PHARMACY FACULTY

STUDY PROGRAM 0916.1 PHARMACY

DEPARTMENT OF PATHOPHYSIOLOGY AND CLINICAL PATHOPHYSIOLOGY

APPROVED

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

Minutes No. 2 of 09.11.2021

Chairman, PhD, associate professor

Uncu Livia _____

APPROVED

at the meeting of the Pharmacy Faculty Council

Minutes No. 3 of 16.12.2021

Dean of Faculty, PhD., associate professor

Ciobanu Nicolae _____

APPROVED

at the meeting of Pathophysiology and Clinical Pathophysiology Department

Minutes No.2. of 12.09.2021

Chief of the department, M.D., professor

Cobet Valeriu _____

SYLLABUS

DISCIPLINE PATHOPHYSIOLOGY

Integrated studies

Type of course: **Compulsory**

Chisinau, 2021

I. INTRODUCTION

General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional trening 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 remedias, which allows their correct use, according to the ethiotropic and pathogenetic principles.

- Mission of the curriculum (aim) in professional training:

1) studying the laws of functional disorders of typical pathological processes and diseases at the molecular, cellular, tissue, organ, system and integral organism levels;

2) studying the laws of general origin, occurrence, evolution and end of typical pathological processes and nosological entities;

3) 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, english
- Beneficiaries: students of the III rd year, Pharmacy faculty, specialty 0916.1 PHARMACY.

II. MANAGEMENT OF THE DISCIPLINE

Course code		**F.05.O.057**	
Name of course		**Pathophysiology**	
Responsible (s) of discipline		**V. Cobeț, M.D., professor** **C. Hangan, Ph.D., lecturer** **S. Todiraș, Ph.D., lecturer**	
Year	**II**	Semesters	**IV**
Total hours including:			**150 hours**
Course	**30**	Practical classes	**45**
Seminars		Individual work	**75**
Form of assessment	**Examination test**	Numbers of credits provided for the course	**5**

III. TRAINING OBJECTIVES OF THE DISCIPLINE

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

- ***at the level of knowledge and understanding:***

1) to know the principles of pathogenic correction of functional disorders in pathological processes and diseases;
2) to know the rules of behavior with laboratory animals and the ethical principles of pathophysiological experiment modeling;
3) to know the principles of planning, organizing and modeling of pathophysiological experiment;
4) 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 ;
5) to know the accepted terminology in pathology;

- ***at the application level:***

1) to be able to interpret the information obtained in the experiment and extrapolate it to clinical pathologies;
2) to be able to answer and argue the correct (and incorrect) answers to the questions in pathophysiology tests;
3) to be able to make general conclusions and to make the nozological differentiation basing on the complex investigations.

- ***at the integration level:***

1) to be able to use the gained knowledge in previously studied subjects (anatomy, physiology, biochemistry) in the study of pathophysiology;
2) 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.

V. THEMES AND ORIENTATIVE DISTRIBUTION OF HOURS

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

Nb.	THEME	Hours		
		Lectures	Practical classes/ seminars	Individual work
1.	Nozology. The object, tasks and research methods of pathophysiology. General aetiology. General pathogenesis. General sanogenesis	2	3/0	5
2.	Cell lesion. Cell death. Cellular adaptive processes.	2	3/0	5
3.	Disorders of local microcirculation.	2	3/0	5
4.	Inflammation	2	3/0	5
5.	Immunopathological processes. Allergy. Allergic reactions type I, II, III, IV. Non-specific hypersensitivity.	2	3/0	5
6.	Pathophysiology of acid-basic imbalance. **I Concluding**	2	3/0	5
7.	Pathophysiology of red blood cells. Anemia. Erythrocytosis	2	3/0	5
8.	Pathophysiology of the leukocyte system. Leukocytosis. Leukopenia. Leukemia.	2	3/0	5
9.	Pathophysiology of the endocrine system	2	3/0	5
10.	Pathophysiology of the cardiovascular system	2	3/0	5
11.	Pathophysiology of the respiratory system. **II Concluding**	2	3/0	5
12.	Pathophysiology of the digestive system	2	3/0	5
13.	Pathophysiology of the liver	2	3/0	5
14.	Pathophysiology of kidneys	2	3/0	5
15.	Pathophysiology of the nervous system. **III Concluding**	2	3/0	5
	Total	**30**	**45**	**75**
	Total	**150**		

