

COURSE PROGRAM

SYLLABUS

1. General information on the course

Full course name	Pathophysiology
Full official name of a higher education institution	Sumy State University
Full name of a structural unit	Academic and Research Medical Institute. Кафедра фізіології і патофізіології з курсом медичної біології
Author(s)	Oleshko Tetiana Bohdanivna, Harbuzova Viktoriia Yuriivna
Cycle/higher education level	The Second Level Of Higher Education, National Qualifications Framework Of Ukraine – The 7th Level, QF-LLL – The 7th Level, FQ-EHEA – The Second Cycle
Duration	two semesters
Workload	5 ECTS, 150 hours. For full-time course 88 hours are working hours with the lecturer (16 hours of lectures, 72 hours of seminars), 62 hours of the individual study.
Language(s)	English

2. Place in the study programme

Relation to curriculum	Compulsory course available for study programme "Medicine"
Prerequisites	Knowledge of the basics of medical biology, histology, biochemistry, physiology, microbiology
Additional requirements	There are no specific requirements
Restrictions	There are no specific restrictions

3. Aims of the course

Formation of knowledge and practical skills in pathophysiology for further mastering of the block of disciplines providing professional and practical training of the future doctor

4. Contents

Module 1. General nosology

Topic 1 Common teaching about disease. General etiology and pathogenesis

Pathophysiology as a science. The place of pathophysiology in the system of medical knowledge. Pathophysiology as an academic discipline, its components: general pathology, pathophysiology of organs and systems. The place of pathophysiology in the system of doctor training. Methods of pathophysiology. History of pathophysiology development. Basic concepts of nosology: norm, health (WHO), disease, pathological process, typical pathological process, pathological reaction, pathological condition. Principles of disease classification, WHO classification. The main directions of the doctrine of the disease: humoral (Hippocrates), solidarity (Democritus), cellular (R. Vikhrov). Definition of "etiology". The main directions of development of the doctrine of etiology: monocausalism, conditionalism, constitutionalism, psycho-somatic concept, etc. Modern ideas about causality in pathology. Classification of etiological factors. Definition of "pathogenesis". Pathological (destructive) and adaptive-compensatory (protective) phenomena in pathogenesis. Manifestations of damage at different levels: molecular, cellular, tissue, organ, at the level of the organism as a whole. Protective adaptive reactions. Adaptation, compensation. Mechanisms of immediate and long-term adaptation. The role of nervous and humoral factors in their implementation.

Topic 2 Pathogenic effects of environmental factors

Pathogenic action of mechanical factors. Patterns of development of mechanical trauma, long-term crushing syndrome, traumatic illness. Pathogenic action of thermal factors. Protective, compensatory reactions and actual pathological changes in hyperthermia. Heat and sunstroke. Burns, burn disease. Hypothermia. Protective, compensatory reactions and actually pathological changes. Mechanisms of long-term adaptation to cold. Artificial hypothermia, its use in medicine. Local action of low temperatures: frostbite. Pathogenic effect of electric current. Factors that determine the nature of the lesions. Effect on the body of high and low atmospheric pressure. Causal relationships in the pathogenesis of compression and decompression syndromes. Explosive decompression. Influence on an organism of factors of space flight - acceleration, weightlessness. Pathogenic effect of radiant energy. Types of ionizing radiation. Radiosensitivity of tissues. Mechanisms of direct and indirect radiation damage of biological structures. Radiolysis of water. Radiotoxins. Manifestations of radiation damage at the molecular, cellular, tissue, organ and system levels. Pathogenesis of radiation sickness, its main forms and syndromes. Immediate and long-term effects of large and small doses of ionizing radiation. Stochastic and non-stochastic effects. Natural mechanisms of radiation protection. Pathophysiological bases of radioprotection.

Topic 3 The role of heredity, constitution, age factors in pathology

Heredity as a cause and condition of disease development. The ratio of hereditary and acquired in the pathogenesis. Classification of hereditary diseases. Mutations. Principles of their classification. Types of mutations. Causes of mutations. Monogenic hereditary diseases. Characteristics of monogenic diseases by type of inheritance of pathological gene. Polygenic (multifactorial) diseases. Hereditary predisposition to disease. Chromosomal diseases. Mechanisms of genome and chromosomal mutations. Methods of diagnosis, principles of prevention and treatment of hereditary diseases. Ways to correct genetic defects. Prospects for genetic engineering. Constitution, its role in pathology. Classification of constitutional types according to Hippocrates, Sigo, Sheldon, Kretschmer, Pavlov. The concept of antenatal pathology. Gameto-, blasto-, embryo- and fetopathy. Teratogenic factors. Aging. Factors determining species, individual and average life expectancy. General features and patterns of aging. Structural, functional and biochemical manifestations of aging at the molecular, cellular, tissue, organ, systemic levels and at the level of the organism as a whole. Theories of aging. Aging and disease. Progeria. Theoretical foundations of life expectancy. Methods of geroprotection.

Topic 4 Reactivity and resistance. Pathophysiology of immunological reactivity

Reactivity as a condition for the development of diseases. Manifestations of reactivity at the molecular, cellular, tissue, organ, systemic levels and at the level of the organism as a whole. Types of reactivity. Dependence of reactivity on sex, age, heredity, state of immune, nervous and endocrine systems. Influence of environmental factors on the reactivity of the organism. The concept of resistance. Passive and active resistance. Relationship between resistance and reactivity. Mechanisms of nonspecific resistance. Biological barriers, their classification, importance in the body's resistance. The role of the physiological system of connective tissue in the body's resistance to pathogenic effects. Humoral factors of nonspecific resistance of an organism to infectious agents. Complement system of agents (OO Bogomolets). Phagocytosis. Disorders of phagocytosis: causes, mechanisms, and its violation. Mechanisms of immune response of humoral and cellular type, mechanisms of immunological tolerance, its types and reproduction in experiment. General patterns of immune system disorders, hyper-, hypo- and dysfunction of the immune system. Experimental modeling of pathology of the immune system. Immune deficiency, definition, classification (WHO). Causes, mechanisms of development, types of primary immunodeficiencies. The role of physical, chemical and biological factors in the development of secondary immunodeficiency.

Topic 5 Allergy

Definition and general characteristics of allergies. Etiology of allergies, types of exogenous and endogenous allergens. Formation of allergic reactions depending on the state of the organism. The importance of hereditary and acquired factors in the development of allergies. Principles of classification of allergic reactions. Classification of allergic reactions according to Coombs and Jell. Stages of pathogenesis of allergic reactions. Anaphylactic reactions: experimental models, basic clinical forms. Cytotoxic reactions: experimental modeling, main clinical forms. Mechanisms of cytotoxicity: complement-dependent cytotoxicity, anti-body-dependent phagocytosis, antibody-dependent cellular cytotoxicity. The role of complement and its activation products in the development of cytotoxic reactions. Immunocomplex reactions: reproduction in the experiment, the main clinical forms. Factors determining the pathogenicity of immune complexes. Immunocomplex lesions, their local and general manifestations. Cellular reactions (delayed-type hypersensitivity reactions): experimental reproduction, basic clinical forms. Features of immunological mechanisms. The role of lymphokines. Allergic reactions of stimulating and inhibitory type, clinical forms. Autoallergic reactions. Causes and mechanisms of their development. The role of the autoallergic component in the pathogenesis of diseases. Basic principles of prevention and treatment of allergy.

Topic 6 Final class in module 1 "General nosology"

All topics of module 1.

