

SYLLABUS

1. General information on the course

Full course name	Histology, Cytology and Embryology
Full official name of a higher education institution	Sumy State University
Full name of a structural unit	Academic and Research Medical Institute. Кафедра морфології
Author(s)	Kiptenko Liudmyla Ivanivna
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	12 ECTS, 360 hours. For full-time course 188 hours are working hours with the lecturer (8 hours of lectures, 180 hours of seminars), 172 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	There are no specific pre-requisites
Additional requirements	There are no specific requirements
Restrictions	There are no specific restrictions

3. Aims of the course

The aim of the discipline is for students to acquire modern constructive thinking and systems of specialized knowledge in the field of histology, cytology, and embryology, as well as achievements modern level of fundamental and clinical thinking. Get the basic principles of histological diagnostics.

4. Contents

Module 1. «Cytology»

Topic 1 History of development histology, cytology and embryology. Histological technique. The aim and tasks of cytology.

The emergence of histology, cytology and embryology as separate sciences. The value of the research of R. Hooke, A. Levenhuk, J. Purkinje, R. Brown, M. Schleiden, T. Schwann for the creation of cell theory. Cell theory is both the basis of biology and the basis for the development of embryology, histology, physiology. Systematization of information about the microscopic organization and development of cells, tissues, organs. The current state of development of histology, cytology and embryology, its achievements, problems, prospects. Relationship of histology with other sciences of medical and biological profile. Microscopic research methods in histology are as basic. Principles of manufacturing drugs for light and electron microscopy: obtaining material, fixation, dehydration, processing, embedding, sectioning on microtome and ultramicrotome. Types of histology specimens. The concept of different staining. Microscopy technique, the concept of resolution. Special methods of light microscopy. Transmission and scanning electron microscopy. The concept of histochemical, immunocytochemical and radioautographic methods. Vital research methods. The aim and tasks of cytology, its significance for medicine.

Topic 2 The structure of the cell.

The concept of the cell as an elementary living system. General morphology of the eukaryotic cell. Modern idea of the elementary biological membrane as the basis of the receptor-barrier-transport system of the cell (plasmalemma). Functions and structure of plasmalemma. The basic components of the cytoplasm - hyaloplasm, organelles, inclusions. Organelles - definitions, classifications. Organelles of the general importance. Organelles of the special importance. Inclusion - definition, classification. The value of the nucleus in the life of a eukaryotic cell. Shape, size, number of nuclei and nuclear-cytoplasmic ratio in different types of cells. The main components of the nucleus: nuclear envelope, chromatin, nucleolus, nuclear matrix. Nuclear envelope, its structural and functional organization: membranes, perinuclear sinternal space, nuclear pores. Chromatin, chemical composition. Chromatin as an interphase state of chromosomes, sex chromatin. The concept of euchromatin and heterochromatin. Levels of chromatin packing. Structure and function of chromosomes and cell division. Karyotype. The nucleolus, as a derivative of chromosomes. The structure of the nucleolus and its role in chromosome formation.

Topic 3 Cell reproduction. Aging and death of the cell.

Cell cycle, its periods. Types of cells that come out of the cell cycle. Methods of cell reproduction: mitosis, amitosis, endomitosis, meiosis. Intracellular regeneration, general morpho-functional characteristics, biological significance. Reactions of cells to the damaging effect. Reversible and irreversible cell changes. Their morphological manifestations. Adaptation of cells, its importance for preserving the life of cells in altered living conditions. Apoptosis and its biological and medical significance. Aging and cell death.

Topic 4 The test control of the Module I «Cytology».

The test and theoretical control of topics 1-3. Control of practical skills on topics 1-3.

Module 2. «Basic and comparative Embryology»

Topic 5 Bases of general embryology.

The aim and tasks of embryology, significance for medicine. Research methods. History of embryology. Theories of embryogenesis: preformism, epigenesis, neopreformism. The main stages of embryo development. The concept of biological processes underlying the development of the embryo: induction, determination, division, cell migration, growth, differentiation, cell interaction. Germ cells. Types of oocytes. Fertilization, phases, its biological significance. Zygote as a unicellular organism. Cleavage, its definition. Methods of cleavage in different classes of vertebrates. Cleavage of the human embryo, chronology of the process. Types of blastulas. Morula. Formation of blastocoele. Embryoblast and trophoblast. Gastrulation, its definition. Methods of the first phase of gastrulation in different classes of vertebrates. Features of gastrulation in humans. Structures formed as a result of the first phase of gastrulation. Epiblast and hypoblast. Presumptive rudiments at the stage of primary strip formation. The second phase of gastrulation in humans. Formation of embryonic mesoderm. Neurulation and formation of the axial complex of organs. Differentiation of embryonic layers and their derivatives.

