

Ministry of Science and Higher Education of the Russian Federation
Federal State Autonomous Institution of Higher Education
“National Research Nuclear University “MEPhI”

INSTITUTE OF ENGINEERING PHYSICS FOR BIOMEDICINE

DEPARTMENT OF FUNDAMENTAL MEDICINE

APPROVED ИТС ИФИБ

Protocol No. 3.1

dated 30.08.2024

ACADEMIC COURSE OUTLINE

ПАТОЛОГИЧЕСКАЯ АНАТОМИЯ / PATHOLOGICAL ANATOMY

Educational program track (speciality) [1] 31.05.01 General Medicine

Semester	Labour input, credits	Total course academic, hours	Lectures, hrs.	Practical sessions, hrs.	Laboratory sessions, hrs.	In the form of practical studies, hrs.	Independent studies, hrs.	Independent studies monitoring, hrs.	Course progress, Exam/Pass-fail exam/Term
5	3	108	18	0	54		36	0	PFE
6	3	108	14	0	34		60	0	PFE
7	4	144	20	0	40		30	0	Ex
Total	10	360	52	0	128	0	126	0	

ABSTRACT

This course provides students with knowledge of the structure of general pathological processes, the totality of which determines the morphological manifestations of a particular disease. The course is based on the study of cellular pathology. Morphological and functional changes underlie all symptoms and syndromes of diseases of organs and systems, which a physician identifies during a patient's examination to establish a diagnosis. Pathological anatomy studies the morphological manifestations and structural foundations of diseases and pathological processes at the organ and system level, as well as at the tissue, cellular, and molecular levels.

The course "Pathological Anatomy" serves as a link between the theoretical knowledge and skills previously acquired by students in such disciplines as biology, medical and biological physics, chemistry, biochemistry, anatomy; histology, embryology, cytology, topographic anatomy, normal physiology; histology, embryology, cytology; biochemistry; medical microbiology and virology; and clinical knowledge and skills.

Without understanding the morphological basis of pathological processes in the human body and the dynamics of their development in various diseases, the study of clinical medicine is impossible.

Pathological anatomy is based on the study of cellular pathology and general pathological processes, the combination of which determines the morphological manifestations of a particular disease; the study of the etiology, pathogenesis, and morphology of diseases at different stages of their development (morphogenesis); the structural foundations of recovery, complications, outcomes, and long-term consequences of diseases; the study of the morphology and mechanisms of the body's adaptation and compensation processes in response to pathogenic factors and changing environmental conditions; the study of disease changes arising both in connection with changing environmental conditions and treatment (pathomorphosis), and as a result of therapeutic, surgical, and diagnostic manipulations (pathomorphosis and iatrogeny); the improvement of diagnostic measures, and the creation of a theoretical and practical basis for the development of new means of disease prevention and treatment. The course involves studying typical pathological processes (general pathological anatomy) and pathological processes associated with specific diseases (nosologies) of organs and systems (specific pathological anatomy).

This course develops the future physician's clinical thinking based on knowledge and understanding of the objective patterns of pathological processes (diseases).

1. ACADEMIC COURSE GOALS AND OBJECTIVES

The objectives of learning this course are to develop competencies in assessing morphofunctional, physiological states, and pathological processes in the human body to solve professional problems; to understand the structural foundations of diseases, their etiology, objective patterns, and general principles of the development and course of pathological processes in the human body; to acquire knowledge and the ability to recognize the morphological manifestations of diseases; and to link pathomorphological changes with clinical manifestations of diseases.

Objectives of learning this course:

- to acquire knowledge of cellular pathology and general pathological processes, the totality of which determines the morphological manifestations of a particular disease;
- to develop knowledge and skills in assessing morphofunctional processes in the human body to solve professional problems and to understand the structural foundations of diseases;

- Acquisition of skills and abilities in recognizing the morphological manifestations of diseases, knowledge of the methodological principles of morphological analysis, and skills in assessing (clinically interpreting) the results of morphological examination of biopsy, surgical, and autopsy material;
- Development of skills in associating and comparing pathomorphological changes with the clinical manifestations of diseases;
- Acquisition of knowledge about the etiology, pathogenesis, and morphology of diseases at different stages of their development (morphogenesis), the structural foundations of recovery, complications, outcomes, and long-term consequences of diseases, the ability to understand objective patterns, general principles of the development and course of pathological processes in the human body, and the use of these skills in professional activities;
- Acquisition of knowledge and skills in the morphology and mechanisms of adaptation processes and compensatory mechanisms in response to pathogenic factors, changing environmental conditions (natural and induced pathomorphosis), and as a result of diagnostic, surgical manipulations, and treatment (iatrogenesis);
- Familiarization of students with the principles of organizing a pathological anatomical service

2. PLACE OF THE ACADEMIC COURSE IN THE MAIN HIGHER EDUCATION CURRICULUM

This course requires knowledge, skills, and abilities developed in the following disciplines: biology, medical and biological physics, chemistry, biochemistry, anatomy; histology, embryology, cytology, topographic anatomy, normal physiology, histology, embryology, cytology; biochemistry; medical microbiology and virology;

To gain a comprehensive understanding of the morphofunctional, physiological states, and pathological processes in the human body for solving professional problems, it is advisable to simultaneously study pathological anatomy with such disciplines as pathological physiology, immunology, pharmacology, internal medicine, general surgery, radiation diagnostics, and diagnostic practical training.

Studying this discipline is necessary for acquiring knowledge, skills and abilities formed by subsequent clinical disciplines included in the curriculum (internal medicine, surgical diseases, faculty therapy, occupational diseases; hospital therapy, hospital surgery, endocrinology; outpatient therapy, infectious diseases, neurology, gynecology, urology, pediatrics, oncology, etc.), and the study of pathological anatomy precedes mastering the sectional course and forensic medicine.

