



**PHARMACY - INTEGRATED  
ACADEMIC STUDIES**

**SECOND YEAR OF STUDY**

2023/2024.

**FUNDAMENTALS OF PATHOLOGICAL HUMAN PHYSIOLOGY**

Subject:

## **FUNDAMENTALS OF PATHOLOGICAL HUMAN PHYSIOLOGY**

The subject is valued with 4 EPTS (European Points Transfer System) points. There are 4 school class of active teaching weekly (2 class of lectures and 2 class of practical learning)

**TEACHERS:**

	Име и презиме	Email адреса	звање
1	Ilija Jeftić	ilijamb@yahoo.com	Associate Professor

**COURSE STRUCTURE:**

Module	Module title	Week	Teaching classes weekly	Work in small group weekly	Teacher-responsible for module
1	<b>Basic pathological physiology</b>	7	2	2	Prof. MD Ilija Jeftić
2	<b>Special pathological physiology</b>	8	2	2	Prof. MD Ilija Jeftić
					$\Sigma 30+30=60$

## **ASSESSMENT:**

The student masters the subject in modules. The grade is equivalent to the number of points earned (see tables). Points are earned in two ways:

**ACTIVITY DURING THE LESSON:** In this way, the student can earn up to 50 points:

A. Oral examination: in a special part of the exercise, he answers one questions from that week of classes and, in accordance with the demonstrated knowledge, earns 0–0.5 points (up to 15 points in total)

B. Tests by modules: in this way, a student can gain up to 35 points (70 questions, each question on the test is valued at 0.5 points)

**FINAL WRITTEN EXAM:** In this way, the student can gain up to 50 points (50 questions, each worth 1 point). A student has the right to take the final written exam if he has achieved more than 50% of the points provided for the activity and test in the modules. Postponed passing of the final written exam (in the following exam periods) does not reduce the number of points used to define the final grade.

### **The final grade is formed as follows:**

In order to pass the course, the student must pass the modules and the final oral exam.

To pass the module the student must:

1. obtains more than 50% points in that module
2. acquires more than 50% of the points provided for the activity in teaching in each module
3. pass the module test, i.e. have more than 50% correct answers.

### **ASSESSMENT – FINAL GRADE:**

<b>Number of points won</b>	<b>mark</b>
0 - 50	<b>5</b>
51 - 60	<b>6</b>
61 - 70	<b>7</b>
71 - 80	<b>8</b>
81 - 90	<b>9</b>
91 - 100	<b>10</b>

# **TESTS BY MODULES**

## **MODULE 1.**

**FINAL TEST**  
**0-16 POINTS**

**EVALUATION**  
**FINAL TEST**

**The test has 32 questions**  
**Each question is worth 0.5 points**

## **МОДУЛ 2.**

**FINAL TEST**  
**0-19 POINTS**

**EVALUATION**  
**FINAL TEST**

**The test has 38 questions**  
**Each question is worth 0.5 points**

**LITERATURE:**

<b>Module</b>	<b>Teaching unit</b>	<b>LITERATURE</b>	<b>Autors</b>	<b>Publisher</b>	<b>Library</b>
1	PATHOPHYSIOLOGY, FOURTH EDITION Pathophysiology/Lee-Ellen C. Copstead. Jecquelyn (Jackie) L. Banasik. – 4 <sup>th</sup> ed. P. ; cm. ISBN-13: 978-1-4160-5543-3, ELSEVIER	PATHOPHYSIOLOGY, FOURTH EDITION	Lee-Ellen C. Copstead. Jecquelyn (Jackie) L. Banasik.	ELSEVIER	Yes
2	PATHOPHYSIOLOGY: THE BIOLOGIC BASIS FOR DISEASE IN ADULTS AND CHILDREN, EIGHTH EDITION by Kathryn L. McCance and Sue E. Huether, 2019.	PATHOPHYSIOLOGY, EIGHTH EDITION	Kathryn L. McCance and Sue E. Huether	MOSBY	e-book available
3	ENCYCLOPEDIA OF GERONTOLOGY AND POPULATION AGING Danan Gu, Matthew E. Dupre – 1 <sup>st</sup> ed. ISBN 978-3-030-22008-2 Springer Cham	ENCYCLOPEDIA OF GERONTOLOGY AND POPULATION AGING	Danan Gu, Matthew E. Dupre	Springer Cham	e-book available

