

Code: MFSE 0301	Course title: Human Physiology 1		
Level: preclinical	Study year: II	Semester: III	ECTS: 10
Status: obligatory	Total contact hours: 100		
Prerequisites:	According to the study regulations		
Lecturers: Professors and associates involved in the implementation of the course in accordance with the plan of the teaching process			
1. Overall aim	The overall aim of the Human Physiology 1 Course is to increase understanding of the fundamental mechanisms of cellular and organ systems functioning and its regulations under normal physiological conditions.		
2. Course contents	The following topics will be covered within the Modules: Module 1. Introduction to human physiology Module 2. Cell membrane physiology Module 3. Excitable tissues physiology Module 4. Cardiovascular physiology 4.1. Heart 4.2. Circulation Module 5. Respiratory physiology		
3. Learning outcomes (knowledge, skills and competences)	<p>Students will acquire knowledge necessary to understand the normal functioning of the body, which is basis for further successful following of medical program and their future independent work.</p> <p>They will be able to understand human body functioning mechanisms, starting from molecular through cellular to organ level. Finally, all processes will be integrated at the level of the entire organism.</p> <p>Students will be able to independently solve problems which requires active participation.</p> <p>Through practical work the students will understand the task of integrating the acquired knowledge and using skills of classical physiological laboratory experiments.</p> <p><i>Through the lectures and seminars the students will gain following knowledge and competences:</i></p> <ol style="list-style-type: none">1. Discover the basics of human body functional organization and principles of homeostatic mechanisms.2. Learn functional properties of biological membranes, cell membrane transports and principles of ion channels functioning.3. Understand how the bioelectric potentials of excitable tissues (nerve and muscle) occur and can be registered.4. Learn the functional organization of the cardiovascular system and its physiological roles.5. Learn the functional properties of the heart muscle and valves, bioelectrical activity, heart rate regulation, pressure and volume changes during the cardiac cycle. Student will learn principles of electrocardiogram registration, analysis and interpretation.6. Learn the functional aspects and physiological roles of different blood vessels, relation between pressure, flow and resistance in the circulatory system, the mechanisms underlying regulation of cardiac output, resistance and arterial blood pressure.7. Discover the physical properties of gases, ventilation and its regulation, gas exchange and transport. <p><i>Through the practical laboratory work students will acquire following skills:</i></p> <ul style="list-style-type: none">- Interpretation of resting and action potential- Interpretation of myograms after different stimulation frequency- Interpretation of electromyography- Interpretation of pneumogram- Registration and analysis of ECG		

	<ul style="list-style-type: none"> - Determination of the heart's electrical axis - Analysis of carotid artery pulse pressure curve - Analysis of polycardiogram - Analysis of phonocardiogram - Auscultation of the heart sounds - Measurement of peripheral pulse - Measurement of blood pressure - Interpretation of static and dynamic spirometry - Analysis of spirogram
4. Teaching methods	<p>Lectures: 39 hours</p> <p>Seminars: 16 hours</p> <p>Laboratory practical work: 45 hours</p>
5. Method of knowledge assessment and examination	<p>Continuous knowledge and skills assessment will be carried out through Partial exam 1, Partial exam 2, Partial exam 3, Seminars and Colloquium 1, Colloquium 2 and Colloquium 3.</p> <p>Partial Exam 1 (Modules 1. and 2.) is written exam in the form of Multiple choice questions (MCQ) test. A student can have maximum 20 points in total. In order to pass the 1st Partial exam, student must achieve minimum 11 points.</p> <p>Partial Exam 2 (Module 4 - 4.1 and 4.2.) is written exam in the form of essay questions and/or Extended Response Questions (ERQs) and/or Short Answer Questions (SAQs). A student can have maximum 30 points in total. In order to pass the 2nd Partial exam, student must achieve minimum 16.5 points.</p> <p>Partial Exam 3 (Module 5) is written exam in the form of MCQ test and test with essay questions and/or ERQs and/or SAQs. A student can have maximum 10 points in total for MCQ test, and maximum 10 points for test with essay questions and/or ERQs and/or SAQs. A student can have maximum 20 points in total on 3th Partial exam. In order to pass the 3th Partial exam, student must achieve minimum 11 points.</p> <p>Colloquium 1 is written, consist of either ERQs or SAQs. A student can have maximum 10 points in total. In order to pass, the student must achieve minimum 5.5 points.</p> <p>Colloquium 2 is written, consist of either ERQs or SAQs. A student can have maximum 10 points in total. In order to pass the, student must achieve minimum 5.5 points.</p> <p>Colloquium 3 is written, consist of either ERQs or SAQs. A student can have maximum 5 points in total. In order to pass the, student must achieve minimum 2.75 points.</p> <p>Seminars - The Seminars are in the form of oral presentations. During the seminars, the teacher monitors and evaluates the student's work. The student must be prepared for the seminar in advance. Activity, interest and contribution to the successful realization of the seminars are evaluated. A student can have maximum 5 points in total based on seminars activities. In order to pass the seminars, student must achieve minimum 2.75 points in total.</p> <p>Final exam The final exam consists of those parts the student did not pass during the course. The final exam is conducted according to the previously defined criteria.</p> <p>The repeated and correction exams The repeated and correction exams are conducted according to the previously defined criteria of the final exam.</p>
6. Literature	<p>Recommended:</p> <p>1. John E. Hall, Michael E. Hall - Guyton and Hall Textbook of Medical Physiology (Guyton Physiology) 14th Edition Elsevier Saunders; 2020.</p> <p>Additional:</p> <p>1. Boron and Boulpaep. Medical Physiology. 2nd edition, Saunders (Elsevier); 2009.</p>

