

Name of the course:	Pathophysiology			Code	
Type of study program, Cycle:	Integrated study program, medicine			Year of study:	III
Credits (ECTS):	11	Semester:	V	Number of hours per semester (l+e+s):	135 (45+30+60)
Status of the course:	mandatory	Preconditions:	Passed all exams of the 2 nd year	Comparative conditions:	/
Access to course:	3 rd year medical students			Hours of instructions:	According to schedule
Course teacher:	Full professor Zlatko Trobonjača, MD, PhD				
Consultations:	Arranged if needed in agreement with students (during and after the course)				
E-mail address and phone number:	zlatko.trobonjaca@uniri.hr				
Associate teachers:	Associate professor Hrvoje Jakovac, MD, PhD Assistant professor Slavica Ćorić, MD, PhD Marija Šandrak, MD, MSc Borko Rajič, MD, MSc Ante Mandić, MD Daniela Bevanda Glibo, MD				
Consultations:	Arranged if needed in agreement with students (during and after the course)				
E-mail address and phone number:	hrvoje.jakovac@medri.uniri.hr corics545@gmail.com marija.sandrak@gmail.com borkorajic@gmail.com ante.mandic@live.com ela.bevanda@gmail.com				
The aims of the course:	<p>The aims of this course are:</p> <ul style="list-style-type: none"> • To enable students to apply the previously acquired knowledge from the first and second year of study, and especially from the Physiology course where they have learned about the normal function of organic systems • To get acquainted with the etiopathogenic mechanisms that lead to disorders of the function of the organism and disease occurrence; • To introduce students with pathophysiological processes that are characteristic for particular functional units and the entire patient's organism • Through the integration of basic medical courses knowledge with implications on clinical events, learn about etiology, 				

	<p>pathogenesis and course of disease development; direct students to a pathophysiological way of observation and meaningful interpretation of the development of certain diseases in accordance with evidence-based medicine.</p>
<p><i>Learning outcomes (general and specific competences):</i></p>	<p><u>General outcomes:</u></p> <ol style="list-style-type: none"> 1. Applying the ability to: independently use medical literature, critically evaluate media or professional publications about the normal and pathological function of the organism, argument and competently discuss pathophysiological topics; 2. Applying the ability of seeking relevant medical information on the Internet through a critical way of thinking; 3. Understanding the interdisciplinary nature of biomedical science; 4. Applying the skills needed for professional development in medicine (independent work, planning of work and time management, organizational abilities); 5. Applying the oral and written communication skills that will enable them to explain the significance of pathophysiological findings; 6. Applying the ability to evaluate the importance of modern medical techniques for the development of science and entrepreneurship in the field of biotechnology. <p><u>Specific outcomes:</u></p> <ol style="list-style-type: none"> 1. Understanding the principles of physiological feedback, remembering how to determine the homeostatic mechanisms of the major functional systems, and understanding the pathophysiological principles of the disease; 2. Remembering the relativity of etiologic factors, distressors, stressors and stimuli in relation to the origin, development and intensity of the etiopathogenic processes; 3. Understanding the relationships between organic systems in a healthy person and the pathogenic mechanism of major systemic diseases; 4. Applying the basic knowledge for the interpretation of general reaction forms of the organism and for understanding of the basic pathophysiological processes in systematic response; 5. Understanding the integration and interpretation of etiopathogenic processes; 6. Remembering the principles of basic functional tests and deviations from normal values; 7. Understanding the analysis and interpretation of graphical schemes and descriptions of etiopathogenetic relationships in clinical, experimental and laboratory data; 8. Evaluation of the functional reserve of the functional system, and understanding the latent insufficiency tests; 9. Understanding the major pathophysiological processes at the

