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PHARMACY FACULTY

STUDY PROGRAM 0916.1 PHARMACY

CHAIR OF PATHOLOGY

APPROVED

at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum in Pharmacy Faculty

Minutes No. 2 of 09.04.2025

Chairman, M.D., lecturer

Diana Guranda



APPROVED

at the Council meeting of the Faculty of Pharmacy

Minutes No. 4 of 10.04.2025

Dean of Faculty Ph.D., lecturer

Livia Uncu



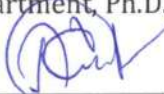
APPROVED

at the meeting of Pathology Department

Minutes No. 15 of 20.03.2025

Chief of the department, Ph.D., associate professor

Melnic Eugen




SYLLABUS

DISCIPLINE PATHOPHYSIOLOGY

Integrated studies / Cycle I, License


Type of course: **Compulsory**

Syllabus elaborated by authors:

Lutan Vasile, PhD, associate professor

Cobeț Valeriu, PhD professor

Chisinau, 2025

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I. INTRODUCTION

- General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional training program.

Pathophysiology is a fundamental medical science and preclinical discipline studied during the physician's instruction. Pathophysiology studies the general laws of the disease origin, disease evolution, the ending of the disease and disease structure. The general object of study of pathophysiology is the sick organism. Primordial object of study of pathophysiology is the laboratory animal. Studies done in laboratory animals gave essential information about the pathological processes and experimental disorders, which being extrapolated and adjusted to the human organism constitutes the theoretical basis of experimental pathology and therapy. This knowledge is needed by the pharmacist student for understanding of the therapeutic effects of drug remedies, which allows their correct use, according to the ethiotropic and pathogenetic principles.

Mission of the curriculum (aim) in professional training:


Studying the laws of functional disorders of typical pathological processes and diseases at the molecular, cellular, tissue, organ, system and integral organism levels; studying the laws of general origin, occurrence, evolution and end of typical pathological processes and nosological entities; studying the pathogenetic principles of correction of functional disorders and pathogenetic treatment of pathological processes and diseases;

After the assimilated course of pathophysiology, the future pharmacist will be able to integrate and apply in practice the gained knowledge in the study of the medicobiological disciplines and those of pharmaceutical profile. So Pathophysiology will be an essential intermediate link between pharmacist and patient.

- Language of the course:** romanian, russian, english.
- Beneficiaries:** students of the IInd year, Pharmacy faculty, specialty 0916.1 PHARMACY.

II. MANAGEMENT OF THE DISCIPLINE

Course code		F.04.O.031	
Name of course		Pathophysiology	
Responsible (s) of discipline		Melnic Eugen, Todiraş Stela	
Year	II	Semesters	IV
Total hours including:			150
Course	30	Practical classes	45
Seminars	0	Individual work	75
Form of assessment	E	Numbers of credits	5

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III. TRAINING AIMS WITHIN THE DISCIPLINE


At the end of discipline studying the student will be able to:

- ***at the level of knowledge and understanding:***
 - to know the principles of pathogenic correction of functional disorders in pathological processes and diseases;
 - to know the rules of behavior with laboratory animals and the ethical principles of pathophysiological experiment modeling;
 - to know the principles of planning, organizing and modeling of pathophysiological experiment;
 - to know the reference values of the functional parameters which characterize the activity of the body's systems and the significance of their deviations from the norm ;
 - to know the accepted terminology in pathology;
- ***at the application level:***
 - to be able to interpret the information obtained in the experiment and extrapolate it to clinical pathologies;
 - to be able to answer and argue the correct (and incorrect) answers to the questions in pathophysiology tests;
 - to be able to make general conclusions and to make the nozological differentiation basing on the complex investigations.
- ***at the integration level:***
 - to be able to use the gained knowledge in previously studied subjects (anatomy, physiology, biochemistry) in the study of pathophysiology;
 - to be able to integrate the gained knowledge in physiopathology with pharmacological and pharmacotherapy information for pharmacological pathogenetic correction of pathological phenomena;

IV. PREREQUISITIES AND REQUIREMENTS

Student of the second year requires the following:

- knowledge of the instruction language ;
- confirmed skills in high school sciences (biology, chemistry, physics);
- confirmed skills in sciences at the level of academic II year (anatomy, biology
- molecular, histology, physiology, biochemistry);
- digital skills (internet usage, processing of document, electronic tables, presentations and the use of graphics programs);
- ability to communicate and and work in the team;
- personal qualities - tolerance, compassion, autonomy.

