

Code: <b>MFSE 0602</b>	Course title: <b>Pathophysiology 2</b>		
Level: <b>preclinical</b>	Study year: <b>III</b>	Semester: <b>VI</b>	ECTS: <b>5</b>
Status: <b>obligatory</b>	Total contact hours: <b>75</b>		
Prerequisites:	<b>According to the Study Regulation</b>		
Lecturers: <b>Professors and associates involved in the implementation of the course in accordance with the plan of the teaching process</b>			
1. Overall aim	The aim of the Pathophysiology 2 course is to train medical students in acquiring knowledge and skills in the field of special pathophysiology, and to help students to understand the pathophysiological processes characteristic for individual functional units as well as for the whole organism.		
2. Course contents	Module 1. Pathophysiology of blood and hematopoietic organs Module 2. Pathophysiology of the cardiovascular system Module 3. Pathophysiology of the endocrine system Module 4. Pathophysiology of the respiratory system Module 5. Pathophysiology of the urinary system Module 6. Pathophysiology of the gastrointestinal system Module 7. Pathophysiology of the central and peripheral nervous system		
3. Learning outcomes (Knowledge, skills and competences)	<p>The purpose of the course is to enable students to recognize functional changes of tissues, organs and organ systems. The acquired knowledge will enable students to understand the etiology and pathogenesis of the disease. The knowledge of the Pathophysiology 2 will help students to master all clinical subjects.</p> <p><i>Through the lectures and seminars, the students will acquire the following knowledge and competences:</i></p> <p>1. Learn basic pathophysiological mechanisms of blood disorders.</p> <p>2. Develop basic knowledge about pathophysiological mechanisms of cardiovascular system disorders.</p> <p>3. Understand pathophysiological mechanisms of endocrine system disorders.</p> <p>4. Recognize main mechanisms of respiratory system disorders.</p> <p>5. Learn pathophysiological mechanisms of urinary system disorders.</p> <p>6. Understand basic pathophysiological mechanisms to recognize gastrointestinal system disorders.</p> <p>7. Discover basic pathophysiological mechanisms of nervous system disorders.</p> <p><i>Through the practical laboratory work, the students will acquire the following skills:</i></p> <p>- Qualitative and quantitative disorders of red blood cells</p>		

	<ul style="list-style-type: none"> <li>- Testing the regenerative ability of blood in anemia</li> <li>- Laboratory tests in the diagnosis of anemia</li> <li>- Qualitative and quantitative changes of erythrocytes in the peripheral blood: <ul style="list-style-type: none"> <li>• folate and iron deficiency anemia</li> <li>• aplastic and hemolytic anemia</li> </ul> </li> <li>- Tests for hemostatic system disorders</li> <li>- Qualitative and quantitative platelet disorders</li> <li>- Disorders of white blood cells</li> <li>- Functional testing of white blood cells: <ul style="list-style-type: none"> <li>• acute leukosis</li> <li>• chronic leukosis</li> </ul> </li> <li>-Functional testing of the uropoetic system: <ul style="list-style-type: none"> <li>• physical and chemical examination of urine</li> <li>• microscopic examination of urine sediment</li> <li>• tests for the assessment of individual kidney function, impaired concentration and dilution testing of renal clearance.</li> </ul> </li> <li>-Functional testing of the hepatobiliary system: <ul style="list-style-type: none"> <li>• determination of bilirubin in the blood</li> <li>• determination of biliary products in the urine</li> <li>• examination of metabolic functions of the liver</li> </ul> </li> <li>- Laboratory markers of acute conditions</li> </ul>
4. Teaching methods	<p>Lectures: 30 hours</p> <p>Seminars: 15 hours</p> <p>Laboratory practical work: 30 hours</p>
5. Method of knowledge assessment and examination	<p><b>Continuous knowledge assessment</b></p> <p><b>Seminars</b></p> <p>During the course duration the students will be tested several times. The maximum number of points is 5.</p> <p><b>Practical work</b></p> <p>The verification of acquired skills through practical exercises will be carried out continuously through the two colloquia. The maximum number of points is 35:</p> <p>Colloquium 1 - maximum 20 points; passing minimum 11 points.</p> <p>Colloquium 2 - maximum 15 points; passing minimum 8,2 points.</p> <p>The structure of the colloquium:</p> <ol style="list-style-type: none"> <li>1. MCQ</li> <li>2. Essays</li> <li>3. Questions with amendments.</li> </ol> <p>The points from the colloquia are added to other points after both partial exams.</p>