	<p>cellular level;</p> <ol style="list-style-type: none"> 10. Remembering the pathogenic causes, course and consequences of energy metabolism disorders; 11. Understanding the etiopathogenic factors of malignant transformation of human cells; 12. Remembering the disorders in blood and plasma composition, and the disorders in maturation and function of the hematopoietic organs; 13. Analyzing the main etiologic factors and pathogenic mechanisms that cause disorders in the function of the immune system; 14. Analyzing the basic etiologic factors and pathogenetic mechanisms that cause disorders in the function of the heart, circulatory system, urogenital system and respiratory system; 15. Understanding the disturbed metabolism of basic and specific nutrients and mechanisms responsible for the disturbed function of the gastrointestinal, hepatobiliary and endocrinological systems; 16. Analyzing the acid-base balance disorders and disorders of electrolytic homeostasis; 17. Understanding the osmolality and hydration disorders of the body, and the distribution of fluid in the body; 18. Remembering the specific disorders of individual organs function in aging. 			
Course content (Syllabus):	<p>Course consists of lectures, seminars and exercises. Conceptually, the content of the teaching entities can be divided into: introduction to pathophysiology, general disorders of the organism function, etiologic factors in the development of the diseases, disorders of the individual functional systems of the organism. During the course, a continuous assessment of knowledge is carried out. There are two partial written exams, a final written exam and an oral exam.</p>			
Format of instruction (mark in bold):	Lectures	Exercises	Seminars	Independent assignments
	Consultations	Work with mentor	Field work	Others
	<p>Remarks: Pathophysiology course is organised as a block in fifth semester of the study. Lectures last two school hours, and seminars and exercises for three school hours. Seminars and exercises prepare students for individual problem solving and integrative consideration of health and disease. At seminars and exercises, students actively discuss with a teacher about physiological and pathophysiological mechanisms, and the teacher mainly plays a "moderator" role in discussing. At seminars and exercises, students receive individual assignments that are solved independently or in small groups. The teacher evaluates the participation of students in seminars and exercises (demonstrated knowledge, understanding, problem solving,</p>			

	conclusion, etc.). The points "earned" during the course are added to the points obtained on the final exam. During course block, but also outside the latter, teachers are available for consultation in agreement with students.			
Student responsibilities:	Students are required to attend classes. If students were absent from the some class, they should access the oral exam from that part of the course. If the student was absent for more than 20% of the tuition, she or he can not take the final exam, i.e. student must attend the course in the next academic year (according to the Regulations on Integrated Studies at the Mostar University School of Medicine). Students prepare in advance the themes discussed in the lectures and particularly in the seminars and exercises, so that they can actively participate in discussion. During the seminars and exercises, students solve the planned tasks alone or in small groups.			
Screening student work (mark in bold):	Class attendance	Class participations	Seminar essay	Practical training
	Oral exam	Written exam	Continous assesment	Essay
Detailed evaluation within a European system of points:				
STUDENTS RESPONSIBILITIES	HOURS	PROPORTIONS OF ECTS CREDITS	PROPORTIONS OF MARK	
Class attendance and participations	145	5	80%	
Partial tests 1 and 2	60	2		
Final written exam	90	3	20%	
Oral exam	30	1		
Further clarification:				
<p>Evaluation of students' work is carried out during the course and at the final exam. During the course the student can achieve a maximum of 30 points, and on the final exam a maximum of 70 points, i.e. in sum a maximum of 100 points.</p> <p>I. During the course, the following activities (up to 30 points) are evaluated:</p> <ol style="list-style-type: none"> 1) Demonstrated knowledge (up to 20 points) – During the course, there are two partial tests with 50 questions and by each test student can get a maximum of 10 points. 2) Activity during the seminars and exercises (up to 10 points) – Maximum of 10 points can be gained through activity and demonstrated knowledge in seminars and exercises. Students are rated in the range of 1 – 5 according to oral answer or written test at the end of a seminar/exercise. The score scale is determined by the absolute distribution of the grade means obtained by adding all grades from the seminars and exercises (a total of 30 teaching units) and dividing up by the number 30 (or less if the student was absent or not evaluated). Points can only be awarded to students who have been evaluated at least in 10 seminars and 5 exercises. <p>II. Final exam (maximum 70 points): The final exam is conducted in written form. The exam consists of 100 questions. This exam examines the key, specific competencies that are</p>				

determined for each unit in particular. At the final exam, the student can only earn points if she or he has solved 55% questions.

III. Final grade (maximum 100 points) from parts I + II: The final grade is determined by the sum of the points acquired during the course and the final exam based on the absolute distribution.

IV. The final grade obtained on the written test is verified on the oral exam. The final grade that is written in the index generally does not deviate more than 1 from grade on the written part. If the student on the oral exam got the grade inadequate (1), she or he must take the oral exam again.