3. DEVELOPED COMPETENCIES AND INTENDED LEARNING OUTCOMES

Universal and/or general professional competencies:

Competency code and title	Code and title of competency-based rubrics
ОПК-5 [1] – Capable of assessing morphofunctional and physiological states, as well as pathological processes in the human body to solve professional tasks.	3-ОПК-5 [1] – Know: - basic medical, pharmaceutical, and morphofunctional terminology, including Latin terms; - structure and functions of the human body, age-related, gender-specific, and individual characteristics of the structure and development of a healthy organism; - physical and chemical nature of processes occurring in a living organism; - patterns of

	vital activity of the organism, mechanisms of self-regulation and regulation; - features of regulation of the functioning of human body systems in pathological conditions; - patterns of occurrence, development, and outcome of typical pathological processes, the concept of sanogenesis; - etiology and pathogenesis of the most common diseases; - the concept of nosology, principles of disease classification; - principles of microorganism classification, their morphology, physiology, and impact on human health; - structure and functions of the human immune system. Y-OIHK-5 [1] – Be able to: - analyze mechanisms of disease development and manifestation; - recognize morphological and functional changes in cells, tissues, organs, and systems of the human body; - use basic physical-chemical and other natural science concepts and methods in solving professional tasks; - determine the cause of death and formulate a pathological diagnosis. B-OIHK-5 [1] – Possess skills in: - conducting microscopy and analyzing microscopic specimens; - correlating morphological and clinical manifestations of diseases; - assessing morphofunctional, physiological states, and pathological processes in humans; - clinical-anatomical analysis of autopsy results.
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4. PEDAGOGIC POTENTIAL OF THE COURSE

Pedagogic tracks/objectives	Pedagogic goals (code)
Intellectual education	Establishing conditions for: formation of culture of intellectual work (B11)
Professional education	Establishing conditions for: formation of motivation to improve the quality of medical care to the population and the desire to follow the rules and norms of interaction between the doctor, colleagues and the patient, contributing to the creation of the most favorable environment for the patient's recovery (B34)

5. ACADEMIC COURSE STRUCTURE AND CONTENT

Academic course sections, their scope, terms of study and assessment:

No.	Academic course section name	Weeks	Lectures/ Practical (seminars)/ Laboratory sessions, hrs.	Compulsory current assessment (form*, week)	Maximum grade per section**	Section assessment (form*, week)	Competency-based rubrics

	<i>5 Semester</i>						
1	General Pathological Anatomy	1-10	12/0/32	T-2 (5), T-6 (10), T-8 (10)	25	T-8	3-ОПК-5, У-ОПК-5, В-ОПК-5
2	Tumors. Carcinogenesis.	11-16	6/0/22	T-12 (25)	25	T-15	3-ОПК-5, У-ОПК-5, В-ОПК-5
	<i>Totals for 5 Semester</i>		18/0/54		50		
	Assessment events for 5 Semester				50	PFE	3-ОПК-5, У-ОПК-5, В-ОПК-5
	<i>6 Semester</i>						
1	Particular Pathological Anatomy, Section 1	1-11	10/0/26	T-9 (25)	25	T-10	3-ОПК-5, У-ОПК-5, В-ОПК-5
2	Particular Pathological Anatomy, Section 2	12-15	4/0/8	T-13 (10), T-14 (15)	25	T-15	3-ОПК-5, У-ОПК-5, В-ОПК-5
	<i>Totals for 6 Semester</i>		14/0/34		50		
	Assessment events for 6 Semester				50	PFE	3-ОПК-5, У-ОПК-5, В-ОПК-5
	<i>7 Semester</i>						
1	Pathological Anatomy, Section 3	1-10	10/0/18	T-1 (8), T-2 (2), T-10 (5)	25	T-10	3-ОПК-5, У-ОПК-5, В-ОПК-5
2	Pathological anatomy of infectious diseases	11-15	10/0/22	T-11 (15), T-14 (12)	25	T-15	3-ОПК-5, У-ОПК-5, В-ОПК-5
	<i>Totals for 7 Semester</i>		20/0/40		50		
	Assessment events for 7 Semester				50	Ex	3-ОПК-5, У-ОПК-5, В-ОПК-5

* – abbreviated name of assessment

** – 100 maximum points per semester including a pass/fail exam and (or) an exam

Abbreviated current assessment forms and section assessment

Abbreviation	Full name
T	Testing
PFE	Pass/fail examination
Ex	Exam

SYLLABUS

Weeks	Topics / Content	Lect., hrs.	Pr./sem., hrs.	Lab., hrs.
	<i>5 Semester</i>	18	0	54

1-10	General Pathological Anatomy	12	0	32
1 - 2	Cell Damage. Necrosis and Apoptosis. Cell Damage. Necrosis and Apoptosis. Necrosis. Definition. Etiology. Pathogenesis and Morphogenesis. Types of Necrosis Depending on Its Cause, Developmental Mechanism, and Morphological Features. Stages of Necrosis Development. Infarction. Types. Gangrene. Possible Outcomes of Necrosis. Apoptosis. Definition. Pathogenesis. Morphogenesis. Differences between Apoptosis and Necrosis.	All		
		2	0	4
		Online		
		0	0	0
3 - 4	Reversible Cell Damage. Parenchymal and Mesenchymal Dystrophies. Mixed Dystrophies Dystrophies. Definition. Types of Dystrophies. Mechanisms of Dystrophic Development. Factors Significant in the Pathogenesis of Hyaline Droplet Dystrophy. Factors Significant in the Pathogenesis of Hydropic Dystrophy. Factors Significant in the Pathogenesis of Fatty Dystrophy. Outcomes and significance of fatty degeneration of the liver and myocardium. Pathogenesis and significance of general obesity. Cardiac obesity, morphological changes. Types of hemoglobin pigment metabolism disorders, development mechanisms, morphological characteristics, and functional significance. Types of proteinogenic pigment metabolism disorders, development mechanisms, morphological characteristics, and functional significance. Lipofuscinoses, development mechanisms, and functional significance. Types of calcifications, development mechanisms, morphological characteristics, and functional significance. Types of stones forming in the urinary and biliary tracts, and the mechanisms of their development. Morphological characteristics of changes in gout.	All		
		4	0	8
		Online		
		0	0	0
5 - 6	Circulatory disorders (plethora, bleeding). Thrombosis, embolism, anemia, infarction. DIC syndrome. Shock. Circulatory disorders (plethora, bleeding). Thrombosis, embolism, anemia, infarction. DIC syndrome. Shock. Definition of venous plethora. Types of venous plethora, causes, and development mechanisms. Macroscopic and microscopic characteristics of venous congestion of various organs (skin, kidneys, spleen, liver, lungs). The functional significance and outcome of venous congestion. Definition of stasis, mechanism of development, and types of bleeding. Definition of hemorrhage. Types of hemorrhage and their morphology. Edema: causes, pathogenesis, classification. Thrombosis and embolism. Types of shock	All		
		2	0	8
		Online		
		0	0	0
7 - 8	Inflammation. Exudative inflammation. Acute inflammation. Productive inflammation. Chronic inflammation. Inflammation. Exudative inflammation. Acute inflammation. Productive inflammation. Chronic inflammation.	All		
		2	0	8
		Online		
		0	0	0