Topic 6 Extraembryonic (provisional) organs.

Provisional organs in different classes of vertebrates. Provisional organs in humans: chorion, amnion, yolk sac, allantois, umbilical cord. Their structure and significance. Types of placentas in different classes of vertebrates, their structure. Human placenta, its development, structure and functions. Changes in the endometrium during pregnancy, amniotic tunics. The mother-fetus system. The concept of critical periods of embryogenesis and ontogenesis. The concept of in vitro fertilization, its medical and social significance.

Topic 7 The test control of the Module II «Basic and comparative Embryology».

The test and theoretical control of topics 5-6. Control of practical skills on topics 5-6.

Module 3. «General Histology»

Topic 8 Basic principles of organization of tissues. Epithelium tissues.

The definition of "tissue". Classification of tissue types. The concept of determination and differentiation of tissues, their molecular genetic bases. Physiological, reparative regeneration and metaplasia of various types of tissues. General morphofunctional characteristics of epithelial tissue. Cytokeratines as markers of different types of epithelial tissues. Genetic and morphofunctional classification of epithelial tissues. The structure, function and localization of simple epithelium. The structure of stratified epithelium. Physiological and reparative regeneration of epithelial tissues. The structure and classification of the glandular epithelium. Morphology of the secretory cycle. Types of glandular secretion.

Topic 9 Internal environment tissues.

General morphofunctional characteristics of internal environment tissues. General characteristics of blood and its components as one of the types of tissues of the internal environment. Blood plasma, its composition and function. Formed blood elements, their classification. Leukocyte formula and hemogram, features in newborns and children of different ages. Lymph, its composition and function. Hemocytopoiesis. The modern scheme of hematopoiesis. Postembryonic and embryonic hemocytopoiesis, its features. Loose connective tissue, its localization, classification, structure and functions. General characteristics of loose fibrous connective tissue, its cellular composition. The chemical composition and function of the extracellular substance. The structure and functions of fibers. The structure and functions of dense connective tissue. Location, structure and functions of the regular and irregular dense connective tissue. The structure of the tendon. Characterization of connective tissue with special properties. Cartilage tissues. The general plan of the structure of cartilage tissue. Histogenesis of cartilage. General characteristics of bone tissue. The structure of the bone as an organ. Development of bones.

Topic 10 Specialized connective tissue. Muscles tissues. Nervous tissue.

General morphological characteristics and classification of muscles tissues. Skeletal muscle tissue. The contractile apparatus of skeletal muscle tissue. Smooth muscle tissue, localization, structure and functional features. Morphological and functional characteristics of the nervous tissue. Histogenesis of nerve tissue. Morphological and functional classification of neurons. General and special organelles of neurons. The functional value of the processes of nerve cells. Neuroglia. Characterization and classification. Macrogia, its function and localization. Characterization of microglia, function and localization. Nerve fibers and nerve endings, their microscopic structure. Regeneration of nerve tissue. Receptor and effector nerve endings, their classification. Synapses, their classification. Mechanisms of transmission of a nerve impulse. The structure of simple and complex reflex arcs.

Topic 11 The test control of the Module III «General Histology».

The test and theoretical control of topics 8-10. Control of practical skills on topics 8-10.

Module 4. «Special Histology of regulatory and sensory systems»

Topic 12 Nervous system.

General characteristics of the nervous system. Embryogenesis of the nervous system. Characteristic of the somatic and autonomic parts of nervous systems. Characteristic of the sympathetic and parasympathetic nervous system. Peripheral nervous system. The main tissue elements of the dorsal root ganglion. The spinal cord. Gray and white matter. The structure of the peripheral nerve. Brain and cerebellar cortexes. The concept of associative, projective and commissural fibers. Cytoarchitectonics of the cerebral cortex. Characteristics of the brain stem. Afferent and efferent connections of the cerebellum. Neural composition and layers of the cerebellar cortex.

Topic 13 Sense organs.

The concept of sensory organs and analyzers. Classification of the sense organs. General characteristics of the organ of vision. The tunics of the eyeball. Functional apparatus of the eye. The structure of the fibrous tunic of the eyeball. The structure of the vascular tunic. The structure and functions of the lens and vitreous body. The retina and its structural components. Adaptive retinal changes in lighting and in the dark. The structure of the yellow and blind spots of the retina. Optic nerve. Hematoophthalmic barrier. Auxiliary apparatus of the eye. Age changes. General characteristics of the auditory and vestibular organs. Structural elements of the outer, middle ears and their functional significances. The inner ear. The general plan of the structure of cochlea and cochlea canals. The structure of the organ of Corti. The vestibular part of the membranous labyrinth. The structure of the macula of the saccule and the utricle and their functional significance. Histophysiology of the auditory organ. Age-related changes in the auditory organ.