Module 2. Typical pathological processes

Topic 7 Peripheral circulatory disorders

causes and mechanisms of development, external manifestations. The role of endothelial factors in the pathogenesis of local circulatory disorders. Tissue changes caused by local circulatory disorders, their significance and possible consequences. The concept of reperfusion syndrome, ischemic toxicosis. Thrombosis and embolism as causes of local circulatory disorders. Causes and conditions of thrombosis. Types of emboli, mechanisms of embolism. The role of reflex mechanisms in the development of general disorders caused by embolism. Features of the course of embolism of large and small circles of blood circulation, portal vein. Typical disorders of microcirculation. Intravascular disorders. Sludge syndrome. Disseminated intravascular coagulation syndrome. Capillary (true) stasis. Violation of the tone, mechanical integrity and permeability of microvessels. Extravascular disorders of microcirculation. Capillarotropic insufficiency. Typical lymphatic disorders. Mechanical, dynamic and resorption insufficiency of lymphatic circulation.

Topic 8 Inflammation

Definition of inflammation. Classifications of inflammation. Etiology of inflammation. General and local manifestations of inflammation. Pathogenesis of acute inflammation. Stages of inflammation. Alteration (primary and secondary), causes and mechanisms of secondary alteration. Biochemical and physicochemical disorders in the inflammatory focus. Inflammation mediators, their classification. Plasma mediators (proteins of the acute phase, proteins of complement systems, coagulation / anti-coagulation, fibrinolysis, kinins). Mediators of cellular origin, specific and nonspecific. Cytokines: types, characteristics of action. Mediators from tissue basophils. Eicosanoids. Disorders of local blood circulation in the focus of acute inflammation. The experiment of J. Congheim. Pathogenesis of ischemia and arterial hyperemia. The reasons for the transition of arterial hyperemia to venous. Exudation at the site of acute inflammation, causes and mechanisms. Characteristics of exudates. Emigration of leukocytes in the inflammatory focus. Stages, causes and mechanisms of leukocyte emigration. Adhesive molecules of leukocytes and endotheliocytes. Causes and mechanisms of leukocyte chemotaxis. Mechanisms of microbial neutralization by leukocytes. Phagocytosis: stages, mechanisms of destruction of phagocytosis objects. Proliferation. Causes and mechanisms of proliferation. The role of reactivity. Principles of anti-inflammatory therapy.

Topic 9 Fever

Definition of the concept. General characteristics of fever, its formation in onto- and phylogeny. Etiology of fever. Characteristics of pyrogens. Primary and secondary pyrogens. Pyrogen formation during infection, aseptic injury and immune reactions. Chemical nature and origin of secondary ("real") pyrogens. Mechanisms of influence on the center of thermoregulation. Stages of fever. Principles of classification, types of fever. Involvement of nervous, endocrine and immune systems in the development of fever. Changes in metabolism and physiological functions in fever. Protective value and pathological manifestations of fever. Pathophysiological principles of antipyretic therapy. The concept of pyrotherapy. The main differences between fever, exogenous overheating and other types of hyperthermia.

Topic 10 Tumors

General patterns of tumor growth. Principles of tumor classification. Experimental study of etiology and pathogenesis of tumors. Etiology of tumors. Physical, chemical and biological carcinogenic factors. Physical carcinogenic factors. Chemical carcinogens, their classification. Exogenous and endogenous carcinogens. Chemical carcinogens of direct and indirect action. Features of the chemical structure of compounds that determine their carcinogenicity. Classification of oncogenic viruses. Viral carcinogenesis. Experimental evidence of viral origin of tumors. Pathogenesis of tumor growth. Stages of pathogenesis: initiation, promotion and progression. Mutational and epigenomic mechanisms of malignant transformation. Disorders of the system of genes that provide cell division. The concept of protooncogenes, oncogenes (cellular, viral), genes-suppressors of cell division. Methods of conversion of protooncogene to oncogene. The role of apoptosis in the pathogenesis of tumor growth. Mechanisms of tumor progression. Interaction of tumor and organism. The effect of the tumor on the body. Mechanisms of cancerous cachexia. Mechanisms of natural antitumor protection, immune and non-immune mechanisms of resistance. Mechanisms of tumor evasion from immune surveillance. Pathophysiological bases of tumor prevention and treatment.

Topic 11 Final class in module 2 "Typical pathological processes"

All topics of module 2.

Module 3. Typical metabolic disorders

Topic 12 Energy, lipid and protein metabolism disorders. Starvation

Disorders of digestion and absorption of lipids. Disorders of lipid transport in the blood. Hyper-, hypo-, dyslipoproteinemia. Etiology, pathogenesis of primary (hereditary, familial) and secondary dyslipoproteinemias. Definition of obesity. Types of obesity. Experimental models. Etiology and pathogenesis of obesity. Violation of the main stages of protein metabolism. Azotemia, productive and retention. Disorders of blood protein composition: hyper-, hypo-, dysproteinemia. Gout: etiology, pathogenesis. Hyper- and hypouricemia. Definition, types of starvation: physiological, pathological; complete, absolute, incomplete, partial. External and internal causes of starvation. Characteristics of disorders of basic metabolism and metabolism in certain periods of complete starvation with water. Pathophysiological features of incomplete starvation. Types, etiology, pathogenesis of partial (qualitative) starvation. Protein-calorie deficiency, its forms: alimentary insanity, kwashiorkor. Alimentary dystrophy.

Topic 13 Carbohydrate metabolism disorders. Diabetes

Disorders of carbohydrate absorption, processes of synthesis, deposition and breakdown of glycogen, transport of carbohydrates into cells. Disorders of nervous and hormonal regulation of carbohydrate metabolism. Hypoglycemia syndrome: types, causes, mechanisms. Pathogenesis of hypoglycemic coma. Hyperglycemia syndrome: types, causes and mechanisms of development. Diabetes. Definition, classification (by WHO). Experimental modeling of diabetes mellitus. Etiology, pathogenesis of type 1 diabetes mellitus. The role of hereditary and environmental factors in its origin and development. Pathogenesis of absolute insulin insufficiency, its manifestations and consequences: violation of energy, protein, carbohydrate, fat, water-electrolyte metabolism, acid-base state. Etiology, pathogenesis of type 2 diabetes. The role of hereditary and environmental factors in its origin and development. Variants of relative insulin insufficiency in type 2 diabetes (secretory disorders of B cells, resistance of target tissues to insulin). Manifestations and consequences of relative insulin insufficiency. The concept of metabolic syndrome. Complications of diabetes. Coma: varieties, causes and mechanisms of development, manifestations, principles of therapy. Long-term complications (macro-, microangiopathy, neuropathy, fetopathy, etc.), their general characteristics. Prevention of the occurrence and development of diabetes.

Topic 14 Water-salt metabolism disorders

Positive and negative water balance. Dehydration: extracellular and intracellular; hypo-, iso-, hyperosmolar. Causes and mechanisms of development. Protective and compensatory mechanisms. Excessive accumulation of water in the body. Hypo-, iso- and hyperosmolar hyperhydria, causes and mechanisms of development, protective, compensatory reactions. Extra- and intracellular hyperhydria. Definition of "edema", types of edema. Causes and mechanisms of edema. The theory of the pathogenesis of Starling's edema. Edema caused by changes in oncotic pressure of blood and tissue fluid. The role of vascular permeability disorders and lymph outflow in the pathogenesis of edema. Edema caused by retention of sodium and / or water salts in the body. Myxedematous edema. Principles of treatment of edema. Hyper- and hyponatremia. Causes and mechanisms of development. Disturbances caused by changes in the concentration of sodium ions in the extracellular fluid. Hyper- and hypokalemia. Causes and mechanisms of development. The main manifestations of disorders of potassium ion metabolism.