	Inflammation. Definition. Classification. Significance in pathology. Tissue reactions during inflammation. Inflammatory mediators, their types and significance. Relationship between inflammation and immunity. Types of acute inflammation. Morphological features of fibrinous and purulent inflammation. Morphological features of serous and catarrhal inflammation. Outcomes of inflammation and their clinical significance			
9 - 10	Compensatory and adaptive processes. Regeneration. Compensatory and adaptive processes. Regeneration. Definition of adaptation and compensation. The nature and types of compensatory and adaptive processes. Stages of compensatory and adaptive processes and their morphological characteristics. Mechanisms of development and functional significance, atrophy, hypertrophy, metaplasia, and dysplasia. Regeneration. Definition. Classification. Morphological characteristics. Wound healing. Morphology. Sclerosis. Definition. Variants of sclerotic processes. Significance.	All		
		2	0	4
		Online		
		0	0	0
11-16	Tumors. Carcinogenesis.	6	0	22
11 - 12	Tumors. General Provisions. Mesenchymal tumors. Tumors. General Provisions. Mesenchymal tumors. Anaplasia and cataplasia. Features of the morphological structure of tumors. Tumor atypism. Types of tumor atypism. Morphological atypism of tumors. Types of tumor growth in relation to surrounding tissues and their characteristics. Benign and malignant tumors. Metastasis, routes of metastasis. Principles of tumor classification. Classification of mesenchymal tumors. Melanoma and its morphogenesis. Nevus. Its typical location.	All		
		2	0	8
		Online		
		0	0	0
13 - 14	Epithelial tumors. Cancer of individual organs. Epithelial tumors. Cancer of individual organs. Classification of epithelial tumors. Macroscopic and microscopic characteristics of benign and malignant epithelial tumors. Features of metastasis of malignant tumors from epithelium. Precancerous changes in the epithelium. Carcinoma "in situ".	All		
		2	0	8
		Online		
		0	0	0
14 - 15	Tumors of hematopoietic and lymphatic tissue Tumors of hematopoietic and lymphatic tissue Definition of hemoblastoses. Definition of leukemia. Pathogenesis of leukemia. Definition of regional tumor diseases of hematopoietic tissue. Pathogenesis of regional tumor diseases of hematopoietic tissue. Differential diagnosis of various types of leukemia based on their macroscopic and microscopic appearance. Complications and causes of death in patients with hematopoietic and lymphatic tumors. Pathomorphism of hematopoietic and lymphatic tumors.	All		
		2	0	6
		Online		
		0	0	0

	6 Semester	14	0	34
1-11	Particular Pathological Anatomy, Section 1	10	0	26
1	Introduction to nosology. The concept of disease. Introduction to nosology. The concept of disease. Understand the principles of presenting a course in particular pathological anatomy. Memorize the definition of disease and nosological entity, and the diagnosis of disease. Understand the components of a disease diagnosis, identifying the immediate cause of death.	All		
		1	0	4
		Online		
		0	0	0
2 - 3	Cardiovascular diseases. Hypertension. Atherosclerosis. Cardiovascular diseases. Hypertension. Atherosclerosis. Definition of atherosclerosis and hypertension. Current theories and predisposing factors for the development of atherosclerosis, hypertension, and coronary heart disease. Key links in the pathogenesis and morphogenesis of these diseases, classification of clinical and morphological forms. Macroscopic and microscopic characteristics of the stages of atherosclerosis and hypertension, features of structural changes in different clinical and morphological forms of the disease. The nature of complications, outcomes, and immediate causes of death in various clinical and morphological forms of atherosclerosis and hypertension.	All		
		2	0	4
		Online		
		0	0	0
4 - 5	Cardiovascular diseases. Coronary heart disease. Cerebrovascular diseases. Cardiovascular diseases. Coronary heart disease. Cerebrovascular diseases. Definition of coronary heart disease. Risk factors. Pathogenesis. Forms of acute coronary heart disease. Chronic ischemic heart disease (CIHD). Differential diagnosis of various forms of coronary heart disease based on macroscopic, microscopic, and ultrastructural characteristics. Complications and causes of death in various forms of coronary heart disease and cerebrovascular diseases, and their pathogenesis. Cerebrovascular diseases. Definition. Classification. Pathogenesis and morphological changes in the brain in various forms of cerebrovascular disease. Characteristics of coronary heart disease and cerebrovascular disease manifestations depending on the underlying disease.	All		
		2	0	4
		Online		
		0	0	0
6 - 7	Cardiovascular diseases. Rheumatism. Congenital heart defects. Cardiovascular diseases. Rheumatism. Congenital heart defects. Definition, etiology, and pathogenesis of rheumatism. Clinical and morphological forms of rheumatism. Macroscopic and microscopic characteristics of the clinical and morphological forms of rheumatism. The significance and consequences of rheumatism. Pathomorphosis of rheumatism. Acquired heart defects. Definition, anatomical variants of acquired defects, morphological changes in organs and tissues in decompensated heart defects.	All		
		2	0	4
		Online		
		0	0	0
8 - 9	Lung diseases. Pneumonia. Lung diseases. Pneumonia.	All		
		1	0	6