VI. REFERENCES OBJECTIVES AND CONTENT UNITS

Objectives	Content units
Theme 1. General nosology. The object, tasks and research methods of pathophysiology. General aetiology. General pathogenesis. General sanogenesis.	
1. To define: to define the basic notions of nozology. **2. To know:** classification and characteristics of causes and conditions, classification and characteristics of physiological reactions. Mechanisms of generalization and localization of pathological processes. **3. To demonstrate:** the role of the experiment in studying of pathological processes. **4. To apply:** the notions of nozology in the interpretation of pathophysiological experiments and in medical practice **5. 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.	General Pathology. Pathological physiology. Subject of studies. The tasks of pathophysiology. The pathophysiological experiment. Nosology. Disease. Latent, prodromal, complete evolution, resolution. Endogenous and exogenous condition. General pathogenesis. Lesion. Reactivity. Adaptive, compensatory, protective, reparative reactions. Pathogenic factor. Cause-effect relationship. Patogenetic chain. The main pathogenetic link. Vicious circle. Generalization and localization of pathological processes. General sanogenesis. Primary and secondary pathogenetic mechanisms.
Theme 2. Cell lesion. Cell death. Cellular adaptive processes.	
Cellular lesions. General causes and pathogenesis of cellular lesions. **1.To define:** cellular lesion, cellular dismetabolism	Cellular lesion; lesion of cytoplasmic membrane, nucleus, mitochondria, endoplasmic reticulum, ribosomes, lysosomes.

Objectives	Content units
2.To know: classification, mechanism of action and primary effects of mechanical, physical, chemical, biological, osmotic, oxidative, enzymatic, immunopathological factors, hypoxia, hydrogen ions, energy depletion. **3.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. **4. To apply:** knowledge of the pathogenesis of cellular dismetabolisms in the explanation of metabolic diseases: liver lipid dystrophy, obesity, atheromatosis. **Apoptosis** **1.To define:** the concepts of apoptosis, intrinsic and extrinsic, positive and negative apoptogenic factors, degenerative and proliferative diseases. **2.To know:** intrinsic and extrinsic, positive and negative apoptogenetic factors **3.To demonstrate:**	Apoptosis. Intrinsic and extrinsic, positive and negative apoptogenic factors. Stages of apoptosis: initiation, execution, final. Necrosis, necrobiosis. Physiological and pathological death. Periods of necrosis. Pathological regeneration, dysplasia, metaplasia, cancer, sclerosis. Functional, adaptive, reparative, protective, compensatory, endocrine hypertrophy.

Objectives	Content units
the complete pathogenetic chain of apoptosis **4.To apply:** information about apoptosis in explaining the pathogenesis of proliferative diseases **5. To integrate:** local processes in apoptosis and necrosis with general disorders in the organism. **Necrosis:** **1. To define:** the notions of necrosis, necrobiosis, physiological and pathological death, tanatogenic factors. **2. To know:** periods of necrosis. **3. To demonstrate:** the pathogenetic chain of cell death at the action of various pathogens factors. **4. To integrate:** cell death with local (inflammation).	
<u>Theme 3.</u> Disorders of local microcirculation.	
Demonstration of arterial hypertension. Classification. Causes. Pathogenetic forms. Demonstration of	Neurotonic, neuroparalytic, neuromioparalytic, humoral, reactive functional arterial hyperaemia. Local obstructive, obliterant, compressive venous hyperemia. Ischemia, red and white infarction.

