

Study programme	MEDICAL STUDIES IN ENGLISH				
Cycle	INTEGRATED	Type	UNIVERSITY		
Study track	-	Module	-		
Year of study	3	Semester	V		
Course title	PATHOPHYSIOLOGY	Course code	MFMSE502		
ECTS	11	Status	OBLIGATORY		
Teaching hours		Lectures	Exercises	Seminars	Practice
		45	30	60	0
Teachers	Full professor Zlatko Trobonjača, MD, PhD	32	3	18	
	Full professor Hrvoje Jakovac, MD, PhD	13	6	9	
	Assistant professor Borko Rajič, MD, PhD	0	3	12	
	Senior assistant Marija Šandrak, MD, PhD	0	3	6	
	Assistant professor Benjamin Palić MD, PhD	0	6	9	
	Ivana Bevanda, MD	0	6	3	
	Ivan Zeljko, MD	0	3	3	
Course objectives	The main goal of this course is to enable students to apply previously acquired knowledge from all subjects of the first two years of the study especially from the courses of Medical Physiology and Medical Chemistry and Biochemistry I and II, in order to become familiar with the pathological function of the certain organic system, as well as etiopathogenetic mechanisms that lead to functional disorders and development of diseases. The knowledge acquired in this course forms the basis for learning and understanding the diagnostic and therapeutic procedures that students learn in many clinical courses, especially in Internal Medicine.				
Course learning outcomes	Learning outcome (LO) Student:		Course learning outcome code	LO code at the study program level	
	Describes the mechanisms of action of biological, physical and chemical etiological factors in the emergence and development of various etiological conditions in patients (genetic, developmental, autoimmune, degenerative, toxic, metabolic, microbiological, neoplastic, traumatic).		IU-MFMSE502-1	IU-MSE5	
	Explains the general patterns of etiopathogenetic events and pathophysiological reactions of the patient at the organismic level using etiopathogenetic clusters.		IU-MFMSE502-2	IU-MSE4	
	Explains disorders of the structure and function of the heart, circulatory, respiratory and urogenital systems, and evaluates and argues the connection between external factors and patient reactivity in the pathogenesis, course and degree of disorders of these systems, and the outcome of the disease.		IU-MFMSE502-3	IU-MSE4	
	Explains disorders of the structure and function of the metabolism, digestive and endocrine systems, and evaluates and argues the connection between the effects of external factors and patient reactivity in the pathogenesis, course and degree of disorders of these systems, and the outcome of the disease.		IU-MFMSE502-4	IU-MSE4	
	Describes the chronobiological characteristics of the pathophysiological response to the influence of etiological factors.		IU-MFMSE502-5	IU-MSE4	
	Describes and connects knowledge about molecular, biochemical and cellular mechanisms that are important in maintaining and disrupting body homeostasis.		IU-MFMSE502-6	IU-MSE3	

	Combines and applies knowledge about the disease's clinical, laboratory and imaging features, and based on etiopathogenesis, interprets and concludes in terms of differential diagnosis.		IU-MFMSE502-7	IU-MSE8
	Identifies the importance of scientific methods in the discovery and explanation of etiopathogenetic mechanisms in the development of diseases and their usage in translational and clinical research.		IU-MFMSE502-8	IU-MSE7
Prerequisites for the course enrolment	In accordance with the Rulebook on the Integrated Studies at the School of Medicine University of Mostar.			
Course content	Week / shift	Topic		
	Lectures	(L1) Introduction to pathophysiology. General causes and development of pathophysiological processes. Homeostatic maintenance and disorders. Health and disease. An integrative approach to the disease. (L2) Principles of the pathogenetic mechanisms. (L3) Inflammation. (L4) Immunopathophysiology. Immunopathogenetic role of the HLA system. Tissue transplant reactions. (L5) Immunodeficiencies. Autoimmunity. (L6) Malignant transformation and growth. Disorders of energy metabolism. (L7) Red blood cell disorders. (L8) White blood cell disorders. (L9) Endogenous bioactive compounds in disease processes. (L10) Disorders of myocardial function. Disorders of the heart valve function. Congenital heart defects. Cardiac filling disorders. Cardiac output disorders. (L11) The coronary circulation and ischemic heart disease. (L12) Disorders of arterial pressure. Hypertension. Local tissue perfusion disorders. (L13) Circulatory Shock. (L14) Overview of renal function disorders. (L15) Overview of respiratory system disorders. (L16) Chronobiological pathophysiology. (L17) Pathophysiology of the gastrointestinal system. Disorders of the exocrine functions of the pancreas - acute and chronic pancreatitis. (L18) Disorders of pancreatic endocrine function. Diabetes mellitus. (L19) Integral organismic reactions to noxious stimuli. (L20) Causes of endocrinopathies. Disorders of pituitary function. Thyroid gland disorders. (L21) Functional disorders of the cortex and medulla of the adrenal gland. (L22) Disorders of gonadal function. (L23) Disorders of parathyroid glands function. Disorders of calcium, phosphate and magnesium metabolism.		
	Seminars	(S1) Pathophysiology of DNA: DNA damages, chromosomal aberrations, genomic instability. Gene expression disorders. Hereditary metabolic diseases. (S2) Functional disorders of subcellular structures. (S3) Function and composition disorders of blood and hematopoietic organs. (S4) Immune hypersensitivities and transfusion reactions. (S5) Disorders of impulse conduction. Heart rhythm disorders. Heart adaptation to the functional load. (S6) Cardiac Failure. (S7) Disorders of arterial pressure and blood flow. (S8) Circulatory Shock. (S9) Disorders of osmolality and hydration of the body. Disorders of extracellular fluid distribution. (S10) Disorders of urine quantity and composition.		