**All lectures are available on the website of the Faculty of Medical Sciences: [www.medf.kg.ac.rs](http://www.medf.kg.ac.rs)**

# PROGRAM:

## FIRST MODULE: BASIC PATHOLOGICAL PHYSIOLOGY

TEACHING UNIT 1 and 2 (FIRST WEEK):

Lecture: 2 school classes

Practical learning: 2 school classes

### **Introduction to pathological physiology**

Subject of Pathological Physiology. Etiology and pathogenesis. Division of etiological factors. Mechanisms of pathophysiological processes. Etiological, pathogenetic and symptomatic therapy of the disease.

### **Health and illness. Homeostasis disorders**

Concept of health and disease. Disease as a nosological entity (definition, stages and course of the disease). Disorders of control mechanisms (positive and negative feedback loops) of individual organic systems and the organism as a whole. General adaptation syndrome.

The influence of heredity, exogenous factors and risk factors in the etiopathogenesis of various pathological conditions. Homeostasis disorders. Presentation of clinical examples.

TEACHING UNIT 3 and 4 (SECOND WEEK):

Lecture: 2 school classes

Practical learning: 2 school classes

### **Adaptation, aging and cell death**

Adaptive cell changes. Mechanisms of cell damage by the action of various etiological factors (ischemia, reactive forms of oxygen, ionizing radiation). Aging and cell death. Forms of cell death (apoptosis and necrosis).

### **Malignant cell transformation**

Causes and mechanisms of malignant cell transformation (carcinogens and carcinogenesis: chemical, physical, biological). Characteristics of malignantly altered cells. Changes in the organism of the patient. Paraneoplastic syndrome.

Adaptation, aging and cell death. Malignant cell transformation. Tumor markers in the diagnosis of malignant diseases. Presentation of clinical examples.

TEACHING UNIT 5 and 6 (THIRD WEEK):

Lecture: 2 school classes

Practical learning: 2 school classes

### **Non-specific and specific protection of the organism**

Characteristics of non-specific and specific immunity. Basic components of non-specific and specific immunity. Immunodeficiencies. AIDS syndrome.

### **Hypersensitivity reactions and autoimmunity**

Division of hypersensitivity reactions. Etiopathogenesis of anaphylactic type of hypersensitivity. Cytotoxic type of hypersensitivity. Immunocomplex type of hypersensitivity. Known type of hypersensitivity. Mechanisms of establishment and maintenance of autotolerance. Mechanisms of interruption of autotolerance and occurrence of autoimmune diseases.

Non-specific and specific protection of the organism. Hypersensitivity reactions and autoimmunity. Presentation of clinical examples.

TEACHING UNIT 7 and 8 (FOURTH НЕДЕЛЯ):

Lecture: 2 school classes

Practical learning: 2 school classes

### **Pathophysiology of inflammation and infection**

Mechanisms of infections (bacterial, viral, fungal). Host response to infection. Fever (stages, forms, metabolic disorders in fever). Etiology and pathogenesis of acute

Etiopathogenesis of acute and chronic inflammation. Laboratory diagnosis of inflammation (erythrocyte sedimentation, changes