Objectives	Content units
thrombogenesis with white thrombus and red thrombus formation. **1.To define:** neurotonic, neuroparalytic, neuromioparalytic, humoral, reactive functional arterial hyperaemia. **2. To know:** etiology, pathogenesis, manifestations and consequences of reactive, functional, humoral, neurotonic, neuroparalytic, neuromioparalytic arterial hyperemia, obstructive venous hyperemia; etiology, pathogenesis, manifestations and consequences of edema. **3. To demonstrate:** the pathogenetic chain of various forms of arterial hyperaemia, venous hyperaemia, ischemia, embolism. To demonstrate the patogenetic effect of different forms of edema. **4. To apply**: the theoretical knowledge in the pathogenic correction of microcirculatory disturbances. **5. To integrate**: the theoretical knowledge about local microcirculatory disorders in pathogenesis of different diseases.	White, red, mixed thrombus.
<u>Theme 4</u>. Inflammation	
1.To define:	Inflammation, alteration, lesional pattern and pathogenic molecules, cells-and plasma-derived mediators, inflammatory arterial and

Objectives	Content units
Notions of: inflammation, alteration; serous, fibrinous, purulent, haemorrhagic, and rotten exudation, leucocyte emigration. **2. To know:** causes of inflammation, the pathogenesis of alteration caused by various flogogenic factors. **3. To demonstrate:** the pathogenetic chain of different forms of inflammation: alterative, exudative, proliferative. **4. 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. **5. To integrate:** knowledge about the etiology, pathogenesis and manifestations of inflammation in the pathogenesis and evolution of inflammatory diseases.	venous hyperemia; serous, fibrinous, purulent, hemorrhagic, rotten exudation; leukocyte emigration, phagocytosis, inflammatory proliferation; acute phase reaction, fever and leukocytosis.
<u>Theme 5.</u> Immunopathological processes. Allergy. Hypersensitivity disorders type I,II,III, IV. Non-specific hypersensitivity	
1.To define: notions of allergy, immediate and delayed types of hypersensitivity disorders.	Allergy. Immediate hypersensitivity, antibody mediated, immune complexes mediated , T-cell mediated. Anaphylactic shock.Hypo-sensitization.Nonspecific

Objectives	Content units
2. To know: etiology of allergic reactions and the classification of antigens, altering mechanisms in allergic reactions. **3. To demonstrate:** the complete pathogenetic chain from inoculating the allergen to structural damage in all types of allergic reactions. **4. 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. **5. To integrate:** the theoretical information about pathogenesis of allergic reactions for involvement in the pathogenesis of allergic, autoallergic and pseudo-allergic diseases.	hypersensitivity.Autoimmunity.Autoantigen.Autoantibody.Immuno deficiencies of humoral, cellular and mixed types.
Theme 6. Pathophysiology of acid-base imbalance	
1.To define: notions of compensated and decompensated acidosis and alkalosis, buffer systems. **2. To know**: causes of hydrogen ions excess, causes of bicarbonate excess, respiratory acidosis and alkalosis, metabolic acidosis and alkalosis.	Acidosis. Alkalosis. Respiratory pattern. Metabolic pattern. Lactoacidosis. Intracellular buffer system. Biochemical buffer system. Red blood cells system. Bicarbonate excess and deficiency. Excess and deficiency of hydrogen.Ammoniogenesis. Acidogenesis. Disorders of brain perfusion in acidosis and alkalosis.