	Definition of acute pneumonia as a group of inflammatory diseases differing in etiology, pathogenesis, and clinical and morphological manifestations. Etiology, pathogenesis, and classification of acute pneumonia. Classification of pneumonias based on etiological, topographic, pathogenetic, and clinical-morphological principles. Etiology, pathogenesis, and clinical and morphological characteristics of croupous pneumonia. Concept of the pathomorphosis of croupous pneumonia. Definition, etiology, pathogenesis, and clinical and morphological characteristics of bronchopneumonia. Features of morphological changes depending on the nature of the pathogen. Pulmonary and extrapulmonary complications of acute pneumonia, outcomes, and causes of death. Influenza. Definition, etiology, and clinical and morphological forms (classification). Morphological manifestations of mild, moderate, and severe forms of influenza. The most common causes of death in influenza.	Online		
		0	0	0
10 - 11	Lung diseases. CNPD Chronic nonspecific lung diseases (CNPD). Definition. Etiology, pathogenesis, and mechanisms of development of CNPD. Macroscopic and microscopic characteristics of diseases in the CNPD group. Chronic bronchitis: definition, types, and histological changes in the bronchial wall. Interstitial lung disease, etiology, main pathogenetic mechanisms, and stages. Pathogenesis of chronic heart failure in CNPD, development of pulmonary hypertension and pulmonary heart disease. Complications and the most common causes of death in CNPD.	All		
		2	0	4
		Online		
		0	0	0
12-15	Particular Pathological Anatomy, Section 2	4	0	8
12 - 13	Pathological anatomy of the gastrointestinal tract. Pathological anatomy of the gastrointestinal tract. Acute and chronic gastritis. Etiology. Pathogenesis. Pathological anatomy. Complications. Chronic Gastritis as a Precancerous Disease of the Stomach. Peptic Ulcer Disease. Etiology. Pathogenesis. Concept of Symptomatic Ulcers. Pathological Anatomy during Exacerbations and Remissions. Complications. Outcomes. Acute and Chronic Enteritis. Etiology. Pathogenesis. Pathological Anatomy. Complications. Acute and Chronic Colitis. Etiology. Pathogenesis. Pathological Anatomy. Complications. Nonspecific Ulcerative Colitis. Etiology. Pathogenesis. Pathological Anatomy. Complications. Crohn's Disease. Etiology. Pathogenesis. Pathological Anatomy. Complications. Appendicitis. Etiology. Pathogenesis. Pathological Anatomy of Acute and Chronic Appendicitis. Complications. Colon Cancer. Etiology. Pathogenesis. Forms. Pathological Anatomy. Patterns of Metastasis. Complications.	All		
		2	0	4
		Online		
		0	0	0
14 - 15	Pathological Anatomy of the Liver. Pathological Anatomy of the Liver. Toxic liver dystrophy as a variant of acute hepatosis. Etiology.	All		
		2	0	4
		Online		

	Pathogenesis. Pathological anatomy. Complications. Outcomes. Fatty hepatosis (liver steatosis). Etiology. Pathogenesis. The role of alcohol in the development of liver steatosis. Pathological anatomy. Complications. Viral hepatitis. Classification. Etiology. Epidemiology. Pathogenesis. Clinical and morphological forms. Pathological anatomy. Complications. Outcomes. Alcoholic hepatitis. Acute and chronic. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Alcoholic hepatitis and liver cirrhosis. Liver cirrhosis. Etiology. Pathogenesis and morphogenesis. Classification Pathological anatomy. Complications. Portal and postnecrotic cirrhosis of the liver. Biliary and mixed cirrhosis of the liver. Liver cancer. Etiology. Macro- and microscopic forms of cancer. Complications	0	0	0
	<i>7 Semester</i>	20	0	40
1-10	Pathological Anatomy, Section 3	10	0	18
1 - 2	Pathological anatomy of the kidneys and genitourinary organs. Pathological anatomy of the kidneys and genitourinary organs. Modern clinical and morphological classification of kidney diseases. The role of kidney biopsy in their study. Acute and chronic glomerulonephritis. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Nephrotic syndrome. Forms: lipoid nephrosis and membranous nephropathy. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Pyelonephritis. Renal amyloidosis. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Acute renal failure. Necrotic nephrosis. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Chronic tubulopathies of obstructive origin. Paraproteinemic nephrosis, gouty kidney. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Kidney tumors. Renal cell carcinoma. Causes, morphological characteristics. Modern classifications of diseases of the genitourinary organs and mammary gland. Hydatidiform mole, placental polyp, chorioepithelioma.	All		
		4	0	6
		Online		
		0	0	0
4 - 3	Pathological anatomy of the endocrine system. Pathological anatomy of the endocrine system. The concept of endocrinopathies. Modern classifications of endocrine diseases. Thyroid diseases. Hypo- and hyperparathyroidism. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Thyroid cancer. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Diabetes mellitus. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes.	All		
		2	0	4
		Online		
		0	0	0
6 - 5	Neurodegenerative disorders. Neurodegenerative disorders. The concept of neurodegenerative disorders. Classification principles.	All		
		2	0	4
		Online		
		0	0	0

	Alzheimer's disease. Etiology. Pathogenesis. Morphology. Complications. Outcomes. Parkinson's disease. Disease Etiology. Pathogenesis. Morphology. Complications. Outcomes. Huntington's disease. Etiology. Pathogenesis. Morphology. Complications. Outcomes.			
7 - 8	Primary brain tumors. Primary brain tumors. Principles of brain tumor classification. Primary brain tumors in adults. Glioblastoma, oligodendroglioma, meningioma, hemangioblastoma, schwannoma, pituitary adenoma. Etiology. Pathogenesis. Complications. Outcomes. Primary brain tumors in children. Morphological picture. Complications. Outcomes.	All		
		2	0	4
		Online		
		0	0	0
11-15	Pathological anatomy of infectious diseases	10	0	22
9 - 10	Морфология инфекционного поражения. Бактериальные инфекции. Бактериальные кишечные инфекции. Morphology of infectious lesions. Bacterial infections. Bacterial intestinal infections. Morphology of the infectious process. Principles of infectious disease classification. Intestinal infections (salmonellosis, typhoid fever, dysentery, cholera, yersiniosis). Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes.	All		
		2	0	6
		Online		
		0	0	0
11 - 12	Airborne infections. Airborne infections. Airborne infections. General characteristics. Diphtheria, scarlet fever, measles, meningococcal infection. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes.	All		
		2	0	4
		Online		
		0	0	0
13 - 14	Tuberculosis. Tuberculosis. Tuberculosis. Etiology, pathogenesis. Classification. Clinical and morphological forms. Primary, hematogenous, secondary tuberculosis. Pathological anatomy, complications, causes of death. Tuberculosis pathomorphosis.	All		
		4	0	6
		Online		
		0	0	0
15	HIV infection. Sepsis. HIV infection. Sepsis. HIV infection. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Sepsis as a special form of infection. Differences from other infections. Etiology, pathogenesis, and interactions between macro- and microorganisms. Classification of sepsis. Clinical and anatomical forms of sepsis: septicemia, septicopyemia, and septic (bacterial) endocarditis. Umbilical sepsis. Pathological anatomy, complications, and causes of death	All		
		2	0	6
		Online		
		0	0	0

Abbreviated names of online options:

