

Study programme	MEDICAL STUDIES IN ENGLISH				
Cycle	INTEGRATED	Type	UNIVERSITY		
Study track	-	Module	-		
Year of study	2	Semester	IV		
Course title	MEDICAL PHYSIOLOGY	Course code	MFMSE401		
ECTS	19	Status	OBLIGATORY		
Teaching hours		Lectures	Exercises	Seminars	Practice
		53	40	87	0
Teachers	dr. sc. Danijel Pravdić, red. prof.		8	0	16
	dr. sc. Ivan Čavar, red. prof.		4	0	13
	dr. sc. Tomislav Kelava, izv. prof.		10	0	11
	dr. sc. Joško Božić, izv. prof.		7	0	5
	dr. sc. Vesna Lukinović-Škudar, izv.prof.		6	0	12
	dr. sc. Alan Šućur, doc.		14	0	9
	dr. sc. Antonio Markotić, doc.		4	0	18
	dr. sc. Marko Kumrić, v. asist.		0	4	3
	Ana Božić, v. asist.		0	6	0
	Antea Bulum, v. asist.		0	10	0
	Pavao Planinić, asist.		0	8	0
	Ivo Krešić, asist.		0	8	0
	Nikola Jurleta, asist.		0	4	0
Course objectives	<p>The objective of the Medical Physiology course is:</p> <ul style="list-style-type: none"> <li>- acquaint students with the normal functions of the organism that maintain homeostasis, and expand the existing knowledge about the functioning of cells, tissues and organs;</li> <li>- train students to be able to understand pathophysiological mechanisms and pharmacotherapeutic measures</li> </ul>				
Course learning outcomes	Learning outcome (LO) Student:		Course learning outcome code	LO code at the study program level	
	Describes and explains basic functional features of neuromuscular, cardiovascular and renal systems at the level of cell, organ and the whole organism.		IU-MFMSE401-1	IU-MSE1 IU-MSE2	
	Describes and explains the basic functional features of respiratory, gastrointestinal, endocrinological, reproductive and hematopoietic system at the level of cell, organ and the whole organism.		IU-MFMSE401-2	IU-MSE2	
	Analyzes and associates the operation of control mechanisms including negative and positive feedback systems to controlled factors and physiological processes in the organism that are necessary for maintenance of homeostasis.		IU-MFMSE401-3	IU-MSE3	
	Describes and analyzes the changes that occur in organic systems if there is a deviation of the controlled parameters and relates them with the appearance of symptoms and/or signs of the disease.		IU-MFMSE401-4	IU-MSE4	
	Measures the arterial pressure value and interprets the obtained values.		IU-MFMSE401-5	IU-MSE3 IU-MSE8	
	Analyzes and interprets the results of basic respiratory function measurements, stress test and glucose tolerance.		IU-MFMSE401-6	IU-MSE3 IU-MSE8	
	Analyzes and interprets a normal electrocardiographic record.		IU-MFMSE401-7	IU-MSE1 IU-MSE21	
Prerequisites for the course enrolment	In accordance with the Rulebook on the Integrated Studies at the School of Medicine University of Mostar.				
	Week / shift	Topic			