Objectives	Content units
3. To demonstrate: pathogenetic chain of development patterns of acidosis and alkalosis. **4. To integrate:** knowledge of etiology, pathogenesis and manifestations of acid-base imbalance in the pathogenesis of somatic diseases.	
Theme 7. Pathophysiology of red blood cells. Anemia. Erythrocytosis	
1.To define: the notions of erythrocytosis, anemias, anisocytosis, poichylocytosis. **2.To know:** etiology, pathogenesis, manifestations and peripheral blood smear of erythrocytosis and anemia. **3.To demonstrate**: peripheral blood smear of erythrocytosis and anemias as well as their myelogram. **4. To apply**: theoretical knowledge in interpretation of the peripheral blood smear and clinical manifestations in the pathology of red and white blood. **5.To integrate:** theoretical knowledge in pathogenesis of haematological diseases.	Primary and secondary, absolute and relative polycythemia; hyporegenerative, acute and chronic blood loss anemias, iron-deficiency and megaloblastic anemias, congenital and aquired hemolytic anemias. Bilirubin metabolism.
Theme 8. Pathophysiology of the leukocyte system. Leukocytosis. Leukopenia. Leukemia.	

Objectives	Content units
1.To define: notions of hemoblastosis, acute and chronic leukemia, lymphoma. Etiology. Pathogenesis. **2. 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, eosinopenia, agranulocytosis, lymphocytopenia. **3.To demonstrate**: white blood cells count, leukocytosis, leukopenia, acute and chronic leukosis. **4. To apply**: theoretical knowledge in the interpretation of blood cells count and clinical manifestations in the pathology of white blood cells. **5.To integrate:** theoretical knowledge in the pathogenesis of hematological disease.	Absolute and relative leukocytosis. Neutrophilia, eosinophilia, lymphocytosis and monocytosis. Absolute and relative leukopenia. Neutropenia, eosinopenia, agranulocytosis, lymphocytopenia. Hemoblastosis. Acute and chronic leukemias. Lymphomas.
Theme 9. Pathophysiology of endocrine system	

Objectives	Content units
1.To define: Hyper- and hyposecretion of somatoliberin-somatotropin-somatomedins, corticoliberin-corticotrophin, thyroliberin-thyrotropin, gonadoliberin-gonadotropins, prolactin-lactotropin. Hyper- and hypocortisolism.Hyper-and hypothyroidism.Male and female hyper- and hypogonadism.Hypoinsulinism.Type Idiabetes mellitus. Insulinresistance.Type II diabetes mellitus. **2. To know:** organization and functional principles of hypothalamus-pituitary peripheral gland axis. **3. To demonstrate:** pathogenetic chain of primary,secondary and tertiary endocrine disorders of adrenal glands cortex, thyroid gland, gonads. **4. To apply:** the theoretical knowledge to explain biochemicaland clinical disorders in clinical forms of hormone failure and hypersecretion. **5. To integrate:** theoretical knowledge in the pathogenesis and manifestations of nosological entities: gigantism and dwarfism,acromegaly, primary and	Hyper- and hypersecretion of somatoliberin- somatotropin-somatomedins, corticoliberin-corticotrophin, thyroliberin-thyrotropin, gonadoliberin-gonadotropins, prolactin-lactotropin. Hyper- and hypocortisolism. Causes. Hyper-and hypothyroidism. Male and female hyper-and hypogonadism. Hypoinsulinism. Type I diabetes mellitus. Type II diabetes mellitus

Objectives	Content units
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.	
Theme 10. Pathophysiology of the cardiovascular system	
1.To define: Notions of coronary and non-coronary, metabolic, hematogenic and cardiogenic circulatory failure. **2. 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, manifesta-tions,compensatory reactions,electrocardiographic changes	Coronary cardiogenic and non-coronary , metabolic, hematogenic cardiogenic circulatory failure. Vasogenic circulatory failure. Primary and secondary arterial hypertension. Acute and chronic arterial hypotension. Tachycardia, bradycardia, sinusal arrhythmia. Extrasistolia, atrial and ventricular flutter, atrial and ventricular fibrillation.The incomplete and complete atrioventricular block. Essential arterial hypertension. Renal hypertension. Endocrine hypertension. Cerebral hypertension. Drug hypertension (iatrogenic).