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V. THEMES AND ESTIMATE ALLOCATION OF HOURS


Lectures, training courses / laboratory hours/seminars and self-training

Nb.	THEME	Hours		
		Lectures	Practical classes	Individual work
I.	Nozology. The object, tasks and research methods of pathophysiology. General aetiology. General pathogenesis. General sanogenesis	2	6	5
II.	Cell injury. Cell death. Cellular adaptive processes.	2	3	5
III.	Disorders of local microcirculation.	2	3	5
IV.	Inflammation	2	3	5
V.	Immunopathological processes. Allergy. Allergic reactions type I, II, III, IV. Non-specific hypersensitivity.	2	3	5
6.	Pathophysiology of red blood cells. Anemia. Erythrocytosis	2	3	5
7.	Pathophysiology of the leukocyte system. Leukocytosis. Leukopenia. Leukemia.	2	3	5
8.	Pathophysiology of the endocrine system	2	6	5
9.	Pathophysiology of the cardiovascular system	2	3	5
10.	Pathophysiology of the respiratory system.	2	3	5
11.	Pathophysiology of the digestive system	2	3	5
12.	Pathophysiology of the liver	2	3	5
13.	Pathophysiology of kidneys	2	3	5
14.	Pathophysiology of the nervous system.	2		5
15.	Hypoxia. Classification. Etiology. Pathogenesis. Compensatory mechanisms	2		5
Total		30	45	75

VI. PRACTICAL TOOLS PURCHASED AT THE END OF THE COURSE

Mandatory essential practical tools (autumn semester) are:

- To be able to interpret changes of erythrocyte sedimentation rate in inflammatory processes;
- To be able to interpret changes of acute phase proteins in the blood;
- To be able to interpret changes of pro- and anti-inflammatory cytokines;
- To be able to interpret changes of pH, HCO₃ in the blood;

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- To be able to interpret changes of humoral immune status, immunoglobulin spectrum;
- To be able to interpret changes of lymphocytes population;
- To be able to interpret changes of hematocrit in different form of hydric imbalance;
- To be able to interpret changes of lipid spectrum in the blood;
- To be able to interpret changes of peripheral blood analysis (hemogram, leucogram);
- To be able to interpret urogram changes in different pathologies;
- To be able to interpret changes of hormonal profile.

VII. REFERENCES OBJECTIVES AND CONTENT UNITS

Objectives	Content units
Theme (chapter) 1. General nosology. The object, tasks and research methods of pathophysiology. General aetiology. General pathogenesis. General sanogenesis.	
<ul style="list-style-type: none"> • To define: to define the basic notions of nosology. • To know: classification and characteristics of causes and conditions, classification and characteristics of physiological reactions. Mechanisms of generalization and localization of pathological processes. • To demonstrate: the role of the experiment in studying of pathological processes. • To apply: the notions of nosology in the interpretation of pathophysiological experiments and in medical practice • To integrate: observations from the demonstrated experiments (hypovolemia, algic shock, hyperadrenalineemia, hypoxia) in the form of pathogenetic chain of the pathological processes with the interpretation of observed phenomena. 	1. General etiology. General pathology. Object of study. Tasks of pathophysiology. The pathophysiologic experiment.
	2. Pathologic process. General pathogenesis. Lesion. Pathogenetic factor. Cause-effect relationship. Pathogenic chain. Main pathogenic link. Vicious circle.
	3. Disease. The latent, prodromal period, the period of complete development, resolution.
	4. Reactivity. Adaptive, compensatory, protective, reparative reaction. General sanogenesis. Primary and secondary pathogenetic mechanisms.
Theme (chapter) 2. Cell injury. Cell death. Cellular adaptive processes.	
<ul style="list-style-type: none"> • To define the concepts: cell injury, general causes and pathogenesis of cell injury, cellular dysmetabolism, the concepts of apoptosis, intrinsic and extrinsic, positive and negative 	1. Cellular injury; injury of cytoplasmic membrane, nucleus, mitochondria, endoplasmic reticulum, ribosomes, lysosomes.