Abbreviation	Full name
EC	E-course
FtM	Full-text material

FtL	Full-text lectures
VM	Video materials
AM	Audio materials
Prs	Presentations
T	Tests
ERM	E-reference materials
IS	Interactive site

LABORATORY (LAB) SESSIONS TOPICS

Weeks	Topics / Content
	<i>5 Semester</i>
1 - 2	Introduction to Pathological Anatomy. Irreversible Cell Damage. Introduction to Pathological Anatomy. Irreversible Cell Damage. Pathological Anatomy: Contents, Objectives, Objectives, and Research Methods. Historical Stages of Pathology Development. Damage and Death of Cells and Tissue: Causes, Mechanisms, and Types of Irreversible Damage. Necrosis. Apoptosis.
2 - 3	Reversible Cell Damage. Parenchymal Dystrophies. Reversible Cell Damage. Parenchymal Dystrophies. Reversible Cell and Tissue Damage. Intracellular and Extracellular Accumulations Due to Disrupted Protein and Fat Metabolism.
4 - 5	Reversible Cell Damage. Vascular-Stromal Dystrophies. Reversible Cell Damage. Vascular-Stromal Dystrophies. Pathogenesis and Significance of General Obesity. Cardiac Obesity, Morphological Changes. Vascular Changes in Dystrophy
6	Reversible Cell Damage. Mixed Dystrophies. Reversible Cell Damage. Mixed Dystrophies. Types of hemoglobin pigment metabolism disorders, development mechanisms, morphological characteristics, and functional significance. Types of proteinogenic pigment metabolism disorders, development mechanisms, morphological characteristics, and functional significance. Lipofuscinoses, development mechanisms, and functional significance.
7	Circulatory disorders. Venous and arterial plethora. Circulatory disorders. Venous and arterial plethora. Circulatory disorders: plethora (arterial and venous), bleeding, hemorrhage, stasis. Disturbances in tissue fluid content.
8	Circulatory disorders. Thrombosis, embolism. Circulatory disorders. Thrombosis, embolism. Circulatory disorders: thrombosis, embolism, anemia (ischemia), infarction.
9	Shock. DIC syndrome. Shock. DIC syndrome. Definition of shock. Main types of shock. Pathogenesis of shock. Morphological changes in shock. DIC syndrome. Morphology. Pathological anatomy. Complications. Outcomes
10	Inflammation, general provisions. Acute inflammation. Inflammation, general provisions. Acute inflammation.

	Inflammation. Acute inflammation. Morphology of exudative inflammation.
11	Chronic inflammation. Chronic inflammation. Chronic inflammation. Productive inflammation. Types of productive inflammation. Types of granulomas.
12	Compensatory and adaptive processes. Compensatory and adaptive processes. Adaptive processes. Hypertrophy. Hyperplasia. Atrophy. Metaplasia. Dysplasia
13	Tumors. General Provisions. Concepts of carcinogenesis. Tumors. General Provisions. Concepts of carcinogenesis. Tumors. General Provisions. Concepts of carcinogenesis. Theories of carcinogenesis. Predictors of tumor development. Tumor classification.
14	Mesenchymal tumors and tumors of neural crest cells. Mesenchymal tumors and tumors of neural crest cells. Tumors of mesenchyme, neural tissue, and melanin-producing tissue. Benign, malignant, and tumors with locally distending growth. Morphological characteristics. Main etiologic factors
15	Epithelial tumors. Cancer of specific sites. Epithelial tumors. Cancer of specific sites. Epithelial tumors. Benign and malignant epithelial tumors. Morphological features. Cervical cancer, gastric cancer, lung cancer. Key morphological characteristics, features of the morphological picture, and etiology.
16	Oncohematology. Oncohematology. Blood diseases: leukemia. Acute and chronic leukemia. Lymphomas, Hodgkin's disease. Etiology, pathogenesis, morphological picture, complications, outcomes, pathomorphism.
	<i>6 Semester</i>
1	Introduction to nosology. The concept of disease. Introduction to nosology. The concept of disease. Understand the principles of presenting a course in specific pathological anatomy. Memorize the definition of disease and nosological entity, and the diagnosis of disease. Understand the components of a disease diagnosis, identifying the immediate cause of death.
2	Cardiovascular diseases. Atherosclerosis and hypertension. Cardiovascular diseases. Atherosclerosis and hypertension. Study the morphological changes in blood vessels and the associated morphological changes in organs and tissues associated with atherosclerosis. Understand and understand the complications and causes of death associated with various forms of atherosclerosis. Memorize the definitions and terms used to describe hypertension, as well as its classification. Understand the risk factors and pathogenesis of hypertension. Study the morphological changes in blood vessels and the associated morphological changes in organs and tissues associated with hypertension. Understand and understand the complications and causes of death associated with various forms of hypertension. Understand the general patterns of atherosclerosis and hypertension development.
3	Cardiovascular disease. IHD.