Objectives	Content units
of cardiac rhythm disorders: tachycardia, bradycardia, sinus arrhythmia, extrasystolia, incomplete and complete atrioventricular block. **3.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 hemo-circulatory disorders.	
Theme 11. Physiopathology of the external respiration	
1.To define: the notion of external respiration. Restrictive and obstructive ventilatory disorders. **2. 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 :**	Pathophysiology of external breathing. Restrictive ventilation disorders. Pulmonary edema. Pneumosclerosis. Obstructive ventilation disorders. Obstruction of the upper respiratory airways. Asphyxia.Asthmatic syndrome. Disorders of alveolo-capillary gas diffusion. Disorders of the pulmonary perfusion. Disruptions of gas transport: oxygen and carbon dioxide.

Objectives	Content units
pathogenetic chain of restrictive and obstructive disorders of external respiration, disorders of diffusion and transport of gases. **4. To apply:** theoretical knowledge in interpretation of clinical manifestations and functional disorders in various forms of external respiratory disorders. **5. To integrate:** The theoretical knowledge in the pathogenesis of nozological entities.	
Theme 12. Pathophysiology of digestion	
1.To define: the notions: hypo and hypersalivation, gastric hypoacidity and hyperacidity, ulcerogenesis: aggressive and protective factors of the stomach. Pancreatic insufficiency. Pancreatic maldigestion. Acholia. Intestinal maldigestion. Intestinal malabsorption. Constipation. Diarrhea. Gastrointestinal intoxication. **2.To know:** etiology, pathogenesis, manifestations and consequences of salivation disorders: hypo-and hypersalivation, manifestations and consequences of saliva secretion disorders. Motility and evacuation of gastric chemo from the stomach: gastric hyper-and	Hypo-and hypersalivation, gastric hypoacidity and hyperacidity.Gastric atonia.Vomiting. Chimostasis in the stomach. Gastric maldigestion. Ulcerogenesis.Pancreatic failure. Maldigestion. Acholia. Intestinal malabsorption. Atonia of bowel. Constipation. Diarrhea. Gastrointestinal intoxication.

Objectives	Content units
hypoacidity. Chimostasis. Dumping syndrome. **•To know:** etiology, pathogenesis, manifestations and consequences of gastric and duodenal ulcerogenesis. **•To know:** etiology, pathogenesis, manifestations and consequences of pancreatic secretion disorders. Pancreatic maldigestion, consequences. **•To know:** etiology, pathogenesis, manifestations and consequences of bile secretion disorders: acholia. **•To know:** etiology, pathogenesis, manifestations and consequences of intestinal digestive disorders: maldigestion, malabsorption, malnutrition. **•To know:** To know the etiology, pathogenesis, manifestations and consequences of intestinal digestive disorders: maldigestion, malabsorption, malnutrition. **•To know:** etiology, pathogenesis, manifestations and consequences of bowel functions disorders: constipation, diarrhea, gastrointestinal intoxication.	

Objectives	Content units
3.To demonstrate: pathogenetic chain of carbohydrates, lipids and proteins maldigestion throughout the digestive tract: oral cavity, stomach, small intestine. **•To demonstrate:** the pathogenetic chain of malabsorption and malnutrition of carbohydrates, lipids and proteins. **•To demonstate:** the pathogenetic chain of pancreatic maldigestion and in the absence of bile. **4.To apply:** theoretical knowledge in interpretation of clinical manifestations and laboratory investigations (gastric juice, duodenal juice, coprogram exam) in digestive diseases. **5.To integrate:** theoretical knowledge in the digestive system diseases: hypertrophic and atrophic gastritis with hyperacidity and hypoacidity, stomach and duodenum ulcer, chronic pancreatitis, acholya, enteritis, diarrhea of different pathogenesis, constipation.	
Theme 13. Pathophysiology of the liver	
1.To define: Pathophysiology of the liver. Liver failure.	Liver failure. Prehepatic, parenchymatous, posthepatic jaundice. Hyperbilirubinemia.Cholemia. Cholalemia. Acholya. Hepatic cirrhosis.

