				
9. CNS THEORY AND NEURAL NETWORKS: Fundamentals of the theory of neural network applications in the pharmaceutical physiology.				
<i>Practical education: exercises, other forms of education, research related activities</i>				
1. Excretion (chemical composition of urine, urine sediment)				
2. Excitable tissue (anelectrotone, catelectrotone, polarization current, Pflüger lows)				
3. Analyzers (examining superficial and deep sensitivity)				
4. Muscles (maximal muscle contraction with different loads, ergography, influence of temperature and fatigue on muscle contraction)				
5. Vegetative nervous system				
6. Endocrinology. Basic characteristics of hormones and methods of investigation of endocrine glands. Thyroid gland. Parathyroid gland. Pancreas. Suprarenal gland. Male and female gonades.				
7. CNS (testing clinically significant reflexes, EEG, neuron activity, EMNG, EP, reaction time)				
8. Control systems of the human body: systems theory in physiology, feedback and shunt.				
9. CNS theory and neural networks: fundamentals of the theory of neural network applications in the pharmaceutical physiology.				
Literature				
<i>Compulsory</i>				
1. Guyton AC. Textbook of medical Physiology. Esevier, 2016.				
<i>Additional</i>				
2. Despopulos A, Silbernagl S. Color Atlas of Physiology. Thieme, 2009.				
3. Bruce KM. Berne & Levy Physiology. Mosby Elsevier, 2010.				
4. Costanzo LS. Physiology. Elsevier, 2014.				
Number of active classes				Other: -
Lectures: 90	Practice: 60	Other types of teaching: -	Research related activities: -	
Teaching methods: lectures; laboratory work.				
Student activity assessment (maximally 100 points)				
Pre-exam activities	points		Final exam	points
Lectures	15		Written	70
Practices	15		Oral	
Colloquium			
Essay				