

Study program: Integrated academic studies of Medicine
Type and level of the study program: integrated academic studies
Course title: Physiology of sport (M2-PHYSP)
Teacher: Barak F. Oto, Drapšin P. Miodrag, Karaba Jakovljević I. Dea, Klačnja V. Aleksandar
Course status: elective
ECTS Credits: 3
Condition: -
Course aim The basic aim of the course in Sports Medicine is to acquaint students with basics of sports physiology and sports medicine, as well as functional status of organs and organ systems under altered regimens.
Expected outcome of the course: Basic functional mechanisms of different organ systems and organization of regulatory mechanisms of complex homeostatic parameters into functional systems of higher level, induced by continuous diverse physical activities. Students should adopt the general principles and rules of working in sports laboratory. Students should become familiar with basic laboratory procedures of functional testing and acquire skills necessary to perform laboratory tests. Student should get acquainted with the procedures for obtaining blood and urine samples for testing, as well as with methods and basic laboratory analyses of blood and urine commonly performed in sports - clinical practice (sedimentation, hematocrit, erythrocyte count, leukocyte count, differential blood count, lactate concentration, general features and chemical composition of urine). Students will be able to apply basic electrophysiological methods (ECG, EMNG, EP), to gain experience in performing recordings and to recognize the basic parameters recorded. Student should be able to perform measurement of the arterial blood pressure, heart auscultation, to determine the respiratory volumes and capacities (determining oxygen consumption during inactive phase and maximum oxygen consumption VO ₂ max).
Course description <i>Theoretical education</i> MUSCLES: Neuro-muscular synapses. Mediators and basic mechanisms of synaptic transmission. Distribution of muscles. Morpho-physiological characteristics of skeletal muscles. Contractions of skeletal muscles. Motor units. Tonus and thermogenesis. Work, power and muscle fatigue. The physical aspects of work (force, power, work). Smooth muscles. BREATHING: Properties of gases. Ventilation. Lung volumes and capacities. Transport of gases to the cells. Major and auxiliary respiratory musculature. Intrapleural pressure. Regulation of breathing. Forms and types of breathing. Breathing in the condition of decreased and increased atmospheric pressure. BLOOD: Blood plasma. Erythrocytes. Leukocytes. Immunity and immune bodies. Thrombocytes. Blood coagulation and hemostasis. Blood groups. Transfusion and transplantation. BLOOD- AND LYMPHATIC CIRCULATION: Functional distribution of the circulatory system. Morpho-functional features of heart muscle. Hemodynamics of the heart. Conductive system of the heart. Athletes' heart. Recording and analysis of the electrocardiogram. Regulation of cardiac muscle. Exchange at the capillary level. Peripheral circulation. Pulse: definition, types and characteristics. Blood flow in veins. Lymphatic circulation. Neurohumoral mechanisms of regulation of vascular tone. BIOENERGETICS. Energy and the role of nutrients, energy sources in the human body. Anabolism and catabolism. Minerals and vitamins. Methods for measuring energy flow and energy deposition. Respiratory coefficient. Glycogen supercompensation. Lactic acid. Basal metabolism. Energy transfer under workloads. Daily diet composition. HOMEOSTASIS: Regulation of acid - base balance. Chemical and physiological buffers. Glycemic regulation. Regulation of body calcium levels. Regulation of protein metabolism (impact of physical activity on anabolic processes in the body). NERVOUS SYSTEM: Membrane potential. Action potential. Excitation. Neuron. Distribution of synapses in the CNS. Neuromediators. Reflex function. Basal ganglia and the formation of dynamic stereotypes. Cerebellum, the vestibular system, proprioception and their role in balance. Tactile and thermal reception. Visceral reception. Smell and taste reception. Pain perception. Hypothalamus. Limbic brain structures. Cerebral cortex. Sleeping. Learning and memory. Consciousness. ERGOMETRY: Energy capacity and its measurement. "Steady State". Sports training and types of training. STRESS: The theory of stress, stages of stress, stressor. The role of sport and recreation according to the modern theory of functional systems in the perception and adaptation to harmful effects of stress. Overtraining and its implications on functional abilities of athletes. Injuries. Chronobiology and its importance in sports. Circadian rhythm. <i>Practical education: laboratory, other forms of education, research related activities</i> 1. Investigation of functional ability (functional test selection, selection of workload type). 2. Determination of aerobic capacity (determining maximal oxygen uptake, "vita maxima" and "all - out" tests, Astrand test, indirect tests). 3. Determination of anaerobic capacity (Wingate anaerobic test, maximum power, the average power, explosive power, fatigue index; determining oxygen debt and oxygen deficit). 4. Determination of steady states (test selection, heart rate monitoring, monitoring of respiratory parameters, oxygen consumption monitoring). 5. Determination of heart rate (palpation, auscultation, heart rate monitoring by ECG). 6. Measurement of arterial blood pressure. 7. Dynamometry (dynamometry equipment, basic parameters of dynamometric testing of muscular strength, arm flexor strength testing, arm extensor strength testing, leg extensor strength testing). 8. Analysis of body composition - basic anthropometrics measurements (basic instruments - scales, pelvimeter, slide calipers, calipers, centimeter tape; determining of BMI; somatotype determination, calculation of physical constitution by Heath - Carter, determining body fat mass utilizing bioelectrical impedance)
Literature <i>Compulsory</i> 1. Costill D, Wilmore J. Physiology of Sport and Exercise, Human Kinetics 2015.

2. William D, Katch IF, Katch VL. Exercise Physiology. Wolters Cluver,2014.			
Number of active classes			Other: -
Lectures: 30	Practice: 15	Other types of teaching: -	
Teaching methods Lecture. Practical work.			
Student activity assessment (maximally 100 points)			
Pre-exam activities	points	Final exam	points
Lectures	20	Written	60
Practices	20	Oral	
Colloquium		
Essay			