	<p>The colloquia which student failed during the course, can be retaken on the final and the repeated exam.</p> <p><b>Partial exam 1</b></p> <p>The partial exam includes modules 1, 2, and 3, and is structured in two parts: the written and the oral parts. The written part is in the form of an MCQ test with 10 questions. The student can score the maximum of 10 points. A student who acquires 55% on the test takes an oral exam which consists of 3 questions. The maximum number of points on the oral exam is 20. Seminars are part of the test and the oral exam. The maximum number of points on the partial exam 1 is 30 (MCQ test 10 points + the oral exam 20 points).</p> <p><b>Partial exam 2</b></p> <p>The partial exam 2 includes modules 4, 5, 6, and 7. It is structured in two parts: the written and the oral exams. The written part is in the form of an MCQ test with 10 questions. The student can score the maximum of 10 points. A student who acquires 55% on the test takes an oral exam which consists of 4 questions. The maximum number of points on the oral exam is 20. Seminars are part of the test and the oral exam.</p> <p><b>Final exam</b></p> <p>The final exam consists of those parts the student did not pass during the course. The final exam has the same structure as the partial exams.</p> <p>The written test – 20 questions:</p> <ul style="list-style-type: none"> <li>a) MCQ test 1 - 10 questions (modules 1, 2, and 3)</li> <li>b) MCQ test 1 - 10 questions (modules 4, 5, 6, and 7).</li> </ul> <p>A student who scores 55% on both tests takes the oral exam with 6 questions from the modules which were parts of the partial exams. The maximum number of points on the final exam is 60.</p> <p>A student who has passed certain parts of the course, on the final exam passes the remaining parts.</p> <p><b>The repeated and correction exams</b></p> <p>The repeated and correction exams are conducted according to the previously defined criteria of the final exam.</p> <p>Final score is obtained on the basis of the sum of points achieved during the course:</p> <ul style="list-style-type: none"> <li>1. Seminars – maximum 5 points.</li> <li>2. Colloquia – maximum 35 points.</li> <li>3. Partial exams – maximum 60 points.</li> </ul>
	<p>Recommended</p> <ul style="list-style-type: none"> <li>1. Matko Marušić, Zdenko Kovač, Stjepan Gamulin. Pathophysiology. Zagreb: Medicinska naklada; 2013.</li> </ul>

6. Literature	<ol style="list-style-type: none"> <li>2. Gary D Hammer, Mc Phee SJ. Pathophysiology of disease:An introduction to clinical medicine. 7th ed. New York: Lange Medical Books/Mc Graw Hill; 2014.</li> <li>3. Sheila Grossman, Carol Mattson Porth. Essentials of Pathophysiology. Concepts of Altered States. 9th ed. Philadelphia: Wolters Kluwer; 2014.</li> <li>4. Kubishkin A.V. General and clinical pathophysiology. Vinnytsia: Nova Knyha Publishers; 2011.</li> <li>5. McCane LK, Huether ES. Pathophysiology. The Biologic Basis for Disease in Adults and Children. 6th ed. St. Louis: Mosby; 2010.</li> <li>6. Almir Fajkić. A textbook of practical pathophysiology. Sarajevo: Medical faculty University of Sarajevo; 2018.</li> </ol>
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## COURSE PLAN: PATHOPHYSIOLOGY 2