	Cardiovascular disease. IHD. Study the definitions and terms used to describe ischemic heart disease, as well as its classification. Understand the risk factors and pathogenesis of these diseases. Study the morphological changes in organs and tissues associated with these diseases. Understand and understand the complications and causes of death associated with ischemic heart disease.
4	Cardiovascular diseases. Rheumatism. Heart defects. Cardiovascular diseases. Rheumatism. Heart defects. Understand the etiology and pathogenesis of rheumatism. Study the morphological changes in organs and tissues in various forms of rheumatism. Understand the complications and causes of death in rheumatism. Study the pathomorphism of rheumatism. Remember the diseases that cause heart defects. Understand the complications of heart defects.
5	Cardiovascular diseases. Cerebrovascular diseases. Cardiovascular diseases. Cerebrovascular diseases. Understand the definitions and terms used to describe cerebrovascular disease, as well as the classification of these diseases. Understand the risk factors and pathogenesis of these diseases. Study the morphological changes in organs and tissues in these diseases. Understand and understand the complications and causes of death in cerebrovascular disease.
6	Respiratory diseases. Pneumonia. Respiratory diseases. Pneumonia. Definitions and terminology used to describe various types of acute pneumonia. Memorize the classification of acute pneumonia. Understand the etiology and pathogenesis of various types of pneumonia. Study the morphological changes in acute pneumonia. Understand and understand the complications and causes of death in pneumonia.
7	Respiratory diseases. Viral infections. Respiratory diseases. Viral infections. Understand the pathological anatomy of various types of influenza, complications, and causes of death. Study the pathological anatomy, lung changes, and outcomes in pneumonia caused by COVID-19.
8	Respiratory diseases. COPD. Respiratory diseases. COPD. Definitions and terms used to describe chronic nonspecific lung diseases. Understand the etiology, pathogenesis, and morphogenesis of diseases included in the COPD group. Understand the morphology of these diseases according to modern classifications. Understand and understand the complications and causes of death in diseases included in the group of chronic obstructive pulmonary diseases.
9	Respiratory diseases. Pneumocanioses. Respiratory diseases. Pneumocanioses. Definitions and terms used to describe pneumocanioses. Understand the etiology, pathogenesis, and morphogenesis of diseases included in the group of pneumocanioses. Study the morphology of these diseases according to modern classifications. Understand and understand the complications and causes of death in diseases included in the group of pneumocanioses.
11	Gastrointestinal diseases. Esophageal cancer. Stomach cancer. Gastrointestinal diseases. Esophageal cancer. Stomach cancer. Esophageal cancer. Etiology. Pathogenesis. Growth patterns. Pathological anatomy. Complications. Acute and chronic gastritis. Etiology. Pathogenesis. Pathological anatomy. Complications. Chronic gastritis as a precancerous disease of the stomach. Peptic ulcer disease. Etiology. Pathogenesis. Concept of symptomatic ulcers. Pathological anatomy during exacerbations and remissions. Complications. Outcomes. Gastric cancer. Etiology. Pathogenesis. Growth patterns. Pathological anatomy. Complications.
12	Bowel diseases.

	Acute and chronic enteritis. Etiology. Pathogenesis. Pathological anatomy. Complications. Acute and chronic colitis. Etiology. Pathogenesis. Pathological anatomy. Complications. Nonspecific ulcerative colitis. Etiology. Pathogenesis. Pathological anatomy. Complications. Crohn's disease. Etiology. Pathogenesis. Pathological anatomy. Complications. Appendicitis. Etiology. Pathogenesis. Pathological anatomy of acute and chronic appendicitis. Complications. Colon cancer. Etiology. Pathogenesis. Growth patterns. Pathological anatomy. Patterns of metastasis. Complications.
13	Liver diseases. Hepatitis and hepatoses. Liver diseases. Hepatitis and hepatoses. Toxic liver dystrophy as a variant of acute hepatosis. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Fatty hepatosis (liver steatosis). Etiology. Pathogenesis. The role of alcohol in the development of liver steatosis. Pathological anatomy. Complications. Viral hepatitis. Classification. Etiology. Epidemiology. Pathogenesis. Clinical and morphological forms. Pathological anatomy. Complications. Outcomes. Alcoholic hepatitis. Acute and chronic. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Alcoholic hepatitis and liver cirrhosis.
14	Liver diseases. Cirrhosis. Liver tumors. Liver diseases. Cirrhosis. Liver tumors. Liver cirrhosis. Etiology. Pathogenesis and morphogenesis. Classification. Pathological anatomy. Complications. Portal and postnecrotic cirrhosis of the liver. Etiology. Pathogenesis. Pathological anatomy. Complications. Biliary and mixed cirrhosis of the liver. Etiology. Pathogenesis. Pathological anatomy. Complications. Liver cancer. Etiology. Macro- and microscopic forms of cancer. Complications. Patterns of metastasis.
	<i>7 Semester</i>
1 - 2	Neurodegenerative Disorders. Neurodegenerative Disorders. Alzheimer's Disease. Parkinson's Disease. Huntington's Disease. Etiology. Pathogenesis. Morphology. Complications. Outcomes.
3 - 4	Primary Brain Tumors in Adults. Primary Brain Tumors in Adults. Glioblastoma, Oligodendroglioma, Meningioma, Hemangioblastoma, Schwannoma, Pituitary Adenoma. Etiology. Pathogenesis. Complications. Outcomes.
5	Primary Brain Tumors in Children. Primary Brain Tumors in Children. Astrocytoma, Meduloblastoma, Ependymoma, Craniopharyngeal Tumor, Penialoma. Etiology. Pathogenesis. Complications. Outcomes.
6	Pathological Anatomy of Glomerulonephritis, Pyelonephritis, and Renal Amyloidosis. Pathological Anatomy of Glomerulonephritis, Pyelonephritis, and Renal Amyloidosis. Current Clinical and Morphological Classification of Kidney Diseases. The Role of Kidney Biopsy in Their Study. Acute and chronic glomerulonephritis. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes.
7	Chronic renal failure, acute renal failure. Uremia. Etiopathogenesis and morphology. Renal tumors. Chronic renal failure, acute renal failure. Uremia. Etiopathogenesis and morphology. Renal tumors. Acute renal failure. Necrotizing nephrosis. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Chronic tubulopathies of obstructive origin. Paraproteinemic nephrosis, gouty

	kidney. Etiology. Pathogenesis. Pathological anatomy. Complications. Outcomes. Renal tumors. Renal cell carcinoma. Causes, morphological characteristics. Patterns of metastasis.
8	Classification of diseases of the reproductive system. Pathology of pregnancy. Classification of diseases of the reproductive system. Pathology of pregnancy. Modern classifications of diseases of the reproductive organs and mammary gland. Hydatidiform mole, placental polyp, chorionepithelioma
9	Endocrine diseases: diabetes mellitus, thyroid disease. Endocrine diseases: diabetes mellitus, thyroid disease. Endocrine diseases: diabetes mellitus, thyroid disease. Etiopathogenesis of diseases. Morphological changes in organs. Complications. Outcomes.
11	Bacterial infections. General provisions. Bacterial intestinal infections. Bacterial infections. General provisions. Bacterial intestinal infections. Main characteristics of the infectious process. Etiology, pathogenesis. Classification. Clinical and morphological forms of intestinal infections.
12	Bacterial airborne infections. Bacterial airborne infections. Etiology, pathogenesis. Classification. Clinical and morphological forms.
13	Tuberculosis. Tuberculosis. Tuberculosis. Etiology, pathogenesis. Classification. Clinical and morphological forms. Primary, hematogenous, secondary tuberculosis. Pathological anatomy, complications, causes of death. Pathomorphosis of tuberculosis.
14	HIV infection. Sepsis. HIV infection. Sepsis. HIV infection. Etiology, pathogenesis. Classification. Clinical and morphological forms. Complications. Causes of death. Sepsis as a special form of infection. Differences from other infections. Etiology, pathogenesis, relationships between macro- and microorganisms. Classification of sepsis. Clinical and anatomical forms of sepsis: septicemia, septicopyemia, septic (bacterial) endocarditis. Umbilical sepsis. Pathological anatomy, complications, causes of death

6. EDUCATIONAL TECHNOLOGIES

The use of information technology in the educational process for this discipline is carried out in accordance with the approved Regulations on the Electronic Information and Educational Environment of NRNU MEPhI.