		(S11) Pathophysiology of the respiratory system. (S12) Disorders of electrolytic homeostasis. (S13) Acid-base balance disorders. (S14) Disorders of metabolism of proteins and carbohydrates. Disorders of dietary balances. (S15) Lipid metabolism disorders. Atherosclerosis. (S16) Pathophysiology of the liver. (S17) Disorders of energy metabolism. Disorders of thermoregulation. (S18) Disorders of specific metabolic substances. (S19) Structural and functional disorders of connective and bone tissue. (S20) Disorders of neurovegetative regulation. Disorders of consciousness.									
	Exercises/Practicals	(P1) Leukocytes and the monocyte-macrophage system disorders. Biological etiological factors. (P2) Physical and chemical etiological factors. (P3) Disorders of the composition and structure of plasma protein. Function disorders of the spleen. Hematological laboratory tests. (P4) Hemostasis and blood clotting disorders. (P5) Electrocardiographic interpretation of disorders of the heart muscle and coronary circulation - Vectorial analysis (P6) Cardiac arrhythmias and their electrocardiographic Interpretation. Pathological electrocardiogram. (P7) Disorders of the digestive system and metabolism. (P8) Pathophysiology of the liver and exocrine pancreas. (P9) Disorders of conception, pregnancy, fetal growth and development. Disorders of sexual function. (P10) Endocrinopathies.									
Language	English										
E-learning	Classes are held live. If necessary, lectures, seminars and exercises can be combined (live and online) or completely online via e-learning platforms (Google Meet) up to max 20%.										
Teaching methods	Teaching, presentations, interactive and active.										
Types of assessment (indicate - Bold)											
Type of pre-examination obligation					Type of exam						
midterm	seminar paper	essay/report	practical/project task	other	written exam	oral exam	practical				
Allocation of ECTS credits and share in the grade											
Student obligations		Learning outcome code		Hours of workload		Share in ECTS		Share in grade			
Class attendance				135		4,5					
Midterm I		IU-MFMSE502-1		30		1		10%			
Midterm II		IU-MFMSE502-2		30		1		10%			
Knowledge and active participation in classes				30		1		10%			
Pre-exam/written exam		IU-MFMSE502-1 IU-MFMSE502-2 IU-MFMSE502-3 IU-MFMSE502-4 IU-MFMSE502-5		60		2		40%			
Final oral exam		IU-MFMSE502-6 IU-MFMSE502-7 IU-MFMSE502-8		45		1,5		30%			
In total				330		11		100%			
Method of calculating the final grade											
1) The final grade is obtained by adding up the points gained during classes (in partial exams and by knowledge and dedication during classes) to points gained on the final written and oral exam. 2) A detailed description is provided in additional information about the case.											
Literature (indicate)	Title (title, author, year)	Edition		Language				Type of literature			
		own	other	croatian	english	other	multilingual	book	article	script	other

Compulsory	Gamulin S, Marušić M, Kovač Z. et al. Pathophysiology (7th edition), Medicinska naklada Zagreb, 2014.		x	x	x			x			
	Guyton A.C., Hall J.E. Textbook of Medical Physiology (14th edition), Elsevier, 2020.	x		x	x			x			
Additional	Teaching material	x	x	x	x						x
	Kovač Z, Gamulin S, et al. Pathophysiology. Study guide algorithms – problem solver, Medicinska naklada, Zagreb, 2014.		x	x	x			x			

Additional course information

The course is performed in the winter semester at the third year of study, in the form of lectures (45 teaching hours), seminars (60 teaching hours), and exercises (30 teaching hours). Lectures last 2, and seminars and exercises 3 teaching hours.