Topic 15 Calcium and phosphate metabolism disorders

Disorders of hormonal regulation of phosphorus-calcium metabolism: hyper- and hypoparathyroidism, hypo- and hypervitaminosis D, disorders of calcitonin secretion. Hypocalcemic conditions: causes, mechanisms of development, main manifestations. Rickets: causes and mechanisms of development, the main clinical manifestations. Principles of prevention and treatment of rickets. Forms of rickets resistant to vitamin D. The concept of osteodystrophy. Hypercalcemic conditions, causes and mechanisms of development. Calcification (calcification) of soft tissues: metastatic, dystrophic and metabolic mechanisms. Hyper- and hypo-phosphatemia. Causes and mechanisms of development..

Topic 16 Acid-base balance disorders

General characteristics of acid-base disorders (ACS). Acidosis, definition, classification, basic laboratory criteria. Gas acidosis: causes and mechanisms of development, clinical manifestations. Non-gas acidosis (metabolic, excretory, exogenous): causes and mechanisms of development, the relationship between CBS and electrolyte disorders. Acidosis with increased and normal anionic difference. Alkalosis, definition, classification, basic laboratory criteria. Gas alkalosis: causes and mechanisms of development, clinical manifestations. Non-gaseous alkalosis (excretory, exogenous): causes and mechanisms of development. The role of buffer systems of blood, ion exchange, respiratory system and kidneys in the mechanisms of compensation and correction of CBS disorders. Pathological changes in the body in disorders of acid-base status. Principles of pathogenic therapy of acidosis and alkalosis.

Topic 17 Final class in module 3 "Typical metabolic disorders"

All topics of module 3.

Topic 18 Final testing "Step-1"

Module 4. Pathophysiology of the blood system

Topic 19 Pathology of red blood cells. Anemia

Changes in total blood volume. Blood loss: etiology, pathogenesis. Erythrocytosis. Anemia: definition, clinical and hematological manifestations, principles of classification. Pathological, degenerative and regenerative forms of erythrocytes. Etiology, pathogenesis, hematological characteristics of posthemorrhagic anemia (acute and chronic). Etiological classification (hereditary, acquired) of hemolytic anemia. Characteristics of causal factors of acquired hemolytic anemia. Hemolysis of erythrocytes, intravascular and intracellular, as mechanisms of hemolytic anemia. Classification of anemias associated with erythropoiesis disorders (deficient, dysregulatory, hypo-, aplastic, etc.), general characteristics of the causes and mechanisms of development. Etiology, pathogenesis, typical changes of peripheral blood in iron deficiency anemia. The concept of iron-refractory anemia. Anemia caused by vitamin B2 and / or folic acid deficiency. Causes and mechanisms of absolute and relative deficiency of vitamin B2 and folic acid. Addison-Birmer malignant anemia. Characteristics of general disorders in the body with a deficiency of vitamin B2 and / or folic acid. Hematological characteristics of vitamin B12-, folate deficiency anemia.

Topic 20 Leukocytosis, leukopenia

Leukocytosis, principles of classification. Causes and mechanisms of reactive and redistributive leukocytosis. Neutrophilic, eosinophilic, basophilic, lymphocytic and monocytic leukocytosis. The concept of nuclear shift of neutrophilic granulocytes, its varieties. Leukopenia, principles of classification. Causes, mechanisms of leukopenia, agranulocytosis (neutropenia). Pathogenesis of the main clinical manifestations. Acquired and hereditary disorders of the structure and function of leukocytes. Leukemoid reactions.

Topic 21 Leukemia

Representation of hemoblastosis, general characteristics of their main groups. Leukemia as a tumor. Principles of classification of leukemia (acute, chronic; myelo-, lympho-, biphenotypic; primary, secondary). Etiology of leukemia: characteristics of leukogenic factors of physical, chemical, biological nature. Mechanisms of their transforming action on hematopoietic cells of the bone marrow. Anomalies of genotype and constitution as risk factors for the occurrence and development of leukemia. "Peaks" of leukemia in children. Typical patterns and features of the pathogenesis of acute and chronic leukemias: disorders of the cellular composition of bone marrow and peripheral blood; morphological, cytogenetic, cytochemical, immunophenotypic characteristics; systemic disorders in the body. Progression of leukemia, the concept of "blast crisis". Leukemia metastasis. Principles of diagnosis and treatment of leukemia.

Topic 22 Disorders of hemostasis

General characteristics of typical disorders in the hemostasis system. Hemorrhagic disorders of hemostasis. Insufficiency of vascular and platelet hemostasis. Vasopathies: types, causes, mechanisms of development, pathogenesis of the main clinical manifestations. Thrombocytopenia: etiology, pathogenesis, mechanisms of hemostasis disorders. Thrombocytopathy. Mechanisms of adhesion disorders, platelet aggregation, release of platelet granules. Violation of coagulation hemostasis. The reasons for the decrease in the activity of the blood coagulation system and the increase in the activity of the anticoagulant and fibrinolytic systems. The main manifestations of disorders of certain stages of blood clotting, their etiology and pathogenesis. Thrombophilic conditions: thrombosis, disseminated intravascular coagulation (DIC), localized intravascular coagulation. Principles of classification of DIC syndrome (according to the course - acute, subacute, chronic; by the trigger mechanism of coagulation), etiology, pathogenesis. Role in pathology. Principles of correction of disorders in the hemostasis system.

Topic 23 Final class in module 4 "Pathophysiology of the blood system"

All topics of module 4.

Module 5. Pathophysiology of the cardiovascular system and external respiration

Topic 24 Pathophysiology of the heart. Heart failure. Arrhythmias

Definition of the concept of circulatory failure, principles of its classification, characteristics of cardio- and hemodynamic disorders. The concept of acute and chronic ("stagnant") circulatory failure. Etiology, pathogenesis, stages of chronic circulatory failure. Mechanisms of development of the main clinical manifestations of chronic circulatory failure (dyspnea, cyanosis, edema). Acute circulatory failure: etiology, pathogenesis, pathological and adaptive-compensatory changes. Collapse, shock as variants of acute circulatory failure. Definition of heart failure, principles of classification. Heart failure due to overload. Causes of heart overload and resistance. Mechanisms of immediate and long-term adaptation of the heart to overload: tachycardia, hyperfunction (hetero-, homeometric), myocardial hypertrophy. Cardiac hypertrophy: types, causes, mechanisms of development, stages (according to FZ Meerson). Features of hypertrophied myocardium, causes and mechanisms of its decompensation. Myocardial form of heart failure.

Topic 25 Coronary heart disease. Atherosclerosis. Hypertension

Coronary insufficiency (relative and absolute; acute and chronic), mechanisms of development. The concept of "critical stenosis". Consequences of myocardial ischemia. Ischemic heart disease as a manifestation of coronary insufficiency, its varieties. Clinical and laboratory criteria, manifestations and complications of myocardial infarction. Pathogenesis of cardiogenic shock. Cardiac arrhythmias: classification, causes, mechanisms, typical electrocardiographic manifestations. Atherosclerosis. Risk factors for atherosclerosis. Experimental models. Modern and historical theories of atherogenesis: the role of endothelial damage, inflammation, hereditary. Hypertension, definition, principles of classification. Hemodynamic variants of hypertension. The role of disorders of pressor and depressor systems in the development of hypertension. Primary and secondary arterial hypertension. Etiology, pathogenesis. Experimental models. Theories of the pathogenesis of primary hypertension. Arterial hypotension: definition, criteria. Etiology and pathogenesis of acute and chronic hypotension.