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Objectives	Content units
<p>apoptogenic factor, degenerative and proliferative diseases. Concepts of necrosis, necrobiosis, physiological and pathological death, tanatogenic factors. physiologic and pathological regeneration.</p> <ul style="list-style-type: none"> • To know: classification, mechanism of action and primary effects of mechanical, physical, chemical, biological, osmotic, oxidative, enzymatic, immunopathogenic, hypoxia, hydrogen ions, energy shortage, intrinsic and extrinsic, positive and negative apoptogenic factors, stages of intrinsic and extrinsic apoptosis. Periods of necrosis. Types and pathogenetic mechanisms of physiological and pathological regenerative processes. • To demonstrate: the complete pathogenetic chain of the cell death at the action of mechanical, physical, chemical, biological, osmotic, oxidative, enzymatic, immunopathic factors, and hypoxia, hydrogen ions, energy depletion, the pathogenetic chain of typical tissue processes. • To apply: knowledge of the pathogenesis of cellular dismetabolisms in the explanation of metabolic diseases: liver lipid dystrophy, obesity, atheromatosis. 	
	2. Apoptosis. Intrinsic and extrinsic, positive and negative apoptogenic factors. Stages of apoptosis: initiation, execution, final.
	3. Necrosis, necrobiosis. Physiological and pathological death. Periods of necrosis.
	4. Pathological regeneration, dysplasia, metaplasia, cancer, sclerosis.
	5. Functional, adaptive, reparative, protective, compensatory, endocrine hypertrophy.
	6. Hypofunctional, involutional, senile, endocrine, posthypertrophic physiological atrophy. Pathological atrophy.
Theme (chapter) 3. Disorders of local microcirculation.	
<ul style="list-style-type: none"> • To define: neurotonic, neuromyoparalytic, neuromyoparalytic, neuromyoparalytic, humoral, functional reactive arterial hyperemia. Ischemia. Embolism. Obstructive, obliterating, compressional local venous hyperemia. Prestage, stasis. Thrombosis. Edema. • To know: etiology, pathogenesis, classification, manifestations and consequences of neurotonic, neuromyoparalytic, neuromyoparalytic, humoral, 	1. Arterial hyperemia neurotonic, neuromyoparalytic, neuromyoparalytic, neuromyoparalytic, neuromyoparalytic, humoral, functional reactive.
	2. Obstructive, obliterative, compressional local venous hyperemia. Prestage and stasis.



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Objectives	Content units
<p>functional, reactive arterial hyperemia, obstructive venous hyperemia, obliterating; etiology, pathogenesis, manifestations and consequences of exogenous and endogenous embolism, edema; ischemia, ischemia, pre- and stasis, thrombogenesis with the formation of white and red thrombus.</p> <ul style="list-style-type: none"> • To demonstrate: the pathogenetic chain of various forms of arterial hyperaemia, venous hyperaemia, ischemia, embolism. To demonstrate the pathogenetic effect of different forms of edema, the pathogenetic chain of white and red thrombus formation. • To apply: the theoretical knowledge in the pathogenic correction of microcirculatory disturbances. • To integrate: the theoretical knowledge about local microcirculatory disorders in pathogenesis of different diseases. 	3. Ischemia. Red and white infarction.
	4. Embolism, types.
	5. White, red, mixed thrombus.
	6. Edema. Hypooncotic, hyperosmotic,, hydrostatic, membranogenic and lympho-static mechanisms of edema formation.
Theme (chapter) 4. Inflammation. Fever	
<ul style="list-style-type: none"> • To define: Notions of: inflammation, alteration; serous, fibrinous, purulent, haemorrhagic, and putrid exudation, leucocyte emigration, concepts of fever, its aetiology, pathogenesis, types and consequences. • To know: causes of inflammation, pathogenesis of the alteration caused by various phlogogenic factors. Pathogenesis and stages of fever evolution: rising, maintaining and falling temperature. Metabolic and functional changes. Biological significance. Pathogenetic correction. Primary and secondary pyogenic factors, exogenous and endogenous. Stages of fever: rising, maintaining and falling temperature. 	1. Inflammation, alteration, lesional pattern and pathogenic molecules
	2. Cells-and plasma-derived mediators,
	3. Vascular reaction in inflammation