Course content	Lectures	<p>(L1) Functional organization of human body; transport through cell membranes</p> <p>(L2) Basic physics of membrane potentials</p> <p>(L3) Excitation of skeletal muscle</p> <p>(L4) Contraction of skeletal muscle</p> <p>(L5) Excitation and contraction of smooth muscle</p> <p>(L6) Physiology of cardiac muscle</p> <p>(L7) Overview of the circulation: physics of pressure, flow and resistance</p> <p>(L8) Vascular distensibility, functions of the arterial and venous systems, the structure of microcirculation</p> <p>(L9) Long-term control of arterial pressure: integrated system for arterial pressure regulation</p> <p>(L10) Hemorrhagic shock and physiological principles of treatment</p> <p>(L11) Kidneys: physiological anatomy and function</p> <p>(L12) Micturition and diuretics</p> <p>(L13) Thirst, integration of renal mechanisms for control of blood volume and extracellular fluid volume</p> <p>(L14) Mechanics of lungs, Laplace's law, functions of the respiratory passageways</p> <p>(L15) Regulation of respiration</p> <p>(L16) Methods for studying respiratory abnormalities</p> <p>(L17) Physiological problems of high-altitude and deep-sea diving</p> <p>(L18) The autonomic nervous system and the adrenal medulla</p> <p>(L19) General principles of gastrointestinal function</p> <p>(L20) Propulsion and mixing of food in the alimentary tract</p> <p>(L21) Review and regulation of carbohydrate metabolism, formation of ATP</p> <p>(L22) Review and regulation of lipid and protein metabolism</p> <p>(L23) The liver as an organ</p> <p>(L24) Dietary balance, regulation of feeding, obesity and starvation, vitamins and minerals</p> <p>(L25) Body temperature regulation</p> <p>(L26) Introduction to endocrinology; principles of secretion, transport, action and clearance of hormones</p> <p>(L27) Pituitary gland-hypothalamus relation, posterior pituitary hormones</p> <p>(L28) Pregnancy, parturition, lactation</p> <p>(L29) Erythrocytes and blood types</p> <p>(L30) Resistance of the body to infection; leucocytes</p> <p>(L31) Hemostasis and blood coagulation</p>
	Seminars	<p>(S1) Membrane and action potentials</p> <p>(S2) Cardiac cycle, regulation of heart pumping</p> <p>(S3) Rhythmical excitation of the heart</p> <p>(S4) ECG</p> <p>(S5) Integration (general physiology, potentials, muscles and heart)</p> <p>(S6) Capillary fluid exchange, local control of tissue blood flow</p> <p>(S7) Humoral and nervous regulation of circulation, rapid control of arterial pressure</p> <p>(S8) Cardiac output and venous return</p> <p>(S9) Muscle blood flow and coronary circulation</p> <p>(S10) Integration (circulation)</p> <p>(S11) The body fluid compartments and volumes and their balance; edema</p> <p>(S12) Glomerular filtration, renal blood flow and their control</p> <p>(S13) Tubular reabsorption and secretion</p> <p>(S14) Regulation of reabsorption in tubules</p> <p>(S15) Regulation of extracellular fluid osmolarity and sodium concentration</p> <p>(S16) Regulation of renal potassium, calcium and magnesium excretion</p> <p>(S17) Acid-base regulation: respiratory and renal regulation, acidosis and alkalosis</p> <p>(S18) Integration (kidneys and body fluids)</p> <p>(S19) Pulmonary ventilation</p>

		(S20) Pulmonary circulation, pulmonary edema and pleural fluid (S21) Physical principles of gas exchange; diffusion of gases through the respiratory membrane (S22) Transport of oxygen and carbon dioxide in blood and tissue fluids (S23) Integration (respiratory system) (S24) Secretory functions of the alimentary tract: secretion of saliva, gastric and pancreatic secretion (S25) Secretory functions of the alimentary tract: bile secretion and intestinal secretion; absorption of water and ions (S26) Energetics and metabolic rate (S27) Integration (alimentary tract and metabolism) (S28) Anterior pituitary hormones (S29) Thyroid hormones (S30) Insulin and glucagon (S31) Blood glucose regulation, diabetes mellitus (S32) Calcium and phosphate metabolism, Bone and teeth physiology (S33) Parathyroid hormone, calcitonin and vitamin D (S34) Synthesis of adrenocortical hormones, functions of mineralocorticoids (S35) Adrenocortical hormones; stress (S36) Integration (endocrinology) (S37) Reproductive and hormonal functions of the male (S38) Female physiology before pregnancy and female hormones (S39) Integration (reproduction)					
	Exercises	(E1) Transport through cell membranes Basic physics of membrane potentials (E2) Recording and vectorial analysis of ECG (E3) Interactive physiology 9.0: Cardiovascular system (E4) Measuring of the arterial pressure and peripheral pulse rate, heart sounds (E5) Electrocardiogram repetition, orthostatic test (E6) Kidney problem solving, ABS cases (E7) Spirometry test (E8) The Astrand cycle test; Effect of exercise on arterial pressure (E9) OGTT- Oral Glucose Tolerance Test (E10) Blood typing (E11) Hematology (erythrocyte count, hemoglobin and hematocrit; hematological indices)					
Language	English						
E-learning	Classes are taken in person. If necessary, lectures, seminars and part of the exercises can take place combined (live and online) or completely online via e-learning platforms (Google Meet) up to a maximum 20%.						
Teaching methods	Teaching, interactive and active-experiential.						
<b>Types of assessment (indicate - Bold)</b>							
Type of pre-examination obligation					Type of exam		
<b>midterm</b>	seminar paper	essay/report	practical/project task	other	<b>written exam</b>	<b>oral exam</b>	<b>practical</b>
<b>Allocation of ECTS credits and share in the grade</b>							
Student obligations		Learning outcome code		Hours of workload	Share in ECTS		Share in grade
Attending classes				180	6		0%
Midterm/Colloquium of exercises - OSCE		IU- MFMSE401-5		30	1		0%
Practical exam		IU- MFMSE401-6 IU- MFMSE401-7 IU- MFMSE401-5		30	1		0%
Pre-exam/partial written exams (P1+P2)		IU- MFMSE401-1 IU- MFMSE401-2		180	6		66,6%
Final oral exam		IU- MFMSE401-3 IU- MFMSE401-4		150	5		33,4%