COURSE PLAN: HUMAN PHYSIOLOGY 1

Weeks	Form of Instructions and materials	Number of classes
Week 1.	<p>Lecture: Functional organization of the human body and control of the “internal environment”, -the cell and its functions,</p> <p>Lecture: Ion channels, transport of substances through the cell membrane</p> <p>Practical laboratory work: Cell membrane and transport through membrane, ion channels</p>	<p>1</p> <p>2</p> <p>3</p>
Week 2.	<p>Lecture: Resting membrane potential</p> <p>Lecture: Stimuli, Action potential, Methods of action potential registration</p> <p>Practical laboratory work: Action potential, resting potential</p>	<p>1</p> <p>2</p> <p>3</p>
Week 3.	<p>Lecture: Physiologic anatomy of skeletal muscle, excitation of skeletal muscle: neuromuscular transmission</p> <p>Lecture: Contraction of skeletal muscle</p> <p>Practical laboratory work: Neuromuscular junction, contraction of skeletal muscle, muscle twitch</p>	<p>2</p> <p>2</p> <p>3</p>
Week 4.	<p>Seminar: Energetics of muscle contraction, characteristics of whole muscle contraction</p> <p>Lecture: Contraction and excitation of smooth muscle</p> <p>Practical laboratory work: Summation of contraction; tetanic contraction, maximum strength of contraction, electromyography (BIOPAC)</p>	<p>2</p> <p>2</p> <p>3</p>
Week 5.	<p>Seminar: Partial exam 1</p> <p>Lecture: Heart muscle, the heart as a pump and function of the heart valves, cardiac cycle</p> <p>Practical laboratory work: Colloquium 1, Heart function (CD presentation, A.D.A.M., Interactive Phys lab)</p>	<p>1</p> <p>2</p> <p>3</p>
Week 6.	<p>Lecture: Rhythmical excitation of the heart</p> <p>Lecture: The normal electrocardiogram and principles of vectorial analysis</p>	<p>2</p> <p>2</p> <p>3</p>

	Practical laboratory work: Electrocardiography (ECG) - registration and analysis	
Week 7.	<p>Seminar: Regulation of heart pumping</p> <p>Lecture: Overview of the circulation; medical physics of pressure, flow, and resistance</p> <p>Practical laboratory work: Auscultation of heart sounds, registration and analysis of phonocardiogram</p>	<p>2</p> <p>2</p> <p>3</p>
Week 8.	<p>Lecture: Vascular distensibility and functions of the arterial and venous systems</p> <p>Lecture: The microcirculation and the lymphatic system, capillary fluid exchange, interstitial fluid and lymph flow</p> <p>Practical laboratory work: Characteristics of the arterial pulse Arterial pulse examination, Analysis of sphygmogram</p>	<p>2</p> <p>2</p> <p>3</p>
Week 9.	<p>Seminar: Local and humoral control of blood flow by the tissues</p> <p>Lecture: Arterial pressure</p> <p>Practical laboratory work: Cardiac efficiency tests, demonstration of carotid sinus reflex, polycardiography, analysis of polycardiogram</p>	<p>2</p> <p>1</p> <p>3</p>
Week 10.	<p>Lecture: Nervous regulation of the circulation, and rapid control of arterial pressure</p> <p>Lecture: Role of the kidney in long-term regulation of arterial pressure</p> <p>Practical laboratory work: Problem based learning- Cardiovascular system</p>	<p>2</p> <p>2</p> <p>3</p>
Week 11.	<p>Seminar: The integrated system for pressure control</p> <p>Lecture: Cardiac output, venous return, and their regulation</p> <p>Practical laboratory work: Blood pressure regulation, measurement of blood pressure</p>	<p>1</p> <p>2</p> <p>3</p>
Week 12.	<p>Lecture: Muscle blood flow and cardiac output during exercise; the coronary circulation</p> <p>Seminar: Physiological responses to alterations in cardiovascular functioning</p> <p>Practical laboratory work: Factors that affect blood pressure effect of posture, gravity and muscular exercise on blood pressure and heart rate</p>	<p>2</p> <p>2</p> <p>3</p>

Week 13.	Seminar: Partial exam 2	2
	Lecture: Pulmonary ventilation	2
	Practical laboratory work: - Colloquium 2; Pulmonary ventilation (CD presentation, A.D.A.M., Interactive Phys lab); Spirometry (BIOPAC); Spirogram - analysis and interpretation	3
Week 14.	Lecture: Physical Principles of Gas Exchange; Diffusion of Oxygen and Carbon Dioxide Through the Respiratory Membrane	2
	Lecture: Pulmonary Circulation, Transport of Oxygen and Carbon Dioxide in Blood and Tissue Fluids	2
	Practical laboratory work: Pneumography; Gas exchange; Regulation of breathing (CD presentation, A.D.A.M., Interactive Phys lab)	3
Week 15.	Seminar: Regulation of respiration	2
	Seminar: Partial exam 3	2
	Practical laboratory work: Colloquium 3	3
Weeks. 17/18	Final exam (regular term)	
Weeks 19/20	Final exam (make-up examination term)	
September	Final exam (September make-up exam)	