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Objectives	Content units
<p>Subfebrile, febrile, high and hyperpyretic fevers. Thermal curve: continuous, remitting, intermittent, recurrent, hectic, atypical.</p> <ul style="list-style-type: none">• To demonstrate: the pathogenetic chain of different forms of inflammation: alterative, exudative, proliferative, the pathogenic chain of fever: the stage of temperature rise, maintenance and decrease).• To apply: information about the composition of the exudate for differentiation of the inflammation variants. Apply information on the pathogenesis of inflammation to modulate the inflammatory process and use anti-inflammatory preparations.• To integrate: knowledge about the etiology, pathogenesis and manifestations of inflammation in the pathogenesis and evolution of inflammatory diseases.	4. Serous, fibrinous, purulent, hemorrhagic, putrid exudation;
	5. Leukocyte emigration, phagocytosis, inflammatory proliferation;
	6. Acute phase reaction, fever and leukocytosis.
Theme (chapter) 5. Immunopathological processes. Allergy. Hypersensitivity disorders type I,II,III, IV. Non-specific hypersensitivity	
<ul style="list-style-type: none">• To define: notions of allergy, immediate and delayed types of hypersensitivity disorders.• To know: etiology of allergic reactions and the classification of antigens, altering mechanisms in allergic reactions.• To demonstrate: the complete pathogenetic chain from inoculating the allergen to structural damage in all types of allergic reactions.• To apply: the theoretical information about pathogenesis of allergic reactions to formulate the principles of pathogenetic therapy. To apply the theoretical knowledge for diagnosing and formulating the principles of pathogenetic correction of immunodeficiencies.• To integrate: the theoretical information about pathogenesis of allergic reactions for	1. Allergy. Immediate-type allergic reactions: anaphylactic, cytolytic, immune complex, stimulatory. Anaphylactic shock. Hyposensitization.
	2. Non-specific hypersensitivity.
	3. Immunodeficiencies of humoral, cellular and mixed types. Drug immunodeficiencies.



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Objectives	Content units
involvement in the pathogenesis of allergic, autoallergic and pseudo-allergic diseases.	
Theme (chapter) 6. Pathophysiology of red blood cells. Anemia. Erythrocytosis	
<ul style="list-style-type: none"> • To define: the notions of erythrocytosis, anemias, anisocytosis, poichylocytosis. • To know: etiology, pathogenesis, manifestations and peripheral blood smear of erythrocytosis and anemia. • To demonstrate: peripheral blood smear of erythrocytosis and anemias as well as their myelogram. • To apply: theoretical knowledge in interpretation of the peripheral blood smear and clinical manifestations in the pathology of red and white blood. • To integrate: theoretical knowledge in pathogenesis of haematological diseases. 	1. Primary and secondary, absolute and relative erythrocytoses.
	2. Hyporegenerative anemias, . acute and chronic posthemorrhagic, phierodericitic, B12 and folic acid deficient, hemolytic: congenital, acquired. Bilirubin metabolism in hemolytic anemias.
Theme (chapter) 7. Pathophysiology of the leukocyte system. Leukocytosis. Leukopenia. Leukemia.	
<ul style="list-style-type: none"> • To define: notions of hemoblastosis, acute and chronic leukemia, lymphoma. Etiology. Pathogenesis. • To know: etiology, pathogenesis, manifestations and peripheral blood smear of leukocytosis, leukocytopenia and leukemia. • To know: etiology, pathogenesis, manifestations and peripheral blood smear of absolute and relative leukocytosis, neutrophilia, eosinophilia, lymphocytosis and monocytosis. • To know: etiology, pathogenesis, manifestations and peripheral blood smear of absolute and relative leukopenia, neutropenia, 	1. Absolute and relative leukocytosis. Neutrophilia, eosinophilia, lymphocytosis and monocytosis.
	2. Absolute and relative leukopenia. Neutropenia, eosinopenia, agranulocytosis, lymphocytopenia.