Topic 26 Pathophysiology of respiration

Definition of the concept of respiratory failure, criteria, principles of classification. Extrapulmonary and pulmonary disorders of alveolar ventilation: central, neuromuscular, thoracodiaphragmatic, decreased airway patency, elastic properties of lung tissue, the number of functioning alveoli. Mechanisms of alveolar ventilation disorders: dysregulatory, restrictive, obstructive. Causes and mechanisms of gas diffusion disorders in the lungs. Pulmonary circulatory disorders. Violation of general and regional ventilation-perfusion relations in the lungs. Changes in the gas composition of the blood and acid-base status in various types of respiratory failure, their importance for the body. Pathogenesis of the main clinical manifestations of respiratory failure. Shortness of breath: types, causes, mechanisms of origin and development. Asphyxia, causes and mechanisms of development. Violation of non-respiratory functions of the lungs, their impact on systemic hemodynamics and the hemostasis system. Pathological breathing. Types of periodic and terminal respiration.

Topic 27 Hypoxia

Definition, principles of classification of hypoxia. Mechanisms of hypoxia development: reduction of supply and disturbance of oxygen utilization by cells. Etiology of the main types of hypoxia: hypoxic, respiratory, circulatory, blood, tissue, mixed. Changes in the gas composition of arterial and venous blood in different types of hypoxia. Immediate and long-term mechanisms of adaptation and adaptation to hypoxia. Resistance to hypoxia. Factors that provide it. Mechanisms of hypoxic cell damage. Modern principles of oxygen therapy. Iso- and hyperbaric oxygenation. Toxic effect of oxygen. Hyperoxia and free radical reactions. Hyperoxia as a cause of hypoxia.

Topic 28 Final class in module 5 “Pathophysiology of the cardiovascular system and respiration”
All topics of module 5.

Module 6. Pathophysiology of digestion, liver, kidneys, endocrine and nervous systems

Topic 29 Pathophysiology of digestion. Impaired digestion in the oral cavity and stomach. Peptic ulcer disease

General ideas about indigestion, principles of classification. Causes of indigestion (maldigestion). The role of alimentary and infectious agents, disorders of nervous and humoral regulation of the digestive system. Relationship between digestive disorders and metabolic and energy disorders in the body. Appetite disorders. Anorexia. Causes and mechanisms of digestive disorders in the oral cavity. Etiology, pathogenesis, experimental models of caries and periodontitis. Causes, mechanisms and consequences of salivation disorders. Impaired motor function of the esophagus. Etiology, pathogenesis of heartburn. Indigestion in the stomach. General characteristics of disorders of motor and secretory functions of the stomach. Pathological gastric secretion, types; causes and mechanisms of development. Etiology, pathogenesis of gastric and / or duodenal ulcers. The role of *Helicobacter pylori*. Understanding the etiology and pathogenesis of symptomatic gastric and / or duodenal ulcers.

Topic 30 Pathophysiology of digestion. Digestive disorders in the intestines. Acute pancreatitis
Indigestion in the intestines, etiology, pathogenesis. Digestive disorders associated with insufficient secretion of pancreatic juice. Etiology, pathogenesis, complications of acute and chronic pancreatitis. Pathogenesis of pancreatic shock. Intestinal dyskinesias. Causes, mechanisms and manifestations of constipation and diarrhea. Intestinal obstruction: types, etiology, pathogenesis. Disorders of intestinal barrier function: intestinal autointoxication, coli-sepsis, dysbacteriosis. Disorders of cavity and parietal digestion in the intestines. Malabsorption syndrome: definition, manifestations (diarrhea, weight loss, protein deficiency, hypovitaminosis), causes and mechanisms of development. Intestinal enzymopathy.

Topic 31 Pathophysiology of the liver

Liver failure: definition, principles of classification. Etiology, pathogenesis, experimental models of liver failure. Typical disorders of carbohydrate, protein, lipid, water-electrolyte metabolism, metabolism of trace elements, vitamins and hormones, dysfunction of functional systems of the body in liver failure. Insufficiency of antitoxic function of the liver, the mechanism of the main manifestations. Types, causes, pathogenesis of hepatic coma. The role of cerebrotoxic substances. Insufficient excretory function of the liver, the main manifestations. Definitions, criteria, types of jaundice, their causes and mechanisms. Comparative characteristics of pigment metabolism disorders in hemolytic, hepatic and mechanical jaundice; syndromes of cholemia and hypo-, acholia. Gallstone disease. Portal hypertension syndrome: etiology, pathogenesis, manifestations. Mechanisms of ascites, hepatolienal and hepato-renal syndromes.

Topic 32 Pathophysiology of the kidneys

Causes and mechanisms of circulatory disorders in the kidneys. Causes and mechanisms of tubular reabsorption and secretion disorders. Quantitative and qualitative changes in the composition of urine. Oliguria, anuria and polyuria. Water, osmotic and hypertensive diuresis. Hypo- and isostenuria. Pathological components of urine: proteinuria, cylindruria, glucosuria, aminoaciduria, hematuria, leukocyturia. The concept of selective and non-selective proteinuria and its mechanisms. Causes, manifestations and mechanisms of retention azotemia. Pathogenesis of renal edema. Acid-base disorders: renal azotemic acidosis, proximal and distal tubular acidosis. Pathogenesis and manifestations of renal osteodystrophy. Mechanisms of development of arterial hypertension, anemia, hemostasis disorders in renal lesions. Syndromes of acute and chronic renal failure: criteria, causes and mechanisms of development. Pathogenesis of uremic coma. Glomerulonephritis: definition, principles of classification. Experimental models, modern ideas about the etiology and pathogenesis of diffuse glomerulonephritis. Nephrotic syndrome, primary and secondary. Causes and mechanisms of kidney stones, urolithiasis.

Topic 33 Pathophysiology of the endocrine system

General characteristics of violations of endocrine system. Disorders of direct and reverse regulatory links. Pathology of hypothalamic-pituitary system. Hypopituitarism and hyperpituitarism. Pathophysiology of neurohypophysis. Etiology, pathogenesis, clinical signs of diabetes insipidus. Pathology of adrenal glands. Adrenal cortex deficiency: classification, etiology, pathogenesis, clinical signs. Adrenal cortex hyperfunction: classification (primary, secondary), etiology, pathogenesis, clinical signs. Itsenko-Cushing, Conn, adrenogenital syndromes. Adrenal medulla disorders: classification, etiology, pathogenesis, clinical signs. Pathology of thyroid gland. Hypothyroidism: causes and development mechanisms, pathogenesis of main manifestations. Hyperthyroidism: causes and development mechanisms, pathogenesis of main manifestations. Goiter: classification (endemic, sporadic, nodular and diffuse toxic), its etiology and pathogenesis; functional changes of the gland. Disorders of parathyroid glands: classification, causes, development mechanisms, clinical and pathophysiological signs. Disorders of gonads: primary and secondary hyper- and hypogonadism. Etiology, pathogenesis, extragenital symptoms of genital disorders. The concept of stress as non-specific, stereotypical adaptation reaction of the body to extreme stimuli. Stages of general adaptation syndrome development. Mechanisms of long-term adaptation. The concept of stress.