inflammatory reaction. Local changes in inflammation, mediators of the inflammatory reaction. Systemic changes in inflammation. Sepsis syndrome.	in the number of leukocytes and leukocyte formula, CRP, fibrinogen, procalcitonon, presepsin).
<b>Exogenous intoxications</b> Chemical etiological factors. Toxicity factors. Distribution, biotransformation and excretion of toxins. Effect of toxins on the cell. Intoxication with ethanol, nicotine and heavy metals. Snake bite. Iatrogenic drug damage.	Acute and chronic intoxications. Presentation of clinical examples.
TEACHING UNIT 9 and 10 (FIFTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Local circulation disorders</b> Arterial hyperemia, venous hyperemia, local ischemia, embolism, thrombosis.	Local circulation disorders. Etiopathogenesis of shock syndrome. Presentation of clinical examples.
<b>Etiopathogenesis of shock syndrome</b> Definition and etiopathogenesis of shock. Compensatory mechanisms, stages in the development of shock. Forms of shock. Multiple organ dysfunction syndrome.	
<b>Etiopathogenesis of shock syndrome</b> Definition and etiopathogenesis of shock. Compensatory mechanisms, stages in the development of shock. Forms of shock. Multiple organ dysfunction syndrome.	
TEACHING UNIT 11 and 12 (SIXTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Disorders of water and mineral metabolism I</b> Disorders of water, sodium and potassium metabolism. Disorders of acid-base balance.	Disorders of water and mineral metabolism. Laboratory diagnostics of water, sodium and potassium metabolism disorders; interpretation of acid-base balance disorders (presentation of clinical examples).
<b>Disorders of mineral metabolism II</b> Regulation of calcium, phosphate and magnesium. Disorders of calcium, phosphate and magnesium metabolism.	
TEACHING UNIT 13 and 14 (SEVENTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Disorders of the metabolism of organic substances.</b> Disorders of carbohydrate, protein and fat metabolism. Etiopathogenesis of diabetes mellitus. Lipidoses. Atherosclerosis.	Disorders of the metabolism of organic substances. Disorders of energy metabolism. Disorders of vitamin metabolism. Laboratory diagnosis of disorders of protein, carbohydrate and fat metabolism: interpretation of lipidogram; tests for the diagnosis of diabetes mellitus; interpretation of OGTT (presentation of clinical examples).
<b>Disorders of energy metabolism. Disorders of vitamin metabolism</b> Eating disorders. Malnutrition and obesity. Hypovitaminosis and hypervitaminosis.	

## SECOND MODULE: SPECIAL PATHOLOGICAL PHISIOLOGY



TEACHING UNIT 15 and 16 (EIGHTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Pathophysiology of the cardiovascular system I</b> Valvular heart defects. Myocardial disorders. Etiopathogenesis of ischemic heart disease. Myocardial infarction. Heart failure.	Pathophysiology of the cardiovascular system. Presentation of clinical examples
<b>Pathophysiology of the cardiovascular system II</b> Pericardial diseases. Cardiac rhythm and conduction disorders. Etiopathogenesis of arterial hypertension and hypotension.	
TEACHING UNIT 17 and 18 (NINTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Pathophysiology of the respiratory system I</b> Disorders of pulmonary ventilation (division). Chronic obstructive pulmonary disease. Bronchial asthma. Etiopathogenesis of restrictive ventilation disorders.	Pathophysiology of the respiratory system Presentation of clinical examples: investigation of ventilation function; arterial blood gas analysis.
<b>Pathophysiology of the respiratory system II</b> Pulmonary perfusion disorders. Gas diffusion disorders through the alveolo-capillary membrane. Pulmonary edema. Adult respiratory distress syndrome. Pulmonary hypertension. Respiratory insufficiency.	
TEACHING UNIT 19 and 20 (TENTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Pathophysiology of the hematopoietic system I</b> Pathophysiological disorders of the red blood line. Etiopathogenesis of anemia. Etiopathogenesis of polycythemia. Pathophysiological disorders of the white blood line. Disorders of the number of leukocytes. Etiopathogenesis of leukemia and lymphoma.	Pathophysiology of the hematopoietic system. Presentation of clinical examples: laboratory diagnosis of anemia; disorders of leukocyte count and leukocyte formula; coagulation tests.
<b>Pathophysiology of the hematopoietic system II</b> Disorders of hemostasis (basic mechanisms of formation and division). Disorders of hemostasis caused by a change in the number and function of platelets. Etiopathogenesis of coagulopathy. Etiopathogenesis of disseminated intravascular coagulopathy (DIK). Medicines that affect blood coagulability.	
TEACHING UNIT 21 and 22 (ELEVENTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Pathophysiology of the endocrine system I</b> Endocrine glands. Control mechanisms of the endocrine system. Function and mechanisms of hormone action. Disorders of the function of the endocrine system. Determination of hormone levels. Hypothalamic and pituitary function disorders.	Pathophysiology of the endocrine system Presentation of clinical examples: determination of hormone levels and interpretation of results.
<b>Pathophysiology of the endocrine system II</b> Thyroid gland function disorders. Parathyroid gland function disorders. Disorders of the cortex and medulla of the adrenal gland.	
TEACHING UNIT 23 and 24 (TWELFTH WEEK):	
Lecture: 2 school classes	Practical learning: 2 school classes
<b>Pathophysiology of the gastrointestinal system I</b> Etiopathogenesis of disorders of the esophagus and stomach (GERD, gastritis and peptic ulcer). Nausea and vomiting. Etiopathogenesis of disorders of the function of the small and large intestine. Maldigestion and malabsorption. Inflammatory	Pathophysiology of the gastrointestinal system. Laboratory diagnostics of the