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Objectives	Content units
<p>eosinopenia, agranulocytosis, lymphocytopenia.</p> <ul style="list-style-type: none"> • To demonstrate: white blood cells count, leukocytosis, leukopenia, acute and chronic leukosis. • To apply: theoretical knowledge in the interpretation of blood cells count and clinical manifestations in the pathology of white blood cells. • To integrate: theoretical knowledge in the pathogenesis of hematological disease. 	<p>3. Hemoblasts. Acute leukemias and chronic. Lymphomas.</p>
Theme (chapter) 8. Pathophysiology of endocrine system	
<ul style="list-style-type: none"> • To define: Hyper- and hyposecretion of somatoliberin-somatotropin- somatomedins, corticoliberin-corticotrophin, thyroliberin-thyrotropin, gonadoliberein- gonadotropins, prolactin- lactotropin. Hyper- and hypocortisolism. Hyper- and hypothyroidism. Male and female hyper- and hypogonadism. Hypoinsulinism. Type I diabetes mellitus. Insulinresistance. Type II diabetes mellitus. • To know: organization and functional principles of hypothalamus-pituitary peripheral gland axis. • To demonstrate: pathogenetic chain of primary,secondary and tertiary endocrine disorders of adrenal glands cortex, thyroid gland, gonads. • To apply: the theoretical knowledge to explain biochemicaland clinical disorders in clinical forms of hormone failure and hypersecretion. • To integrate: theoretical knowledge in the pathogenesis and manifestations of 	<p>1. Hyper- and hyposecretion of somatoliberein-somatotropin-somatomedin, corticoliberin-corticotropin, thyroliberin-thyrotropin, gonadoliberein-gonadotropins, prolactostatin-lactotropin.</p>
	<p>2. Hyper- and hypocorticism: causes.</p>
	<p>3. Hyper- and hypothyroidism.</p>



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Objectives	Content units
nosological entities: gigantism and dwarfism, acromegaly, primary and secondary hypercortisolism (Cushing's disease and syndrome), hypocortisolism (Addison's disease), hyperthyroidism (Graves's disease), hypothyroidism (endemic goiter, mixedem), primary hypersecretion of mineralocorticoids (Conn's disease), type I and type II diabetes mellitus, insulin resistance.	4. Hypoinsulinism. Type I diabetes mellitus. Type II diabetes mellitus.
Theme (chapter) 9. Pathophysiology of the cardiovascular system	
<ul style="list-style-type: none">• To define: Notions of coronary and non-coronary, metabolic, hematogenic and cardiogenic circulatory failure.• To know: etiology, pathogenesis, compensatory reactions and manifestations of circulatory insufficiency. Pathogenesis of emergent and delayed compensatory reactions, pathogenesis of myocardial hypertrophy.• To know: etiology, pathogenesis, compensatory reactions and manifestations vasogenic circulatory insufficiency. Arterial hypertension. Arterial hypotension. Chronic arterial hypotension.• To know: aetiology, pathogenesis, manifestations, compensatory reactions, electrocardiographic changes of cardiac rhythm disorders: tachycardia, bradycardia, sinus arrhythmia, extrasystolia, incomplete and complete atrioventricular block.• To demonstrate: the pathogenetic chain of compensatory reactions and disorders.• To apply: the pathogenetic chain of compensatory reactions and hemocirculatory disorders in primary hypertension and secondary forms.• To integrate: the pathogenetic chain of compensatory reactions and hemocirculatory disorders.	1. Coronary cardiogenic, metabolic, hematogenous, cardiogenic circulatory failure.
	2. Vasogenic circulatory insufficiency.
	3. Primary and secondary hypertension. Essential hypertension. Renal hypertension. Endocrine hypertension. Cerebral arterial hypertension. Drug-induced (iatrogenic) hypertension.
	4. Acute and chronic hypotension.
	5. Tachycardia, bradycardia, sinus arrhythmia.
	6. Extrasystoles, atrial and ventricular flutter, atrial and ventricular fibrillation.
	7. Incomplete and complete atrioventricular block.



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Objectives	Content units
Theme (chapter) 10. Physiopathology of the respiratory system	
<ul style="list-style-type: none"> • To define: the notion of external respiration. Restrictive and obstructive ventilatory disorders. • To know: etiology, pathogenesis, manifestations and consequences of external respiratory disorders in restrictive, obstructive processes: stenosis of upper airways, asthmatic syndrome. • To know: etiology, pathogenesis, manifestations and consequences of alveolo-capillary diffusion disorders. • To demonstrate : pathogenetic chain of restrictive and obstructive disorders of external respiration, disorders of diffusion and transport of gases. • To apply: theoretical knowledge in interpretation of clinical manifestations and functional disorders in various forms of external respiratory disorders. • To integrate: The theoretical knowledge in the pathogenesis of nozological entities. 	1. Restrictive ventilatory disorders. Pulmonary edema. Pneumosclerosis.
	2. Obstructive ventilatory disorders. Upper airway obstruction. Asphyxia. Asthmatic syndrome.
	3. Alveolo-capillary gas diffusion disorders. Lung perfusion disorders. Gas transport disorders: oxygen and carbon dioxide.
Theme (chapter) 11. Pathophysiology of digestive system	
<ul style="list-style-type: none"> • To define: the notions: hypo and hypersalivation, gastric hypoacidity and hyperacidity, ulcerogenesis. Pancreatic 	1. Hypo and hypersalivation.