Weeks	Form of Instructions and materials	Number of classes
<b>Week 1.</b>	<b>Lectures:</b> Alterations in the hematologic system – Red blood cell disorders	2
	<b>Seminar:</b> Incompatibility of AB0 system and Rh system	1
	<b>Laboratory practical work:</b> – Qualitative and quantitative disorders of red blood cells – Disorders in the development of red blood cells – Morphological changes of red blood cells: shape, size, color – Testing regenerative abilities of blood in anemia – Determination of reticulocytes count (Wolfer)	2
<b>Week 2.</b>	<b>Lectures:</b> Alterations in the hematologic system – White blood cell disorders – Platelet and coagulopathic disorders	2
	<b>Seminar:</b> Acute and chronic leukemia pathogenesis	1
	<b>Laboratory practical work:</b> Laboratory tests in the diagnosis of anemia (red blood cells count, Hemoglobin, Hematocrit, Iron, TIBC, UIBC)	2
<b>Week 3.</b>	<b>Lectures:</b> Alterations in the cardiovascular system – Valvular heart disease – Congenital heart defects – Disorders of the pericardium – Coronary heart disease	2
	<b>Seminar:</b> Hemodynamic disorders in arrhythmias	1
	<b>Laboratory practical work:</b> Megaloblastic and sideropenic anemia - analysis of blood and bone marrow smear	2
<b>Week 4.</b>	<b>Lectures:</b> Alterations in the cardiovascular system – Alterations in blood pressure: hypertension, hypotension – Insufficiency and decompensation of the heart	2
	<b>Seminar:</b> Malignant hypertension, pulmonary hypertension	1
	<b>Laboratory practical work:</b> Aplastic and hemolytic anemia - analysis of blood and bone marrow smear	2

<b>Week 5.</b>	<b>Lectures:</b> Alterations in the endocrine system <ul style="list-style-type: none"> <li>– General aspects of altered endocrine function</li> <li>– Hormone secretion disorders</li> <li>– Hormone receptor disorders</li> <li>– Disorders of the system hypothalamus-pituitary-target gland</li> <li>– Anterior pituitary disorders</li> <li>– Posterior pituitary disorders</li> <li>– Thyroid disorders</li> </ul>	2
	<b>Seminar:</b> Paraneoplastic syndrome	1
	<b>Laboratory practical work:</b> Determination of bleeding and clotting time <ul style="list-style-type: none"> <li>– Determination of bleeding time (Duke; Ivy)</li> <li>– Determination of clotting time (Lee-White; Burcker)</li> <li>– Prothrombin time test (Quick)</li> <li>– Determining the clotting time of recalcified plasma (Howel)</li> </ul>	2
<b>Week 6.</b>	<b>Lectures:</b> Alterations in the endocrine system <ul style="list-style-type: none"> <li>– Disorders of adrenal cortical function</li> <li>– Disorders of adrenal medulla function</li> <li>– Parathyroid hormone disorders</li> <li>– Alterations in the male reproductive system</li> <li>– Alterations in the female reproductive system</li> </ul>	2
	<b>Seminar:</b> Osteoporosis	1
	<b>Laboratory practical work:</b> Determination of bleeding and clotting time <ul style="list-style-type: none"> <li>– Rumpel-Leede capillary fragility test</li> <li>– Platelet count test (Fonio)</li> </ul>	2
<b>Week 7.</b>	<b>Lecture and Seminar- Partial exam 1</b>	2+1
	<b>Laboratory practical work:</b> <ul style="list-style-type: none"> <li>– White blood cells disorders tests</li> <li>– White blood cells morphological changes</li> <li>– Differential leukocyte count</li> </ul>	2
<b>Week 8.</b>	<b>Lectures:</b> Alterations in the respiratory system <ul style="list-style-type: none"> <li>– Disorders of ventilation: hypoventilation, hyperventilation</li> <li>– Obstructive airway disorders</li> <li>– Restrictive airway disorders</li> </ul>	2
	<b>Seminar:</b> <ul style="list-style-type: none"> <li>– Consequences of ventilation disorders</li> <li>– Ventilation/perfusion ratio disorders</li> </ul>	1
	<b>Laboratory practical work:</b> Acute leukemia - analysis of blood and bone marrow smear Chronic leukemia - analysis of blood and bone marrow smear	2