Required literature:	<ol style="list-style-type: none"> 1. Gamulin S, Marušić M, Kovač Z, et al. Pathophysiology. Medicinska naklada, Zagreb, 2013. 2. Kovač Z, Gamulin S, et al. Pathophysiology – integrative problem based seminars. Medicinska naklada, Zagreb, 2011. 3. Kovač Z, et al. Clinical pathophysiology – etiopathogenetic clusters. Medicinska naklada, Zagreb, 2013. 4. Guyton AC, Hall JE. Textbook of Medical Physiology, 13th ed. Saunders, 2015.
Optional literature:	<ol style="list-style-type: none"> 1. Andreis I, Batinić D, Čulo F, Grčević D, Lukinović-Škudar V, Marušić M, Taradi M, Višnjić D. Immunology, 7th ed. Medicinska naklada, Zagreb, 2010. 2. Physiology, neurophysiology and immunology exercise manual. Department of physiology, immunology and pathological physiology, University of Rijeka School of Medicine, 2001. (available at http://sp.medri.hr/Studenti/). 3. Silbernagl S, et al. Color Atlas of Pathophysiology. Georg Thieme Verlag, Stuttgart. 4. Smith LH, et al. Pathophysiology, The Biological Principles of Disease. Saunders Co., Philadelphia. 5. McPhee SJ, et al. Pathophysiology of Disease: An Introduction to Clinical Medicine. Appleton&Lange, Stanford.
Additional information about the course:	<p>Monitoring methods of teaching quality:</p> <ul style="list-style-type: none"> - student questionnaire - quality analysis by students and teachers - exam results analysis - report of the office for teaching quality - external evaluation (visit of team for quality control)

TOPICS AND LITERATURE:

LECTURES

1. Introduction to pathophysiology. General causes and development of pathophysiological processes. Homeostatic mechanisms. Health and disease. Integrative approach to the disease.
2. Principles of pathogenic mechanisms and the onset of disease.
3. Inflammatory reaction.
4. Immunopathophysiology. HLA in pathogenesis. The tissue response reactions.
5. Immunodeficiency. Autoimmunity.
6. Malignant transformation and growth. Energy metabolism disorders.
7. Erythrocyte disorders.
8. Leukocyte disorders.
9. Endogenous biological compounds in the pathophysiological process.
10. Cardiac output and venous return disorders. Cardiac function disorders. Congenital heart defects.
11. Coronary circulation disorders and ischemic heart disease.
12. Arterial pressure disorders. Hypertension. Tissue blood supply disorders.
13. Circulatory shock.
14. Overview of renal function disorders.
15. Overview of respiratory disturbances.
16. Pathophysiology of aging.
17. Pathophysiology of the digestive system. Exocrine pancreatic function disorders - acute and chronic pancreatitis.
18. Endocrine disorders of the pancreas. Diabetes mellitus.
19. Causes of endocrinopathies. Disorders of pituitary function. Thyroid function disorders.
20. Adrenal glands disorders.
21. Sex glands disorders.
22. Parathyroid gland disorders. Calcium, phosphate and magnesium metabolism disorders. Connective and bone tissue disorders.
23. Reaction to the pathogenic noxa.

SEMINARS

1. Pathophysiology of DNA: Microlesions, chromosomal aberrations, genomic instability. Gene expression disorders. Inheritance metabolic diseases.
2. Subcellular structure disorders.
3. Atopic and transfusion reactions. Immunoreactivity tests.
4. Disorders of the structure and function of blood and hematopoietic organs.
5. Cardiac conduction system disorders. Complex rhythm disorders.
6. Heart failure.
7. Arterial pressure and blood flow disorder.
8. Circulatory shock.

9. Osmolality and hydration disorders. Disorders of extracellular fluid distribution.
10. Disturbance of urine volume and composition.
11. Pathophysiology of respiratory system.
12. Disorders of electrolytic homeostasis.
13. Acid-base balance disorders.
14. Carbohydrate and protein metabolism disorders. Dietary disorders.
15. Lipid metabolism disorders. Atherosclerosis.
16. Pathophysiology of the liver.
17. Energy metabolism disorders. Thermoregulation disorders.
18. Specific metabolic substances disorders.
19. Metabolic syndrome.

EXERCISES

1. Leukocytes and monocyte-macrophage system. Biological etiological factors.
2. Physical and chemical etiological factors.
3. Plasma proteins disorders. Spleen function disorders. Hematologic laboratory tests.
4. Hemostasis disorders.
5. Electrocardiographic interpretation of cardiac muscle and coronary blood flow abnormalities, vectorial analysis.
6. Cardiac arrhythmias and their ECG interpretation. Pathological ECG.
7. Digestive and metabolic disorders.
8. Pathophysiology of the liver and exocrine pancreas.
9. Endocrinopathies.
10. Disorders of conception, pregnancy, development and child growth. Sexual function disorders.

Literature: required and optional.

(Detailed plan of specific thematic units with learning outcomes is attached.)