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Objectives	Content units
<p>insufficiency. Pancreatic maldigestion. Acholia. Intestinal maldigestion. Intestinal malabsorption. Constipation. Diarrhea. Gastrointestinal intoxication.</p> <ul style="list-style-type: none"> • To know: etiology, pathogenesis, manifestations and consequences of salivation disorders: hypo- and hypersalivation, of stomach, of gastric and duodenal ulcerogenesis, of pancreatic secretion disorders, pancreatic maldigestion, of bile secretion disorders: acholia, of intestinal digestive disorders: of large intestine functions disorders: constipation, diarrhea, gastrointestinal intoxication. • To demonstrate: pathogenetic chain of carbohydrates, lipids and proteins maldigestion throughout the digestive tract: oral cavity, stomach, small intestine; malabsorption and malnutrition of carbohydrates, lipids and proteins; the pathogenetic chain of pancreatic maldigestion and in the absence of bile. • To apply: theoretical knowledge in interpretation of clinical manifestations, laboratory investigations (gastric juice, duodenal juice, coprogram exam) and formulating the principles of pathogenetic correction in digestive diseases. • To integrate: theoretical knowledge in the digestive system diseases: hypertrophic and atrophic gastritis with hyperacidity and hypoacidity, stomach and duodenum ulcer, chronic pancreatitis, acholia, enteritis, diarrhea of different pathogenesis, constipation. 	<p>2. Gastric hyper- and hypoacidity. Gastric atony. Vomiting. Chemosostasis in the stomach. Gastric maldigestion. Ulcerogenesis.</p>
	<p>3. Pancreatic insufficiency. Pancreatic maldigestion. Acholia.</p>
	<p>4. Intestinal maldigestion. Intestinal malabsorption. Large bowel atony. constipation diarrhea Gastrointestinal intoxication</p>
Theme (chapter) 12. Pathophysiology of the liver	
<ul style="list-style-type: none"> • To define: Pathophysiology of the liver. Liver failure. 	<p>1. Liver failure. Hepatic coma.</p>



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Objectives	Content units
<ul style="list-style-type: none"> • To know: Etiology, pathogenesis, manifestations and consequences of protein, carbohydrate, lipid metabolism, metabolism disorders. Bilirubin metabolism in liver failure. • To know: etiology, pathogenesis, manifestations and consequences of hepatic coma; of digestive disorders in liver failure; of prehepatic, parenchymatous and subhepatic jaundice. • To demonstrate: pathogenetic chain of liver failure from different reasons, pathogenetic chain of metabolic disorders in liver failure, pathogenetic chain of bilirubin metabolism disorders in different types of jaundice. • To apply: theoretical knowledge in the interpretation of clinical manifestations and laboratory investigations in hepatic disorders. • To integrate: theoretical knowledge in hepatic nosological entities: hepatitis, steatosis, jaundice, hepatic failure. 	
	2. Prehepatic, parenchymatous, posthepatic jaundice. Hyperbilirubinemia.Cholemia. Cholalemia. Acholia.
	3. Hyperglycaemia. Hyperlipidaemia. Hypoproteinaemia.
	4. Haemostasis dysregulation. Hormone metabolism dysregulation.
Theme (chapter) 13. Pathophysiology of kidneys	
<ul style="list-style-type: none"> • To define: disorders of glomerular filtration, reabsorption and tubular secretion. • To know: etiology, pathogenesis, manifestations and consequences of glomerular filtration disorders; etiology, pathogenesis, manifestations and consequences of reabsorption disorders. • To apply: theoretical knowledge in interpretation of clinical manifestations and laboratory investigations in kidneys disorders. • To integrate: theoretical knowledge in pathogenesis of nosological entities: nephritis, nephrotic syndrome, renal failure, nephrolithiasis. Principles of etiologic and pathogenetic therapy. 	1. Disorders of glomerular filtration, reabsorption and tubular secretion.
	2. Quantitative and qualitative disorders of urinary output. Oliguria. Polyuria..
	3. Nephrotic syndrome. Nephritic syndrome.
	4. Acute renal failure. Chronic renal failure.
	5. Pathological components of urine:oliguria, polyuria, nicturia, anuria, pollakiuria,