Topic 34 Pathophysiology of the nervous system General characteristics of nervous system pathology, principles of disorder classification. Sensory function disorders of nervous system. Brown-Sekar syndrome. Signs of damage of thalamic centers and sensory structures of the cerebral cortex. Pain. The concept of pain as a type of sensitivity. Principles of pain classification. Somatic pain. Visceral pain. Modern theories of pain etiology and pathogenesis. Antinoceptive natural mechanisms. Principles and methods of anesthesia. Motor nervous system disorders. Experimental simulation of motor disorders. Peripheral and central paralyzes and paresis: etiology, pathogenesis, main clinical signs. Spinal shock. Motor disorders of subcortical origin. Cerebellar disorders. Convulsions, its types. Disorders of neuromuscular transmission. Myasthenia gravis. Nervous trophy disorders. Neurodystrophic process. Pathological excitation and inhibition of the nervous centers. Neurosis. Neuron injury as one of the reasons of integrative CNS disorders. Acute and chronic disorders of cerebral circulation. Stroke. Edema and brain swelling, etiology and pathogenesis. Intracranial hypertension. Significance of the neuroglia injury to pathological processes development in the CNS. Brain-blood (hematoencephalic) barrier injury and autoimmune cerebral damage.
Topic 35 Final class in module 6 “Pathophysiology of digestion, liver, kidneys, endocrine and nervous systems” All topics of module 6.
Topic 36 Final testing "Step-1" The class is conducted through final testing.
Topic 37 Final control: exam Conducting the exam in accordance with the regulations

5. Intended learning outcomes of the course

After successful study of the course, the student will be able to:

LO1	Determine and evaluate the course of characteristic pathological processes of organs and body systems of patients of all age groups based on the results of laboratory diagnostics
LO2	Be able to determine the necessary list of laboratory, instrumental research methods for effective assessment and separation of pathological conditions and diseases of the body with further interpretation of the obtained results
LO3	Identify pathological processes and states of organ functioning in the most common diseases of the cardiovascular, respiratory, digestive, endocrine and nervous systems
LO4	To be able to determine and evaluate the course of various pathological conditions in patients in emergency conditions
LO5	Analyze the role of environmental and internal factors biological factors (age, heredity, constitution, reactivity) in the occurrence and development of typical pathological processes (disorders of local circulation, inflammation, tumors, fever, hypoxia, starvation) and most common diseases of the blood and circulatory system, external respiration, digestion, liver and kidney, endocrine and nervous systems

LO6	Apply the skills of questioning and comprehensive examination of the patient, regardless of age and the nature of the pathological processes of the body's organs and systems
LO7	Be able to work with professional medical literature and analyze with further effective use of the information obtained

6. Role of the course in the achievement of programme learning outcomes

Programme learning outcomes achieved by the course.

For 222 Medicine:

PO4	Isolate and identify primary clinical symptoms and syndromes (according to List 1); establish a provisional clinical diagnosis of a disease (according to List 2) using standard methodologies, based on preliminary patient history, physical examination findings, and knowledge of human anatomy, organs, and systems.
PO5	Collect patient complaints, medical and life history; assess the patient's psychomotor and physical development, as well as the state of bodily organs and systems; evaluate diagnostic information based on laboratory and instrumental findings (according to List 4), accounting for the patient's age.
PO6	Establish a definitive clinical diagnosis by making informed decisions and analysing subjective and objective data obtained from clinical and supplementary examinations; perform differential diagnosis while adhering to relevant ethical and legal standards, under the supervision of a supervising physician within a healthcare facility setting (according to List 2).
PO7	Prescribe and analyse supplementary (mandatory and elective) diagnostic methods (laboratory, functional, and/or instrumental) (according to List 4) for patients with diseases of organs and bodily systems to perform differential diagnosis (according to List 2).
PO8	Determine the primary clinical syndrome or the underlying cause of a casualty's/affected individual's critical condition (according to List 3) by making informed decisions and assessing the individual's condition under any circumstances (inside or outside a healthcare facility), including emergency situations, combat operations, field settings, and environments with limited time and information.
PO21	Retrieve required information from professional literature, databases, and other sources; analyse, evaluate, and apply this information.
PO23	Evaluate environmental impacts on human health to assess population morbidity patterns.

7. The role of the course in the development of program competencies

Program competencies addressed by the course:

For 222 Medicine:

PC1	GC 1. Ability to think abstractly, analyse, and synthesize.
PC2	GC 2. Ability to learn and master modern knowledge.
PC3	GC 3. Ability to apply knowledge in practical situations.

PC4	GC 4. Knowledge and understanding of the subject area and understanding of professional activity.
PC5	GC 11. Ability to search, process and analyze information from various sources.
PC6	SC 18. Ability to analyse the performance of a physician, department, or healthcare institution, ensuring the quality of medical care and improving the efficiency of healthcare resource utilization.

8. Teaching and learning activities

Topic 1. Common teaching about disease. General etiology and pathogenesis
pr.tr.1 "Common teaching about disease. General etiology and pathogenesis" (full-time course) The doctrine of the disease, general etiology and pathogenesis. Analysis of actually pathological and protective physiological changes in the body using the example of acute blood loss. Pathophysiological interpretation of clinical manifestations of blood loss.
Topic 2. Pathogenic effects of environmental factors
pr.tr.2 "Pathogenic effects of environmental factors" (full-time course) Патогенна дія термічних факторів і радіації на організм. Постановка віртуальних експериментів на тваринах з аналізом їх результатів.
Topic 3. The role of heredity, constitution, age factors in pathology
pr.tr.3 "The role of heredity, constitution, age factors in pathology" (full-time course) Classification of hereditary diseases. Monogenic and chromosomal diseases. Analysis of pedigrees and the likelihood of hereditary pathology in specific clinical cases.
Topic 4. Reactivity and resistance. Pathophysiology of immunological reactivity
pr.tr.4 "Reactivity and resistance. Pathophysiology of immunological reactivity" (full-time course) Violation of nonspecific and specific humoral and cellular mechanisms of immunity. Pathophysiological analysis of specific clinical cases with discussion of the results such analysis
Topic 5. Allergy
lect.1 "Allergy" (full-time course) Allergy. Etiology and pathogenesis. The subject and methods of pathophysiology. Etiology. Pathogenesis. Multimedia interactive lecture on the elements of problematcity. It is carried out on line on Google Meet.
pr.tr.5 "Allergy" (full-time course) Allergic reactions according to the classification of Coombs and Jella. Stages of allergy pathogenesis. Pathophysiological analysis of specific clinical cases with discussion of the results such analysis
Topic 6. Final class in module 1 "General nosology"

pr.tr.6 "Final class in module 1 "General nosology"" (full-time course) Classes are conducted by final testing and a survey on the topics covered in the module.
Topic 7. Peripheral circulatory disorders
pr.tr.7 "Peripheral circulatory disorders" (full-time course) Local circulation disorders: arterial and venous hyperemia, ischemia, stasis, thrombosis, embolism. Conducting a virtual experiment with the analysis of its results.
Topic 8. Inflammation
lect.2 "Inflammation" (full-time course) Inflammation. General characteristics. Etiology. Pathogenesis. A multimedia interactive lecture with elements of problematcity. It is carried out on line on Google Meet.
pr.tr.8 "Inflammation" (full-time course) Etiology and pathogenesis of inflammation. Stages of the inflammatory process. Conducting a virtual experiment with analysis of its results
Topic 9. Fever
pr.tr.9 "Fever" (full-time course) Etiology and pathogenesis of fever. Analysis of different types of temperature curves. Conducting a virtual experiment with analysis of its results
Topic 10. Tumors
pr.tr.10 "Tumors" (full-time course) Etiology and pathogenesis of a malignant tumor process. Discussion of modern concepts of chemical and viral oncogenesis.
Topic 11. Final class in module 2 "Typical pathological processes"
pr.tr.11 "Final class in module 2 "Typical pathological processes"" (full-time course) The lesson is conducted by final testing and a survey on the topics covered by the module.
Topic 12. Energy, lipid and protein metabolism disorders. Starvation
pr.tr.12 "Energy, lipid and protein metabolism disorders. Starvation" (full-time course) Fasting classification. Obesity. Hereditary disorders of amino acid metabolism. Gout. Pathophysiological analysis of specific clinical cases with discussion of the results such analysis
Topic 13. Carbohydrate metabolism disorders. Diabetes
lect.3 "Carbohydrate metabolism disorders. Diabetes" (full-time course) Typical disorders of carbohydrate metabolism. Diabetes mellitus, etiology, pathogenesis. Multimedia interactive lecture on the elements of problematcity. It is carried out on line on Google Meet.