Objectives	Content units
2. 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. **•To know:** the manifestations and consequences of digestive disorders in liver failure. **• To know:** etiology, pathogenesis, manifestations and consequences of prehapatic, parenchymatous (pre-microsomal, microsomal and submicrosomal) and subhepatic jaundice. **3.To demonstrate:** pathogenetic chain of liver failure from different reasons. **• To demonstrate:** pathogenetic chain of metabolic disorders in liver failure. **To demonstrate:** pathogenetic chain of bilirubin metabolism disorders in different types of jaundice. **4.To apply:** theoretical knowledge in the interpretation of clinical manifestations	

Objectives	Content units
and laboratory investigations in hepatic disorders. **5.To integrate:** theoretical knowledge in hepatic nosological entities: hepatitis, hepatitis, steatosis, jaundice, hepatic failure.	
Theme 14. Pathophysiology of the kidneys	
1.To define: disorders of glomerular filtration, reabsorption and tubular secretion. **2.To know:** etiology, pathogenesis, manifestations and consequences of glomerular filtration disorders. **•To know:** etiology, pathogenesis, manifestations and consequences of reabsorption disorders. **4. To apply:** theoretical knowledge in interpretion of clinical manifestations and laboratory investigations in kidneys disorders. **5.To integrate:** theoretical knowledge in pathogenesis of nosological entities: nephritis, nephrotic syndrome, renal failure, nephrolithiasis. Principles of etiotropic and pathogenetic therapy.	Disorders of glomerular filtration, reabsorption and tubular secretion. Oliguria. Polyuria.Quantitative and qualitative disorders of urinary output. Pathological components of urine:oliguria, polyuria, nicturia, anuria, pollakiuria, proteinuria, glucosuria, bilirubinuria, cilindria. Hypostenuria, hyperstenuria and isostenuria.
Theme 15. Pathophysiology of CNS	

Objectives	Content units
1.To define: notions: disorders of neurons, astrocytes, microglia, vegetative, motor and sensory centers. **2. To know**: Etiology, pathogenesis, manifestations and outcomes of neuronal damage, brain damage from medicines. **3. To apply:** theoretical knowledge in interpretation of clinical manifestations and laboratory investigations in brain diseases. **4. To integrate:** theoretical knowledge in the pathogenesis of central nervous system	Ischemic and hypoxic damage of neurons. Inflammatory cerebral response. Brain hypoperfusion. Excitotoxicity of neurons.

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

- **Professional (specific) (SC) competences:**

• CP1. Knowledge, understanding and deciphering of the notions of theoretical, general and special pathophysiology;

• CP2. Knowledge of the hierarchical structure of the organism and the characteristic of the pathological processes at molecular, subcellular, cellular, tissue, organ, system and integral levels.

• CP3. The ability to reveal the content of pathological phenomena according to etiology, pathogens, manifestations and consequences.

• CP4. The ability of dialectical vision of pathological phenomena to highlightpure pathological phenomena and physiological reactions of the body.

• CP5.The ability to formulate the principles of pathogenetic correction of disturbances on the course of the disease.

• CP6. Knowledge and ability to highlight the basic elements of the disease structure: symptom, syndrome, pathological process.

• CP7. The ability to highlight the primary and subsequent effects of disease in the pathogenicity of a the action of the harmful factor.

• CP8. The ability to evidence the pathogenetic chain of pathological, diseases processes and to explainthe pathogenetic factors, the main link of pathogenesis, the vicious circle.

• CP9. The ability to classify pathological processes according to etiology, successivity the appearance, the pathogenesis, the form of clinical evolution.

• CP10. The ability to reveal the pathogenetic essence of clinical manifestations of the disease.

• CP11. The ability to interpret pathogenetically the clinical manifestations of the disease, biochemical, laboratory and functional investigations.

• CP12. The ability to plan, perform and interpret the results of the pathophysiological experiments.

•CP13. The ability to integrate in the analysis and interpretation of pathological processes of previous knowledge and disciplines studied in parallel with pathophysiology.