Lectures are a form of classes that provide an introduction and an overview of a thematic unit that is taught in more detail on seminars and exercises.

Seminars and exercises/practicals are a form of classes where students actively review and critically discuss physiological and pathophysiological mechanisms of certain morphological and functional units, which are then explained at the molecular, microenvironmental, organic, systemic and whole-organism levels.

Active participation of students in the curriculum program is further achieved by studying natural integrators of etiopathogenetic events, the so-called etiopathogenetic clusters, performing exercises in the laboratory and on computer programs that simulate pathological conditions and provide clinical correlates of certain diseases

Students are obliged to prepare material that is discussed in lectures, seminars and exercises. In seminars and exercises, students actively discuss physiological and pathophysiological mechanisms with the teacher. Through presentations of clinical cases during the exercises, students have the opportunity to connect pathophysiological conditions with their clinical manifestations.

The teacher evaluates the student's participation in seminars and exercises (demonstrated knowledge, understanding, ability to pose problems, reasoning, etc.). "Earned" points are added to the points obtained in the final exam.

Class attendance and student participation in all forms of classes are compulsory in accordance with the Law and the Statute of the Faculty of Medicine in Mostar. Accordingly, student attendance at lectures, seminars, and exercises will be regularly checked. Only justifiable absences due to, for example, the illness will be acceptable within the limits allowed and according to the Ordinance on Studies.

Student work will be evaluated during classes and at the final exam. A maximum of **(I) 30 grade points** can be obtained during classes and up to **(II) 70 grade points** on the final exam, which totals **100 grade points**.

I. The following components are evaluated during classes (up to 30 grade points):

1) acquired knowledge (up to 20 grade points)

2) active participation in classes (up to 10 grade points)

1) acquired knowledge (up to 20 grade points)

During classes, the acquired knowledge will be evaluated by means of **two midterm tests comprising 50 questions**.

A student may obtain up to **10 grade points** on each test as follows:

Correct answers	Grade points
48-50	10
45-47	9

42-44	8
39-41	7
36-38	6
33-35	5
30-32	4
27-29	3
24-26	2
21-23	1

2) active participation in classes (up to 10 grade points)

Based on oral discussions, activities and knowledge students are graded at all seminars and exercises. Students will be graded in the range of 1 to 5. The score scale is determined according to the absolute distribution of mean values of grades, which is achieved by summing all grades from seminars and exercises (a total of 30 teaching units) and dividing by the number 30 (or less if the student was justifiably absent or not graded). Students can obtain grade points during classes only if they are **graded** at least on 10 seminars and 5 exercises. The obtained average grade is converted into grade points as shown in the table:

4,26-5,0	10 points
3,76-4,25	8 points
3,26-3,75	6 points
2,76-3,25	4 points
2,00-2,75	2 points

II. Final exam (up to 70 grade points):

The final exam consists of an **oral and a written part**. This exam tests key, specific competencies that have been determined for each unit separately. A student must solve **at least 50% of the test** in order to be able to access the oral part of the final exam.

Who can NOT access the final exam:

Students who missed 20% or more teaching hours. Such a student cannot take the final exam, i.e. he/she must re-enroll in the course in the following academic years.

Students can obtain a maximum of 70 grade points at the written part of the final exam (100 questions) which corresponds to the total number of grade points as shown in the table:

Correct answers	Grade points		Correct answers	Grade points
97-100	70		70-71	58
94-96	69		68-69	57
91-93	68		66-67	56
88-90	67		64-65	54
86-87	66		62-63	52
84-85	65		60-61	50
82-83	64		58-59	48
80-81	63		56-57	46
78-79	62		54-55	44
76-77	61		52-53	42
74-75	60		50-51	40
72-73	59		<50	0

III. The final grade (a maximum of 100 grade points)

The final grade represents the sum of all grade points obtained during classes and on the final exam. It is based on the absolute distribution according to the following scale:

A (80-100 grade points)	excellent (5)
B (70-79,99 grade points)	very good (4)
C (60-69,99 grade points)	good (3)
D (40-59,99 grade points)	sufficient (2)
F (student who has solved less than 50% of the test on the final exam)	insufficient (1)

IV. The final grade obtained on the written test has to be confirmed at the oral exam