pr.tr.13 "Carbohydrate metabolism disorders. Diabetes" (full-time course) Diabetes mellitus type 1 and 2: etiology and pathogenesis. Pathophysiological analysis of specific clinical cases with discussion of the analysis results.
Topic 14. Water-salt metabolism disorders
lect.4 "Water-salt metabolism disorders" (full-time course) Typical disorders of water-salt metabolism. Hyper- and hypohydria. Swelling. Multimedia interactive lecture with elements of problematicness. It is carried out on line on Google Meet.
pr.tr.14 "Water-salt metabolism disorders" (full-time course) Hyper- and hypohydria. Edema, their mechanisms. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 15. Calcium and phosphate metabolism disorders
pr.tr.15 "Calcium and phosphate metabolism disorders" (full-time course) Hyper- and hypocalcemia. Rickets: etiology and pathogenesis. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 16. Acid-base balance disorders
pr.tr.16 "Acid-base balance disorders" (full-time course) Causes and mechanisms of acidosis and alkalosis. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 17. Final class in module 3 "Typical metabolic disorders"
pr.tr.17 "Final class in module 3 "Typical metabolic disorders"" (full-time course) The lesson is conducted by final testing and survey on the topics of the module.
Topic 18. Final testing "Step-1"
pr.tr.18 "Final testing "Step-1"" (full-time course) Testing on modules №1-7.
Topic 19. Pathology of red blood cells. Anemia
lect.5 "Pathology of red blood cells. Anemia" (full-time course) Characteristics of disorders of the erythrocyte system. Pathophysiological features of various forms of anemia. Multimedia interactive lecture with elements of problematicness. It is carried out on line on Google Meet.
pr.tr.19 "Pathology of red blood cells. Anemia" (full-time course) Etiology and pathogenesis of various forms of anemia. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 20. Leukocytosis, leukopenia

pr.tr.20 "Leukocytosis, leukopenia" (full-time course) Causes, mechanisms of leukocytosis and leukopenia. Pathophysiological analysis specific clinical cases with discussion of the results of such analysis.
Topic 21. Leukemia
pr.tr.21 "Leukemia" (full-time course) Etiology and pathogenesis of leukemia. Pathophysiological analysis of specific clinical cases with discussing the results of such an analysis.
Topic 22. Disorders of hemostasis
pr.tr.22 "Disorders of hemostasis" (full-time course) Hemorrhagic syndrome, its causes and mechanisms. DIC syndrome. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 23. Final class in module 4 “Pathophysiology of the blood system”
pr.tr.23 "Final class in module 4 “Pathophysiology of the blood system”" (full-time course) Classes are held by final testing and questionnaires module topics.
Topic 24. Pathophysiology of the heart. Heart failure. Arrhythmias
pr.tr.24 "Pathophysiology of the heart. Heart failure. Arrhythmias" (full-time course) Options for heart failure. Causes and mechanisms of arrhythmias. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 25. Coronary heart disease. Atherosclerosis. Hypertension
pr.tr.25 "Coronary heart disease. Atherosclerosis. Hypertension" (full-time course) Etiology and pathogenesis of coronary heart disease, atherosclerosis, hypertension.
Topic 26. Pathophysiology of respiration
lect.6 "Pathophysiology of respiration. Hypoxia" (full-time course) Insufficiency of external respiration, types of respiratory insufficiency, forms of respiratory disorders. Hypoxia. Types, mechanisms and pathophysiological manifestations of hypoxia. Multimedia interactive lecture with elements of problematcity. It is carried out on line on Google Meet.
pr.tr.26 "Pathophysiology of respiration" (full-time course) Insufficiency of external respiration, its pathogenetic variants. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 27. Hypoxia
pr.tr.27 "Hypoxia" (full-time course) Causes, mechanisms and consequences of oxygen starvation. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.

Topic 28. Final class in module 5 “Pathophysiology of the cardiovascular system and respiration” pr.tr.28 "Final class in module 5 “Pathophysiology of the cardiovascular system and respiration”" (full-time course) The lesson is conducted by final testing and survey on the topics of the module.
Topic 29. Pathophysiology of digestion. Impaired digestion in the oral cavity and stomach. Peptic ulcer disease lect.7 "Pathophysiology of digestion. Peptic ulcer disease. Acute pancreatitis" (full-time course) Pathophysiological aspects of digestive disorders. Ulcer disease. Acute pancreatitis. Multimedia interactive lecture with elements of problemat�city. It is carried out on line on Google Meet. pr.tr.29 "Pathophysiology of digestion. Impaired digestion in the oral cavity and stomach. Peptic ulcer disease" (full-time course) Etiology and pathogenesis of caries and periodontitis. Gastric ulcers, mechanisms of their formation. Gastric or peptic ulcer: etiology and pathogenesis. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 30. Pathophysiology of digestion. Digestive disorders in the intestines. Acute pancreatitis pr.tr.30 "Pathophysiology of digestion. Digestive disorders in the intestines. Acute pancreatitis" (full-time course) Etiology and pathogenesis of acute pancreatitis, intestinal obstruction. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 31. Pathophysiology of the liver pr.tr.31 "Pathophysiology of the liver" (full-time course) Liver failure, its variants. Hepatic coma. Jaundice. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 32. Pathophysiology of the kidneys pr.tr.32 "Pathophysiology of the kidneys" (full-time course) Acute and chronic renal failure: etiology, pathogenesis. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.
Topic 33. Pathophysiology of the endocrine system lect.8 "General pathophysiology of the endocrine system" (full-time course) General characteristics of the pathophysiology of the endocrine system. Multimedia interactive lecture with elements of problemat�city. It is carried out on line on Google Meet. pr.tr.33 "Pathophysiology of the endocrine system" (full-time course) Hyper- and hypofunction of various endocrine glands: causes and mechanisms of development. Pathophysiological analysis of specific clinical cases with discussion of the results of such analysis.

Topic 34. Pathophysiology of the nervous system
pr.tr.35 "Pathophysiology of the nervous system" (full-time course) Causes and mechanisms of disorders of electrophysiological and neurochemical processes in the central nervous system. Pathophysiological analysis of specific clinical cases with discussing the results of such an analysis.
Topic 35. Final class in module 6 “Pathophysiology of digestion, liver, kidneys, endocrine and nervous systems”
pr.tr.33 "Final class in module 6 “Pathophysiology of digestion, liver and kidneys”" (full-time course) The lesson is conducted by final testing and survey on the topics of the module.
Topic 36. Final testing "Step-1"
pr.tr.36 "Final class in module 7 “Pathophysiology of endocrine and nervous systems”" (full-time course) The lesson is conducted by final testing and survey on the topics of the module.
Topic 37. Final control: exam
assessm.37 "Final control: exam" (full-time course) Conducting the exam in accordance with the regulations.

9. Teaching methods

9.1 Teaching methods

Course involves learning through:

TM1	Lecture teaching
TM2	Case-based learning
TM3	Team-based learning (TBL)
TM4	Research-based learning (RBL)
TM5	Practical training
TM6	Electronic learning

The teaching uses modern teaching methods such as CBL, TBL, RBL. They should contribute to the development of professional abilities and stimulate creative and scientific activities.