<b>Week 9.</b>	<b>Lectures:</b> Alterations in the respiratory system <ul style="list-style-type: none"> <li>– Disorders of gas exchange</li> <li>– Pathogenesis of pulmonary edema</li> <li>– Pulmonary embolism</li> <li>– Pneumothorax</li> <li>– Atelectasis</li> <li>– Disorders of respiratory rhythm</li> </ul>	2
	<b>Seminar:</b> Disorders of non-respiratory functions of the lungs	1
	<b>Laboratory practical work: Colloquium 1</b>	2
<b>Week 10.</b>	<b>Lectures:</b> Alterations in the urinary system <ul style="list-style-type: none"> <li>– Prerenal disorders of kidney function</li> <li>– Disorders of glomerular function</li> <li>– Nephrotic syndrome</li> </ul>	2
	<b>Seminar:</b> Postrenal disorders of kidney function	1
	<b>Laboratory practical work:</b> Physical and chemical examination of urine	2
<b>Week 11.</b>	<b>Lectures:</b> Alterations in the urinary system <ul style="list-style-type: none"> <li>– Acute and chronic renal failure</li> <li>– Vascular kidney disorders</li> <li>– Tubulointerstitial disorders</li> </ul>	2
	<b>Seminar:</b> <ul style="list-style-type: none"> <li>– Oliguria</li> <li>– Poliuria</li> <li>– Disorders of urine composition</li> </ul>	1
	<b>Laboratory practical work:</b> Microscopic examination of urine sediment	2
<b>Week 12.</b>	<b>Lectures:</b> Alterations in the gastrointestinal system <ul style="list-style-type: none"> <li>– Disorders of pharynx and esophagus</li> <li>– Disorders of motor function of the stomach</li> <li>– Ulcer disease</li> <li>– Disorders of small and large intestines</li> <li>– Vomiting</li> <li>– Diarrhea</li> <li>– Ileus</li> <li>– Constipation</li> </ul>	2
	<b>Seminar:</b> Disorders of the exocrine pancreas <ul style="list-style-type: none"> <li>– Acute pancreatitis</li> <li>– Chronic pancreatitis</li> </ul>	1
	<b>Laboratory practical work:</b> <ul style="list-style-type: none"> <li>– Concentration and dilution test (Volhard)</li> <li>– Renal clearance test</li> </ul>	2

<b>Week 13.</b>	<b>Lectures:</b> Alterations in hepatobiliary function <ul style="list-style-type: none"> <li>– Disorders of carbohydrates, fats and proteins metabolism</li> <li>– Disorders of biotransformation mechanisms</li> <li>– Jaundice</li> <li>– Cholelithiasis</li> <li>– Disorders of hepatic blood flow</li> <li>– Portal hypertension</li> <li>– Pathogenesis of ascites</li> <li>– Liver failure</li> </ul>	2
	<b>Seminar:</b> Pathophysiology of gastrointestinal bleeding	1
	<b>Laboratory practical work:</b> Tests of hepatobiliary function	2
<b>Week 14.</b>	<b>Lectures:</b> Alterations in the nervous system <ul style="list-style-type: none"> <li>– Disorders of neural transmission</li> <li>– Peripheral motoneuron disorders</li> <li>– Neuromuscular junction disorders</li> <li>– Disorders of the corticospinal tract</li> <li>– Extrapyramidal disorders</li> <li>– Neuropathy and polyneuropathy</li> <li>– Pathophysiology of ischemic and hemorrhagic stroke</li> <li>– Disorders of consciousness and behavior</li> <li>– Memory disorders</li> </ul>	2
	<b>Seminar:</b> Pathophysiology of epilepsy Disorders of cerebrospinal fluid	1
	<b>Laboratory practical work:</b> Laboratory markers of acute conditions	2
<b>Week 15.</b>	<b>Lectures and Seminar - Partial exam 2</b>	2+1
	<b>Laboratory practical work: Colloquium 2</b>	2
<b>Week 17.-18.</b>	<b>Final exam</b>	
<b>Week 19.-20.</b>	<b>Re-sit exam</b>	