Transversal competences (TC)

- TC1.Ability to create and decipher illustrative materials: tables, schemes, animations;
- TC2. Ability to play pathological processes in essays, presentations, animations;
- TC3. Ability to work with references;
- TC4. Ability to summarize briefly the essence of the bibliographic sources;
- TC5. Ability to make decisions based on available information;
- TC6. Ability to integrate multidisciplinary information;
- TC7. Ability to analyze critically the information with ambiguous dialectical or contradictory character;
- TC8. Formationof the personal position regarding the importance of the discipline studied for

future activity;

• TC9. The ability to evaluate and value the contribution of scholars in the historical aspect;

• TC10. The work with extracurricular information sources;

• TC11. Capacity of interdisciplinary integration.

✓ **Study findings**

• SF1. To know and apply the notions of theoretical physiopatology in later clinical studies: etiology, cause, condition, pathogenicity, pathogenetic factor, pathogenetic chain,vicious circle, sanogenesis, tanatogenesis;

• SP2. To know and to apply in the notions of pathological processes those of the cellular, tissue, organ, system and integral processes;

• SP3. To know and integrate the major pathological processes in clinical subsequent researches: cell, tissue, organ, system and integral.

• SP4.To use the information about pathogenesis of pathological processes in the formulation of pathogenetic therapy principles;

• SP5. To use the informations about pathogenesis of pathological processes in the interpretation of clinical manifestations and paraclinical investigation results.

Note. Study findings (are deduced from the professional competencies and formative valences of the informational content of the discipline).

VIII. STUDENT'S SELF-TRENING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Working with textbooks	Studuing 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;	
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 informationof the theoretical course; Ability to reproduce textually and to interpret presentation the theoretical course;	
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 results, their interpretation	Ability to integrate experiments into structure of the theoretical theme; The integration of experimental datain studied pathological processes; The topic illustrationof real factice 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 aboutdiagnosis, therapy and prognosis;	
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	
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	
7.	Working with online materials	Studying materialson-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	

IX. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

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

Teaching of pathophysiology discipline uses different methods and teachingprocedures, oriented towards efficient learningand achievingobjectives of the teaching process.In the theoretical course along with traditional methods (courseexposition, interactive course, synthesis course), PowerPoint presentations are used.Tests, situations problems, demonstrationof the film are used in practical workwith the modeling of pathological processes in laboratory animals.Teaching materials (tables, micrographs, transparencies) are used for deeper material acquisition.

- ***Applied*** *(specific to the discipline)****teaching strategies / technologies***
- ***Methods of assessment****(including the method of final mark calculation)*

***Current**:* frontal oral evaluation, problem basic learning, test-control -3 attestations in the SIMU system and evaluation of students's individual work.

The annual middle average consists of the average of 3 attestations and an individual student's work note.

***Final**:* exam-test in SIMU system

The final mark will consist of the middle average of three intermediate totalizations, mark of individual students's work (coefficient 0.5), and final test (coefficient 0.5).

The annual middle average and the marks of all the final stages of the examination (assisted by computer, testing) -all will be expressed in numbers according to the rating scale (according to the table), and the final obtained mark will be expressed in number twodecimal places, which will be passed to the notes book.

Method of mark rounding at different assessment stages

Intermediate marksscale (annual average, marks from the examination stages)	National Assessment System	ECTSEquivalent
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**
8,51-8,00	**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.

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.

RECOMMENDED LITERATURE:

1. Patology. (Sub red. Prof. V.Lutan). Chisinău, 2005
2. Robins & Cotran. Pathologic Basis of Diseases. Lippincot Williams & Wilkins, VIIIth edition. 2014
3. Color Atlas of Pathophysiology .S Silbernagl et al, Thieme 2000
4. P. Cazacu. Fiziopatologie. 1000 teste la computer. Chişinău, 1998
5. Carol Mattson Porth. Pathophyziology.