9.2 Learning activities

LA1	Performing practical tasks
LA2	Interpretation of laboratory (clinical analysis of blood, urine, biochemical analysis blood, immunological studies, etc.) and instrumental examination methods
LA3	E-learning using Zoom, Google Meet, MIX-SSU systems
LA4	Solving situational tasks

LA5	Preparing for Step-1
LA6	Preparation for current and final control
LA7	Preparation for practical training
LA8	Case discussion

10. Methods and criteria for assessment

10.1. Assessment criteria

Definition	National scale	Rating scale
Outstanding performance without errors	5 (Excellent)	$170 \leq RD \leq 200$
Above the average standard but with minor errors	4 (Good)	$164 \leq RD < 169$
	4 (Good)	$140 \leq RD < 163$
Fair but with significant shortcomings	3 (Satisfactory)	$127 \leq RD < 139$
	3 (Satisfactory)	$120 \leq RD < 126$
Fail – some more work required before the credit can be awarded	2 (Fail)	$70 \leq RD < 119$
	2 (Fail)	$0 \leq RD < 69$

10.2 Formative assessment

	Description	Deadline, weeks	Feedback
FA1 Self-assessment of ongoing testing	Improving the results of educational activities by comparing the current level of success with previous indicators. Provides an opportunity to analyze one's own educational activities.	During the entire period of studying the discipline	Adjustment of learning approaches taking into account assessment results
FA2 Teacher guidance in the process of completing practical tasks	The guidelines reveal the methods of pedagogical control over the professional activities of applicants. Efficiency is determined by compliance with all stages of practical tasks. The effectiveness of the formation of the necessary practical skills and abilities depends on the level of formation of practical competence	During the entire period of studying the discipline	Counseling of students in working with a standardized patient, direct and indirect observation of the work of applicants "at the patient's bedside" with further determination of the level of practical training

FA3 Teacher's survey and oral comments of the results	Makes it possible to identify the state of educational experience acquired by students in accordance with the set goals, to find out the prerequisites of the state of formation of the obtained results, the causes of difficulties, to adjust the learning process, to track the dynamics of the formation of learning results and to predict their development	During the entire period of studying the discipline	According to the obtained data on the results of training, based on their analysis, it is proposed to determine the evaluation as an indicator of the achievements of the educational activities of the applicants
FA4 Verifying experiment results	Practicing practical skills and experiments on various mannequins and simulators	During the entire period of study	The maximum number of points is 20, the minimum is 12
FA5 Checking and evaluating written tasks	Assessment of acquired theoretical knowledge on the subject of the discipline. It is conducted in a practical session in accordance with the specific goals of the topic on the basis of a comprehensive assessment of the student's activity, which includes monitoring the level of theoretical training, performing independent work according to the thematic plan	During the entire period of studying the discipline	Feedback is aimed at supporting students' independent work, identifying shortcomings and assessing the level of acquired theoretical knowledge
FA6 Solving situational tasks	The method allows you to reveal and form the qualities and abilities of medical students necessary for further work, forms clinical thinking, analytical abilities, independence in decision-making, communication, skills for working with a sufficiently large amount of information	During the entire period of studying the discipline	Assessment of the student's ability to think clinically, justify their decisions, clearly express their opinions, determine the level of theoretical training, which is reflected in the corresponding assessment

FA7 Testing "Step-1"	A method of effective verification of the level of assimilation of knowledge, abilities and skills from an educational discipline. Testing allows you to check the results of training after completing the discipline	In the penultimate discipline lesson	The maximum number of points for the test is 10 points, provided that 100% of the answers are correct. The minimum score for successfully passing the tests is 8 points (80% of correct answers)
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10.3 Summative assessment

	Description	Deadline, weeks	Feedback
SA1 Final control: exam	Passing a practical-oriented exam. Candidates who have successfully mastered the subject material, passed practical skills and final computer testing are allowed to take the exam	According to the schedule	The applicant can get 80 points for the exam. The minimum number of points a student must receive is 48 points
SA2 Testing	A method of effective verification of the level of assimilation of knowledge, abilities and skills from an educational discipline. Testing allows you to check the results of training during the cycle and determine the level of knowledge at the end of the discipline	Final computer test at the end of the course (10 points)	It is an admission to take the exam
SA3 Evaluation of written works, survey, solution and implementation of practical tasks	Includes oral interview, interpretation of laboratory and instrumental methods of examination, objective structured clinical examination of the patient, solution of clinical individual and group cases, ongoing testing. Students who are involved in research activities have the opportunity to present the results of their own research at conferences, student research competitions, etc. (incentive activities, additional points)	During the entire period of studying the discipline	At each lesson, the result of the ND performance affects the comprehensive assessment for the practical lesson

Form of assessment:

	Points	Можливість перескладання з метою підвищення оцінки
The second semester of teaching	200 scores	
SA1. Final control: exam	80	
Answers to theoretical questions and questions relating to practical training	80	No
SA2. Testing	20	
	20	No
SA3. Evaluation of written works, survey, solution and implementation of practical tasks	100	
Oral examination, group case study, clinical case study, assessment, objective structured clinical examination, interpretation of laboratory and diagnostic test results	100	No

For each module (1, 2, 3, 4, 5, 6), a student can receive a maximum of 20 points, of which 5 points - oral questioning, 5 points - written work, 5 points - testing, 5 points - execution practical tasks. The points for the module are given as the sum of the arithmetic mean current classes, in which each of the components is separately assessed according to the traditional 4-point system. The maximum number of points that a student can receive in practical classes during the academic year - 120. The exam is held in accordance with the schedule at the end semesters during the examination session Examination tickets contain three theoretical questions on different topics and cover all sections of the academic discipline (20 points each), one practical task (20 points). The exam is credited to the student if he scored not less than 48 points out of 80. The total score for the discipline cannot exceed 200 points.

11. Learning resources

11.1 Material and technical support

MTS1	Information and communication systems
MTS2	Library funds
MTS3	Computers, computer systems and networks
MTS4	Laboratory equipment (light microscopes "Biolam", blood products)
MTS5	Multimedia, video and sound reproducing, projection equipment (video cameras, projectors, screens, smartboards, etc.)
MTS6	Software (to support distance learning, web survey, virtual labs, virtual patients, computer graphics, simulations, etc.)
MTS7	Projection equipment

11.2 Information and methodical support

Essential Reading	
1	Recent Advances in Molecular Mechanisms Underlying Kidney Diseases. Pathophysiology and Therapeutic Targets [Електронний ресурс] / ed. G. J. Dugbartey. — MDPI, 2025. — 122 p. — CC BY-NC-ND 4.0.
2	Renin-Angiotensin System in Cardiovascular Biology [Електронний ресурс] / ed. : M. Szekeres, G. L. Nadasy, A. Balla. — Basel : MDPI, 2025. — 170 p. — CC BY-NC-ND 4.0.
3	Animal Models for Study of Pathophysiological Mechanisms of Hypertension and Its Complications [Електронний ресурс] / ed. : J. Zicha, I. Vaneckova. — Basel : MDPI, 2023. — 296 p. — CC BY-NC-ND 4.0.
4	Physiology and Pathophysiology of Iron Metabolism [Електронний ресурс] / ed. D. Enko. — Basel : MDP, 2023. — 214 p. — CC BY-NC-ND 4.0.
5	The Pituitary Gland. An Overview of Pathophysiology and Current Management Techniques [Електронний ресурс] / ed. A. Малеха. — IntechOpen, 2023. — 94 p. — CC BY 3.0.
Supplemental Reading	
1	Oleshko O., Berladir K., Oleshko T. et al. Neurobiological aspects of pathogenetic mechanisms in the development of post-traumatic stress disorder (literature review). Eastern Ukrainian Medical Journal. 2025. 13 (1). С. 39-54 DOI: 10.21272/eumj.2025;13(1):39-54.
2	Ataman, O. Crash Course in Pathophysiology. Questions & Answers / O. Ataman. — Vinnytsia : Nova knyha, 2019. — 520 p.
3	General and clinical pathophysiology = Загальна та клінічна патофізіологія : [textbook] / A. V. Kubyshkin, A. I. Gozhenko, V. F. Sagach et al. ; edited by A. V. Kubyshkin, A. I. Gozhenko. — 3rd ed. — Vinnytsia : Nova Knyha, 2019. — 656 p.
4	Robbins Basic Pathology. 11th Edition. Editors: Vinay Kumar, Abul Abbas, Jon Aster.- Elsevier, 2018.- 936p.
5	Pathophysiology: textbook / N. V. Krishtal, V. A. Mikhnev, N. N. Zayko etc. ; edited by N.V. Krishtal, V.A. Mikhnev. — К. : AUS Medicine Publishing, 2017. — 656 p.
7	Robbins Basic Pathology. 10th Edition. Editors: Vinay Kumar, Abul Abbas, Jon Aster.- Elsevier, 2017.- 952p.
8	Pathophysiology: textbook / N. V. Krishtal, V. A. Mikhnev, N. N. Zayko etc. ; edited by N.V. Krishtal, V.A. Mikhnev. — К. : AUS Medicine Publishing, 2017. — 656 p.
9	Endothelial Dysfunction: From Pathophysiology to Novel Therapeutic Approaches [Електронний ресурс] / ; ed. Byeong Hwa Jeon. — Basel : MDPI, 2022. — 368 p. — CC BY-NC-ND 4.0.