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Objectives	Content units
	proteinuria, glucosuria, bilirubinuria, cilindria. Hypostenuria, hyperstenuria and isostenuria.
Theme (chapter) 14. Pathophysiology of Cetral Nervouse System	
<ul style="list-style-type: none">• To define: notions: disorders of neurons, astrocytes, microglia, vegetative, motor and sensory centers.• To know: Etiology, pathogenesis, manifestations and outcomes of neuronal damage, brain damage from medicines.• To apply: theoretical knowledge in interpretation of clinical manifestations and laboratory investigations in brain diseases.• To integrate: theoretical knowledge in the pathogenesis of central nervous system	1. Ischemic and hypoxic damage of neurons. Brain hypoperfusion.
	2. Inflammatory cerebral response.
	3. Excitotoxicity of neurons.
	4. Neuronal oedema. Neuronal exicosis.
Theme (chapter) 15. Hypoxia. Classification. Etiology. Pathogenesis. Compensatory reactions.	
<ul style="list-style-type: none">• To define: respiratory, circulatory, haemic, tissue hypoxia.• To know: the causes, pathogenesis, manifestations and consequences of respiratory, circulatory, haemic and tissue hypoxia.• To demonstrate: the pathogenetic chain of hyperthermia and hypothermia; the pathogenetic chain of different forms of hypoxia (respiratory, circulatory, haemic, tissue).• To apply: theoretical knowledge in the interpretation of haematological, biochemical parameters, clinical manifestations recorded in hypoxia.• To integrate: Theoretical information in the framework of diseases (hypoxia in diseases of the blood, cardiovascular and respiratory system.	1. Respiratory, circulatory, haemic, tissue hypoxia.
	2. Haematological, biochemical parameters, clinical manifestations recorded in hypoxia.

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VIII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ Professional (specific) (SC) competences

- *PC1:* Knowledge of the theoretical foundations of the disciplines included in the faculty curriculum, of the general principles in the elaboration, analysis and registration of pharmaceutical and parapharmaceutical products; knowledge of the general principles of organization and functioning of pharmaceutical institutions with different legal forms of activity; knowledge of the legislative framework in the field of pharmacy; knowledge of the rights and obligations of pharmacists.
- *PC2:* forecasting the basic economic indicators of the pharmacy: achievements, stocks of pharmaceutical preparations; circulation expenses; profit; evaluation of the development trends of population assistance with medicines; performing various practical tasks related to the preparation, analysis and standardization of synthetic and phytoprepared drugs; knowledge of the drug in terms of action, indications, contraindications, adverse effects, mode of administration and their interactions; practical application of patient counseling and pharmaceutical assistance.
- *PC3:* designing the practical activity in the pharmaceutical system according to the diversity of professional roles; using and adapting the theoretical knowledge in the field of pharmacy to the situations of practical activity; making the professional activity more efficient by introducing innovative elements in the field of pharmacy; applying the requirements of the normative acts in the field of pharmacy in the practical activity; using the computer as a working tool in the theoretical and practical pharmaceutical activity; establishing the correlation between the components of the process of pharmaceutical activity and the health care system of the population; continuously making the pharmaceutical activity more efficient by introducing innovations and implementing inventions in the field.
- *PC4:* to diagnose the peculiarities and organizational culture of the institution in the pharmaceutical system, where the specialist works; to plan and coordinate the pharmaceutical activity in various institutions: open state or private pharmacies; hospital pharmacies; pharmaceutical warehouses; pharmaceutical factories, laboratories for quality control and certification of medicines, etc.; to actively involve the specialist in the process of achieving the mission of the pharmaceutical institution; to demonstrate the ability to make decisions aimed at improving the pharmaceutical system.
- *PC6:* adopting messages to diverse socio-cultural environments, including communicating in multiple languages; using situational problem-solving skills in pharmacy work in collaboration with physicians; promoting principles of tolerance and compassion towards patients; using information technology (and computers) in pharmacy work;

✓ Trans transversal competences (CT)

- *TC2:* Identifying training needs in relation to the evolution of the pharmaceutical system; determining priorities in the continuing professional training of pharmacists; assessing

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changes in the pharmaceutical system as a condition for its functionality.

✓ **Study finalities**

Note. Discipline finalities (are deduced from the professional competences and the formative valences of the informational content of the discipline).