<p>bowel diseases. Ileus. Diarrhea and constipation.</p>	<p>gastrointestinal system: pancreatic enzymes, liver function tests (presentation of clinical examples).</p>
<p><b>Pathophysiology of the gastrointestinal system II</b> Disorders of pancreatic function. Acute and chronic pancreatitis. Liver function disorders (etiopathogenesis of hepatitis, liver cirrhosis, cholelithiasis). Alcoholic liver disease.</p>	
<p>TEACHING UNIT 25 and 26 (THIRTEENTH WEEK):</p>	
<p>Lecture: 2 school classes</p>	<p>Practical learning: 2 school classes</p>
<p><b>Pathophysiology of the urinary system I</b> Division of kidney function disorders. Disorders of the function of glomeruli and tubules. Glomerulonephritis. Nephrotic syndrome. Tubulointerstitial kidney diseases. Acute tubular necrosis. Nephrotoxic drugs. Urinary infections.</p>	<p>Pathophysiology of the urinary system. Presentation of clinical examples: physical and chemical characteristics of urine; urine sediment; creatinine clearance.</p>
<p><b>Pathophysiology of the urinary system II</b> Renal hypertension. Acute and chronic renal failure. Nephrolithiasis.</p>	
<p>TEACHING UNIT 27 and 28 (FOURTEENTH WEEK):</p>	
<p>Lecture: 2 school classes</p>	<p>Practical learning: 2 school classes</p>
<p><b>Pathophysiology of the nervous system I</b> Peripheral and central motor neuron damage syndrome. Disorders of cerebral blood flow. Etiology and pathogenesis of Parkinson's disease. Multiple sclerosis. Dementia (Alzheimer's disease).</p>	<p>Pathophysiology of the nervous system Presentation of clinical examples: physical and chemical characteristics of cerebrospinal fluid.</p>
<p><b>Pathophysiology of the nervous system II</b> Etiopathogenesis of epilepsy. Pathophysiological aspects of pain; analgesics and coanalgesics in pain modulation. Disorders of consciousness. Sleep disorders. Etiopathogenesis of depression; mechanisms of drug action on serotonergic and noradrenergic neurotransmission. Etiopathogenesis of schizophrenia; mechanisms of drug action on dopaminergic neurotransmission.</p>	
<p>TEACHING UNIT 29 and 30 (FIFTEENTH WEEK):</p>	
<p>Lecture: 2 school classes</p>	<p>Practical learning: 2 school classes</p>
<p><b>Pathophysiology of bone diseases I</b> Structure and function of bones and joints. Pathogenesis of metabolic bone diseases (osteoporosis, osteomalacia, rickets). Pathophysiology of bone fractures. Pathogenesis of degenerative rheumatic joint diseases (osteoarthritis).</p>	<p>Pathophysiology of bone diseases and systemic connective tissue diseases Laboratory diagnostics of rheumatoid arthritis and systemic lupus erythematosus (presentation of clinical examples)</p>
<p><b>Pathophysiology of bone diseases II</b> Inflammatory rheumatic diseases. Etiopathogenesis of systemic lupus erythematosus, rheumatoid arthritis, seronegative arthropathies.</p>	

## **LECTURE SCHEDULE**

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## **PRACTICAL LEARNING SCHEDULE**