10	Animal Models for Study of Pathophysiological Mechanisms of Hypertension and Its Complications [Електронний ресурс] / ed. : J. Zicha, I. Vaneckova. — Basel : MDPI, 2023. — 296 p. — CC BY-NC-ND 4.0.
Web-based and electronic resources	
1	Kniazkova P. V., Harbuzova V. Y., Pokhmura V. V. The Link between ANRIL Gene rs4977574 Polymorphism and Common Atherosclerosis Cardiovascular Complications: A Hospital-Based Case-Control Study in Ukrainian Population. // BioMed Research International, 2022, 8468202. https://doi.org/10.1155/2022/8468202
2	Ya. D. Chumachenko, M. O. Kyrychenko, D. M. Ramazanova, M. V. Smiianova, V. Yu. Harbuzova, O. V. Ataman. Association study between BGLAP RS1800247-polymorphic variant and type 2 diabetes mellitus development among hypertensive and non-hypertensive Ukrainians. Zaporozhye Medical Journal, Vol. 23 No. 3 (2021). https://doi.org/10.14739/2310-1210.2021.3.220651
3	Lukavenko I., Kolnoguz A., Harbuzova V., & Ataman O. (2021). LncRNA SRA gene polymorphisms and risk of gynecological pathology development among Ukrainian women with proliferative type of benign breast disease without atypia. Zaporozhye Medical Journal, 23(5), 651-655. doi: 10.14739/2310-1210.2021.5.230144

COURSE DESCRIPTOR

№	Course Descriptor	Total hours	Classroom work, hours				Independent work of students, hours									
			Total hours	Lectures	Workshops (seminars)	Labs	Total hours	Self-study of the material	Preparation for workshops (seminars)	Preparation for labs	Preparation for assesment	Independent extracurricular tasks				
1	2				3	4	5	6	7	8	9	10	11	12	13	
full-time course																
Module 1. General nosology																
1	Common teaching about disease. General etiology and pathogenesis				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
2	Pathogenic effects of environmental factors				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
3	The role of heredity, constitution, age factors in pathology				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
4	Reactivity and resistance. Pathophysiology of immunological reactivity				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
5	Allergy				5	4	2	2	0	1	0.5	0.5	0	0	0	
6	Final class in module 1 "General nosology"				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
Module 2. Typical pathological processes																
1	Peripheral circulatory disorders				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
2	Inflammation				5	4	2	2	0	1	0.5	0.5	0	0	0	
3	Fever				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
4	Tumors				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
5	Final class in module 2 "Typical pathological processes"				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
Module 3. Typical metabolic disorders																
1	Energy, lipid and protein metabolism disorders. Starvation				2.5	2	0	2	0	0.5	0	0.5	0	0	0	
2	Carbohydrate metabolism disorders. Diabetes				5	4	2	2	0	1	0.5	0.5	0	0	0	
3	Water-salt metabolism disorders				5	4	2	2	0	1	0.5	0.5	0	0	0	

1	2	3	4	5	6	7	8	9	10	11	12	13
4	Calcium and phosphate metabolism disorders	2.5	2	0	2	0	0.5	0	0.5	0	0	0
5	Acid-base balance disorders	2.5	2	0	2	0	0.5	0	0.5	0	0	0
6	Final class in module 3 "Typical metabolic disorders"	2.5	2	0	2	0	0.5	0	0.5	0	0	0
7	Final testing "Step-1"	2.5	2	0	2	0	0.5	0	0.5	0	0	0
Module 4. Pathophysiology of the blood system												
1	Pathology of red blood cells. Anemia	5	4	2	2	0	1	0.5	0.5	0	0	0
2	Leukocytosis, leukopenia	2.5	2	0	2	0	0.5	0	0.5	0	0	0
3	Leukemia	2.5	2	0	2	0	0.5	0	0.5	0	0	0
4	Disorders of hemostasis	2.5	2	0	2	0	0.5	0	0.5	0	0	0
5	Final class in module 4 "Pathophysiology of the blood system"	2.5	2	0	2	0	0.5	0	0.5	0	0	0
Module 5. Pathophysiology of the cardiovascular system and external respiration												
1	Pathophysiology of the heart. Heart failure. Arrhythmias	2.5	2	0	2	0	0.5	0	0.5	0	0	0
2	Coronary heart disease. Atherosclerosis. Hypertension	2.5	2	0	2	0	0.5	0	0.5	0	0	0
3	Pathophysiology of respiration	5	4	2	2	0	1	0.5	0.5	0	0	0
4	Hypoxia	2.5	2	0	2	0	0.5	0	0.5	0	0	0
5	Final class in module 5 "Pathophysiology of the cardiovascular system and respiration"	2.5	2	0	2	0	0.5	0	0.5	0	0	0
Module 6. Pathophysiology of digestion, liver, kidneys, endocrine and nervous systems												
1	Pathophysiology of digestion. Impaired digestion in the oral cavity and stomach. Peptic ulcer disease	5	4	2	2	0	1	0.5	0.5	0	0	0
2	Pathophysiology of digestion. Digestive disorders in the intestines. Acute pancreatitis	2.5	2	0	2	0	0.5	0	0.5	0	0	0
3	Pathophysiology of the liver	2.5	2	0	2	0	0.5	0	0.5	0	0	0
4	Pathophysiology of the kidneys	2.5	2	0	2	0	0.5	0	0.5	0	0	0
5	Pathophysiology of the endocrine system	5	4	2	2	0	1	0.5	0.5	0	0	0
6	Pathophysiology of the nervous system	2.5	2	0	2	0	0.5	0	0.5	0	0	0
7	Final class in module 6 "Pathophysiology of digestion, liver, kidneys, endocrine and nervous systems"	2.5	2	0	2	0	0.5	0	0.5	0	0	0

1	2	3	4	5	6	7	8	9	10	11	12	13
8	Final testing "Step-1"	2.5	2	0	2	0	0.5	0	0.5	0	0	0
9	Final control: exam	0	0	0	0	0	0	0	0	0	0	0
Assesment												
1	Graded Credit	6	0	0	0	0	6	0	0	0	6	0
2	Exam	30	0	0	0	0	30	0	0	0	30	0
Independent extracurricular tasks												
1	extracurricular tasks	4	0	0	0	0	4	0	0	0	0	4
<i>Total (full-time course)</i>		<i>150</i>	<i>88</i>	<i>16</i>	<i>72</i>	<i>0</i>	<i>62</i>	<i>4</i>	<i>18</i>	<i>0</i>	<i>36</i>	<i>4</i>