IX. STUDENT'S SELF-TRAINING


No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Working with textbooks	Studying the material from the recommended manuals Summary the material in the form of postulates Playing the material in the form of improvised schemes Marking the questions that require special consultation	The ability to reproduce the main notions and the content of the material; the ability to give the essence; Ability to express the material in logical schemes; Ability to explain the material; Ability to answer control questions;	During semester
2.	Working with the materials of theoretical course	Studying the material of theoretical course; Studying the presentations of theoretical course; Summary of material in the form of postulates;	Ability to supplement the material with information of the theoretical course; Ability to reproduce textually and to interpret presentation the theoretical course;	During semester
3.	Working with the compendium of practical lessons	Studying the expected experiments for demonstration at the practical lesson: the methodology of the experiment, the obtained	Ability to integrate experiments into structure of the theoretical theme; The integration of	During semester



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		results, their interpretation	experimental data studied pathological processes; The topic illustration of real factual material; Explanation of experimental results with theoretical information; Translocation of the experiment into medical practice;	
4.	Working with the situations problem recommended for the theme	Studying and solving of situation problems	The ability to answer correctly to the questions of the problems; The ability to interpret the pathogenetic summary of clinical, paraclinical, and laboratory information; The ability to make conclusions; Ability to make decisions about diagnosis, therapy and prognosis;	During semester
5.	Working with the pathophysiological explanatory dictionary	Studying the dictionary of physiopathological terms	The ability to reproduce and decipher the essence of definition and notion	During semester
6.	Working with the collection of tests in pathophysiology	Studying and solving control tests on the subject; Self-control of material acquisition using the control questions	Monitoring the cognitive process through self control	During semester

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7.	Working with online materials	Studying materials on-line from the Department SITE; Working with encyclopedic materials, dictionaries, scientific activities; Selection of the research theme, purpose, selection of materials, formulation of conclusions, bibliography.	Supplementing informations with recent materials; Workload	During semester
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X. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used***

In teaching the subject of Pathophysiology, different teaching methods and procedures are used, oriented towards the efficient learning and achievement of the objectives of the teaching process.

In the theoretical course, PowerPoint presentations are used in addition to the traditional methods (lecture-exposure, interactive lecture, synthesis lecture). Tests, situation problems, demonstrations

Didactic videos modeling pathological processes in laboratory animals.

Teaching materials (tables, diagrams, online platforms) are used to deepen the understanding of the material.

- ***Applied (specific to the discipline) teaching strategies / technologies***

The use of didactic movies, including those downloaded from the internet, which have a notable informational load regarding the interactive exemplification of pathogenetic patterns of pathological processes that relate to the current topic of the practical lesson.


The use of situation problems with eccentric mode of solving, i.e. explaining the pathogenetic chain in a consecutive manner, based on the deviations of functional and biochemical indicators of the different pathologies.

Analysis and exegesis of experiments on laboratory animals carried out by the department's collaborators.

Analysis and exegesis of the plausible impairment of vital organs to the action of different drugs.

- ***Methods of evaluation (including the method of final mark calculation)***

Current: includes 2 totalizations, in the form of computerized tests consisting of 25 variations of questions (single compliment and multiple compliment) and the evaluation of

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individual work, which includes the presentation of the notebook with the experiments described during the seminars with their explanation. Thus, the annual average mark is calculated from the marks obtained in the summations during the semester (2 marks in the SIMU tests) and 1 mark attributed to the individual work.

Students who have at least one negative mark in the totalization or who have not made up absences from practical lessons and seminars will not be admitted to the promotion exam.


Final: takes place in the computerized assessment room of the USMF. The computerized final assessment computerized test consists of variations of 50 quizzes each from all Pathophysiology course topics and practical assignments topics respectively. The student has 50 minutes to answer the tests. The test is graded from 0 to 10.

The final grade consists of 2 components: average annual mark X 0.5; SIMU computerized test X 0.5.

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-9,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

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Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations in the failed exam.

XI.RECOMMENDED LITERATURE:

A. Compulsory:

1. Theoretical pathology course. Todiraş S., Vişnevschi A., Bâţca A.

B. Additional:

1. Medical Physiopathology Vol. I and Vol II (Ed. Prof. V.Lutan). Chisinau, 2005
2. Atlas of Physiopathology. Stefan Silbernagl and Florian Lang... 2011