In total				570				19				100 %			
Method of calculating the final grade															
The final grade is obtained as the arithmetic mean of the grades from two partial exams and the oral exam (sum of grades from P1, P2 and oral exam divided by 3). A detailed description is given in the additional information about the subject.															
Literature (indicate)	Title (title, author, year)	Edition		Language				Type of literature							
		own	other	croatian	english	other	multilingual	book	article	script	other				
Compulsory	A. C. Guyton. J. E. Hall: Medical physiology, 14th Edition. Elsevier, Philadelphia, USA, 2020		x		x			x							
	Exercises in physiology. Internal edition, Faculty of Medicine University of Mostar, 2020.	x			x					x					
Additional	Lecture notes		x		x						x				
	Linda Costanzo: Physiology, 7 <sup>th</sup> edition, 2021		x		x			x							
Additional course information															
<p><b>Physiology classes</b> contain 180 hours and are taken over 11 weeks, which includes the post-class examination period (pre-exam). The class is divided into two approximately equal parts: Physiology I (P1) and Physiology II (P2). The teaching consists of lectures, seminars and exercises. At the end of each week a seminar entitled "Repetition and examination of passed material" is organized. In this part of the course, the topics are repeated and consolidated based on problem solving and test questions.</p> <p>During classes from seminars and exercises, <b>knowledge is continuously checked</b>. To students who demonstrate exceptional knowledge of the learning material covered in the seminar or motivation and understanding in the exercises additional points will be awarded (bonuses), which will be added to the points on the final exam. <b>Weekly tests</b> are held at the beginning of each week, and there are 6 weekly tests in total. They contain 20 questions related to the previous week's topics. On these tests, knowledge is evaluated as follows: for a grade of 5, the student receives 2.0 points, for a grade of 4, the student receives 1.5 points, for a grade of 3, student receives 1 point, and for a grade of 2, student receives 0.5 points. The maximum number of additional points that student can earn for one partial exam is 6, and it is obtained on the basis of the sum of points from classes and the results of weekly tests.</p> <p><b>Partial exams</b> are held about a week after the lessons from P1 or P2. They consist of 80 test-questions with multiple choice of answers (one of the five offered answers is always correct). To pass the exam (grade sufficient), the student must answer 55% of the questions correctly, i.e., must obtain at least 44 points.</p> <p>According to the Rulebook on Studying at the University of Mostar grades are assigned as follows:  00-54% (0-43 points) insufficient (1);  55-66% (44-53 points) sufficient (2);  67-78% (54-63 points) good (3);  79- 90% (64-72 points) very good (4);  91-100% (73-80 points) excellent (5).</p> <p><b>The colloquium of the exercises</b> refers to the skill of measuring arterial pressure. The student should demonstrate the ability to measure arterial blood pressure and interpret the measured values The exam is conducted using the Objective Structured Clinical Examination (OSCE) model. Students who do not pass the midterm exam during the course will have to pass it as a part of the practical exam.</p> <p><b>The practical exam</b> consists of 15 questions/tasks assessing the understanding of ECG, respiratory analysis, stress tests, OGTT, blood types, ABS and other units that were covered and taught using active-experiential methods during exercises. The exam is divided into two parts, the knowledge of ECG (5 questions/tasks) is evaluated separately, and the remaining parts separately (10 questions/tasks), due to the importance of ECG interpretation for daily practice. The minimum passing requirement is 80% correctly solved tasks for each part individually (in practice – 4 correctly solved tasks from the ECG and</p>															

8 correctly solved tasks from the other sections). Students who have not passed the colloquium/midterm of exercises, will take it as the third component of the practical exam.

The partial exams, colloquium and practical exam, when passed, are acknowledged during the academic year.

**The oral exam** includes the most important, integrative units of overall physiology. In the final exam, it is not details that are required, but integrative knowledge that is essential for understanding the whole subject, medical practice and others courses. The condition for taking the oral exam is that the student has passed all partial exams and the colloquium/practical exam of exercises. Students who have passed the partial exams and the colloquium/practical exam during the class will be admitted in the pre-exam term and subsequent terms (when applicable) directly to the oral exam, which is counted as taking the exam.

**The final grade** is calculated as the arithmetic mean of the grades obtained on the two partial exams and the grade obtained on the oral exam. That is:  $(P1+P2+Oral)/3$ .