## LECTURE SCHEDULE

module	week	date	time	place	type	title	professor
1	1				lecture	Introduction to pathological physiology. Health and illness. Homeostasis disorders. General adaptation syndrome.	Prof. dr Ilija Jeftić
	1				practical learning	The influence of heredity, exogenous factors and risk factors in the etiopathogenesis of various pathological conditions. Homeostasis disorders. Presentation of clinical examples.	Prof. dr Ilija Jeftić
1	2				lecture	Adaptation, aging and cell death. Malignant cell transformation.	Prof. dr Ilija Jeftić
	2				practical learning	Ischemic cell damage. Cell damage caused by free radicals. Cell damage caused by ionizing radiation. Presentation of clinical examples.	Prof. dr Ilija Jeftić
1	3				lecture	Non-specific and specific protection of the organism. Hypersensitivity reactions. Autoimmunity	Prof. dr Ilija Jeftić
	3				practical learning	Non-specific and specific protection of the organism. Hypersensitivity reactions. Autoimmunity. Presentation of clinical examples.	Prof. dr Ilija Jeftić
1	4				lecture	Pathophysiology of inflammation and infection. Acute and chronic intoxications.	Prof. dr Ilija Jeftić
	4				practical learning	Etiopathogenesis of acute and chronic inflammation. Acute and chronic intoxications. Presentation of clinical examples.	Prof. dr Ilija Jeftić
1	5				lecture	Local circulation disorders. Etiopathogenesis of shock syndrome.	Prof. dr Ilija Jeftić
	5				practical learning	Local circulation disorders. Etiopathogenesis of shock syndrome. Presentation of clinical examples.	Prof. dr Ilija Jeftić
1	6				lecture	Disorders of water and mineral metabolism. Disorders of acid-base balance.	Prof. dr Ilija Jeftić
	6				practical learning	Disorders of water and mineral metabolism. Disorders of acid-base balance. Presentation of clinical examples.	Prof. dr Ilija Jeftić

## LECTURE SCHEDULE

module	week	date	time	place	type	title	professor
1	7				lecture	Disorders of the metabolism of organic substances. Disorders of energy metabolism. Disorders of vitamin metabolism.	Prof. dr Ilija Jeftić
	7				practical learning	Disorders of the metabolism of organic substances. Disorders of energy metabolism. Disorders of vitamin metabolism. Presentation of clinical examples.	Prof. dr Ilija Jeftić
					<b>FTM1</b>	<b>FINAL TEST MODULE 1</b>	
2	8				lecture	Pathophysiology of the cardiovascular system.	Prof. dr Ilija Jeftić
	8				practical learning	Pathophysiology of the cardiovascular system. Presentation of clinical examples.	Prof. dr Ilija Jeftić
2	9				lecture	Pathophysiology of the respiratory system.	Prof. dr Ilija Jeftić
	9				practical learning	Pathophysiology of the respiratory system. Presentation of clinical examples.	Prof. dr Ilija Jeftić
2	10				lecture	Pathophysiology of the hematopoietic system.	Prof. dr Ilija Jeftić
	10				practical learning	Pathophysiology of the hematopoietic system. Presentation of clinical examples.	Prof. dr Ilija Jeftić
2	11				lecture	Pathophysiology of the endocrine system.	Prof. dr Ilija Jeftić
	11				practical learning	Pathophysiology of the endocrine system. Presentation of clinical examples.	Prof. dr Ilija Jeftić
2	12				lecture	Pathophysiology of the gastrointestinal system.	Prof. dr Ilija Jeftić
	12				practical learning	Pathophysiology of the gastrointestinal system. Presentation of clinical examples.	Prof. dr Ilija Jeftić

## LECTURE SCHEDULE

module	week	date	time	place	type	title	professor
2	13				lecture	Pathophysiology of the urinary system.	Prof. dr Ilija Jeftić
	13				practical learning	Pathophysiology of the urinary system. Presentation of clinical examples.	Prof. dr Ilija Jeftić
2	14				lecture	Pathophysiology of the nervous system.	Prof. dr Ilija Jeftić
	14				practical learning	Pathophysiology of the nervous system. Presentation of clinical examples.	Prof. dr Ilija Jeftić
2	15				lecture	Pathophysiology of bone diseases. Systemic connective tissue diseases	Prof. dr Ilija Jeftić
	15				practical learning	Pathophysiology of bone diseases. Systemic connective tissue diseases. Presentation of clinical examples.	Prof. dr Ilija Jeftić
					<b>FTM2</b>	<b>FINAL TEST MODULE 2</b>	
					<b>EXAM</b>	<b>EXAM (january/february)</b>	