The electronic learning management system (LMS) is used to implement educational programs in face-to-face, distance, and blended learning modes.

The system implements the following main functions:

- Creating and managing classes,
- Creating courses,
- Organizing student enrollment in courses,

- Providing access to educational materials for students,
- Publishing assignments for students,
- Assessing student assignments, administering tests, and tracking learning progress,
- Organizing interaction between participants in the educational process.

The system integrates with additional services, enabling such features as a work calendar, video communication, multi-user document editing, creating questionnaires, and an interactive whiteboard.

List of information technologies

- Checking homework and providing consultations via the electronic educational environment.
- Use of electronic presentations during practical training.
- A set of educational videos

7. ASSESSMENT TOOLKIT

The assessment toolkit ensures verification of the intended learning outcomes achievement (competency-based rubrics) using current, midterm and interim assessment of the course.

The link between developed competencies and their assessment is presented in the following table:

Competency	Achievement rubrics	Assessment activity (Syl 1)	Assessment activity (Syl 2)	Assessment activity (Syl 3)
OIIK-5	3-OIIK-5	PFE, T-8, T-15, T-2, T-6, T-8, T-12	PFE, T-10, T-15, T-9, T-13, T-14	Ex, T-10, T-15, T-2, T-10, T-11, T-14
	Y-OIIK-5	PFE, T-8, T-15, T-2, T-6, T-8, T-12	PFE, T-10, T-15, T-9, T-13, T-14	Ex, T-10, T-15, T-2, T-10, T-11, T-14
	B-OIIK-5	PFE, T-8, T-15, T-2, T-6, T-8, T-12	PFE, T-10, T-15, T-9, T-13, T-14	Ex, T-10, T-15, T-2, T-10, T-11, T-14

Educational achievement rubrics scales

The scale of each assessment activity varies from 0 to the maximum established point, inclusive. The final assessment of the course is performed on a 100-point scale and represents the sum of the points earned by the student in the section assessments, framework of current and interim assessment.

Sections and interim assessments are considered passed when the student achieves a minimum score equal to 60% of the maximum. The final grade is assigned only upon passing all sections and the interim assessment.

The final grade is assigned in accordance with the following scale:

Total score	Rating on a 4-point scale	Pass/fail examination	ECTS assessment
90-100	5 – « <i>excellent</i> »	« <i>pass</i> »	A
85-89	4 – « <i>good</i> »		B
75-84			C

70-74	3 – « <i>satisfactory</i> »		D
65-69			E
60-64			
below 60	2 – « <i>fail</i> »	« <i>fail</i> »	F

An “excellent” grade indicates a deep and solid mastery of the program material by a student who presents their answers consistently, clearly, and logically, is able to closely link theory with practice, and uses materials from monographic literature in their answers.

A “good” grade corresponds to a student’s solid knowledge of the material, who presents their answers competently and to the point, without any significant inaccuracies.

A “satisfactory” grade corresponds to the basic level of mastery of the material by the student, in which the main material has been mastered, but its details have not been assimilated, the answers contain inaccuracies, insufficiently correct wording and logical inconsistencies.

A grade “pass” corresponds to at least a basic level of mastery of the program material, in which the student possesses the necessary knowledge, skills, and abilities, and is able to apply theoretical principles to solve typical practical problems.

A grade “fail” is given to a student who lacks a significant understanding of the curriculum material, makes significant errors in their answers, or fails all required assignments. These students are generally unable to continue their studies without additional classes.

8. ACADEMIC COURSE EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT

CORE READING:

1. ЭИ Т89 Macro- and microscopic diagnosis in practical classes in pathological anatomy. Atlas : учебное пособие, Silina E. V., Shakirova A. Z., Tsyplakov D. E., Москва: ГЭОТАР-Медиа, 2023
2. ЭИ Р32 Pathological Anatomy : textbook : учебник, , Москва: ГЭОТАР-Медиа, 2022
3. ЭИ П42 Патологическая анатомия в вопросах и ответах : учебное пособие, Повзун С.А., Москва: ГЭОТАР-Медиа, 2016

FURTHER READING:

1. ЭИ З-17 Общая патологическая анатомия : практическое руководство, Мишутченко О.П. [и др.], Москва: ГЭОТАР-Медиа, 2013
2. ЭИ П 20 Патологическая анатомия : руководство к практическим занятиям, , Москва: ГЭОТАР-Медиа, 2015
3. ЭИ С 87 Патологическая анатомия : учебник, Струков А.И., Серов В.В., Москва: ГЭОТАР-Медиа, 2023

4. ЭИ П20 Патологическая анатомия. В 2 томах. Том 1. Общая патология : учебник, , Москва: ГЭОТАР-Медиа, 2020
5. ЭИ П 21 Патологическая анатомия. В 2 томах. Том 2. Частная патология : , , Москва: ГЭОТАР-Медиа, 2022
6. ЭИ П 20 Патологическая анатомия: атлас : Министерство образования и науки РФ
Рекомендовано ГОУ ВПО "Первый Московский государственный медицинский университет имени И.М. Сеченова" в качестве учебного пособия для студентов учреждений высшего профессионального образования, обучающихся по специальностям 060101.65 "Лечебное дело", 060103.65 "Педиатрия", 060105.65 "Медико-профилактическое дело", 060201.65 "Стоматология" по дисциплине "Патологическая анатомия", , Moscow: ГЭОТАР-Медиа, 2014
7. ЭИ К 57 Патология органов дыхания : учебное наглядное пособие, Соколова И.А. [и др.], Москва: Литтерра, 2013

SOFTWARE:

No special softwares is required

LMS AND ONLINE RESOURCES

<https://online.mephi.ru/>

<http://library.mephi.ru/>

9. LOGISTICAL SUPPORT

1. Персональный компьютер: Моноблок Lenovo V540-24IWL All-In-One 23,8" i3-8145U 8Gb 256GB_SSD_M.2 Intel (64-305)
2. Мышь, клавиатура (64-305)
3. Видеокамера Microsoft LifeCam Cinema HD (64-305)
4. Интерактивная доска SMART SBM 685 (64-305)
5. Проектор SMART P109 (64-305)
6. Мебель лабораторная, стулья, шкафы для хранения (64-305)
7. Мойка лабораторная (64-305)
8. Шкаф лабораторный вытяжной "Лабтех" ШВ202 (64-305)
9. Биноккулярные микроскопы "Микромед 2" (64-305)
10. Тринокулярный микроскоп "Микромед 3" (64-305)
11. Видеоокуляр TourCam 10,0 MP (64-305)
12. Биноккулярные микроскопы Levenhuk MED 10B (64-305)

13. Набор микропрепаратов по патологической анатомии (64-305)

14. Морфологическая лаборатория (64-205)

10. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR STUDENTS

Lecture:

Writing lecture notes: briefly, schematically, and consistently capture the main points, conclusions, formulations, and generalizations; highlight important ideas, and underline keywords and terms. Check terms and concepts using encyclopedias, dictionaries, and reference books, writing down definitions in your notebook. Identify questions, terms, and material that poses difficulties, mark them, and try to find the answer in the recommended literature. If you are unable to understand the material independently, formulate a question and ask the instructor during a consultation or practical lesson.

Independent Work:

Each student should prepare individually for the course topics by reading lecture notes and recommended literature. Independent work allows students to think in a calm environment, understand the information on the topic, and, if necessary, consult reference literature. Careful reading and reviewing of the material helps to fully grasp the topic's content and structure knowledge.

To ensure lasting retention of the subject's substantive information, it is advisable to study it in stages—topically and in strict sequence, as subsequent topics typically build on previous ones. Therefore, a large portion of independent work involves preparing for seminars, completing recommended problems, preparing for colloquiums, completing and defending individual homework assignments, and preparing for laboratory work. To successfully complete these tasks, each student has access to the teaching resources developed by the department.

Students are best advised to schedule the time for independent work necessary for studying this course throughout the semester, while also including regular review of the material covered. Material taken during lectures should be regularly supplemented with information from the literature presented in the course syllabus. For each independent study topic listed in the course syllabus, students should first read the recommended readings and, if necessary, create a brief summary of the key concepts, terms, and information that must be memorized and are fundamental to this topic and to subsequent sections of the course. To expand their knowledge of the course, it is recommended to use online resources.

When working independently, it is recommended to take notes on the material being studied (processed). These notes can be basic, containing only the main key points, but still sufficient to fully answer the question. These notes can be detailed. The length of the notes is determined by the student.

When working with educational/scientific literature, students are encouraged to take notes as they read, using a simple or detailed outline, create abstracts, and prepare summaries of what they have read. Such notes may earn additional points for active participation.

Laboratory Activities:

Review of the syllabus, paying particular attention to the goals and objectives, structure, and content of the course. Taking notes on sources. Working with lecture notes, preparing answers to test questions, reviewing recommended readings, and working with the textbook. Listening to audio and video recordings on a given topic, solving computational and graphic problems, solving algorithmic problems, etc.

Test:

Familiarization with primary and secondary literature, including reference works and foreign sources, and a summary of key concepts, terms, and information required for memorization and fundamental to the topic. Writing annotations for the literature read, etc.

Abstract:

Researching literature and compiling a bibliography, using 3 to 5 scientific papers, presenting the authors' opinions and your own judgment on the selected issue; outlining the main aspects of the problem. Familiarize yourself with the structure and format of an abstract.

Preparing for an Exam/Credit:

When preparing for an exam (credit), it is necessary to refer to lecture notes, recommended readings, etc.

11. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR TEACHERS

The course study process involves both contact work (lectures and practical classes) and independent work (self-study for practical classes, presentation preparation, preparation for solving case studies, and preparation for testing).

The main part of the course time is devoted to the theoretical analysis of the pathological anatomy program and the development of practical skills.

The main forms of organizing the educational process in this course are classical lectures and practical classes (using interactive learning technologies), as well as independent work by students. When studying this course (module), students must master practical skills in:

- ✓ using a microscope;
- ✓ identifying pathological processes at the microscopic level and identifying the affected tissue area;
- ✓ recognizing key structural changes and understanding the differences between normal and pathological conditions. During classes, the department promotes the development of teamwork, interpersonal communication, decision-making, and leadership skills in students (through interactive lectures, group discussions, role-playing games, training sessions, case studies, and simulations). The course (module) is taught as a course based on the results of the University's research, taking into account regional specifics of graduates' professional activities and employer needs.

Lectures:

Classical lecture. Recommended for all topics in the "Pathological Anatomy" module. Lectures cover the topics covered in the course curriculum, focusing on the most fundamental and complex issues within the course, and providing questions for independent study. Lecture notes serve as a basis for preparation for practical classes, exams, and independent study.

Lecture material is recommended to be presented in multimedia format. The lecture's focus shifts from presenting theoretical material to motivating independent learning through posing learning problems and demonstrating solutions to professional challenges within the context of a given topic. The primary lecture method is problem-based presentation.

Practical Classes:

Practical classes in this discipline are conducted with the aim of acquiring practical skills in the field of pathological anatomy.

Practical classes are conducted in the form of interviews, discussions, small-group discussions, demonstrations of microscope slides and the use of visual aids, practicing practical skills under microscopes, solving situational problems, completing tests, and analyzing clinical cases.

Students complete practical work both orally and in writing, through presentations and reports.

Practical classes promote a deeper understanding of the theoretical material of the academic discipline, as well as the development, formation, and establishment of various levels of professional competence in students. Independent Work:

Student independent work involves preparing for all sections of the "Pathological Anatomy" module and includes preparing for classes, writing essays, and preparing for ongoing assessments.

Working with textbooks is considered a type of academic work for the "Pathological Anatomy" module and is completed within the hours allocated for its study (in the Independent Work Section). Each student has access to the university and department library collections. During the course, students (under the instructor's supervision) independently work with a microscope, prepare descriptions of microscope slides, and present them in class.

Students' initial knowledge is determined through testing and interviews.

Ongoing assessment of course mastery is conducted through oral questioning during classes, typical case studies, quizzes, and essays.

At the end of the course (module), a midterm assessment is conducted using quizzes and practical skills assessments. Questions on this subject are included in the state final assessment of graduates.

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