Topic 14 Cardiovascular system.

General morphofunctional characteristics of the cardiovascular system. Embryogenesis of the cardiovascular system. Dependence of the structure of blood and lymphatic vessels on hemodynamic conditions. Morphofunctional characteristics of arteries and their classification. Morphofunctional characteristics of veins and their classification. General characteristics of the lymphatic vessels. Morphofunctional characteristics of blood vessels of the microvasculature. The structure of the main lymphatic trunks. Features of the structural organization of the venous and arterial links of the microvasculature. Arterio-venular anastomoses, general characteristic. General characteristics and structure of the heart. Heart development. The structure and functions of the myocardium. The structure and function of contractile, conductive and secretory cardiomyocytes. Possibilities of myocardial regeneration. Newborn heart. Restructuring, development and age changes hearts.

Topic 15 Organs of hematopoiesis and immune defense.

General characteristics and classification of organs of hematopoiesis and immune defense. Red bone marrow. The interaction of hematopoietic, stromal and vascular components of the red bone marrow. Age-related changes in red bone marrow. Regeneration of the red bone marrow. Yellow bone marrow. General characteristics of the thymus as a central organ of lymphocytopoiesis and immunogenesis. The blood-thymus barrier. Development and age-related changes in the thymus. Accidental involution of the thymus and its regeneration. General characteristics and functional significance of the lymph nodes. The cortex of the lymph nodes. Medulla and paracortical zone. General plan of the structure and functional significance of the spleen. The structure, cellular composition and significance of the white pulp and red of the spleen. Blood supply in the spleen. The concept of the immune system. Definition of term "antigens" and "antibody". Characterization of immunocompetent cells. Cellular immunity. Humoral immunity. Antigen-dependent proliferation and differentiation of lymphocytes. Intercellular interactions in providing immune defense.

Topic 16 Endocrine system.

Morphofunctional characteristic. Classification of the organs of the endocrine system. The concept of hormones, their types, place of action (target cells). Classification of the endocrine glands. The hypothalamus. The structure and function of the neurosecretory cells of the hypothalamus. General characteristics of the pituitary gland. Hypothalamus-adenohypophysis and hypothalamus-neurohypophysis systems, their role. Blood supply connection of the hypothalamus and adenohypophysis. Age-related changes. Epiphysis. Hormones of the pineal gland, their effect. Thyroid gland. The structure of the thyroid gland, tissue and cell composition, structural and functional unit. Phase of production in secretory cycle of thyrocytes. Parafollicular cells, their role. Parathyroid glands, general characteristic. Tissue and cell composition of the parathyroid glands. Hormone of the parathyroid glands and its participation in the regulation of calcium homeostasis. General morphofunctional characteristics of the adrenal glands. The structure of the adrenal cortex. Regulation of the secretory function of cells of the adrenal gland cortex. The structure of the adrenal medulla, the cellular composition. The role of adrenal hormones.

Topic 17 The test control of the Module IV «Special Histology of regulatory and sensory systems».

The test and theoretical control of topics 12-16. Control of practical skills on topics 12-16.

Module 5. «Special Histology and embryology of the digestive system»

Topic 18 Oral cavity organs

General morphofunctional characteristics. Embryogenesis of the digestive system organs. Division into sections according to development, structure, and functions. Classification of internal organs: tubular and parenchymal. General structure of the wall of tubular organs. Characteristics of membranes, their tissue composition and features in different areas of the digestive tract. Oral cavity. Features of the structure of the oral cavity organs. Structural mechanisms of the development of malformations of the oral cavity and its derivatives. Morphogenesis of the tooth. Anomalies and variants of tooth development. Tooth tissues: enamel, dentin, cementum. Tooth pulp, structure and function of the periodontium, periodontium. Timing of permanent tooth eruption. Deciduous teeth: formula, structural features, timing of eruption. General plan of the structure of the major salivary glands. Structure and types of terminal secretory divisions. Structure and functions of the excretory duct system (striated, interlobular, and common ducts). Morphofunctional characteristics of the parotid, submandibular, and sublingual salivary glands. Embryogenesis and regeneration of the salivary glands.

Topic 19 Digestive system organs.

Features of the structure of the pharynx and esophagus. Features of the structure of the esophageal wall in different sections. Structure of the stomach. Gastric glands, their histophysiology. Features of the structure of the small and large intestines. The crypt-villus system. Features of the structure of the duodenum. Microscopic and ultramicroscopic structure of the endocrine and exocrine sections of the pancreas. Hormones and their significance. Liver. Embryogenesis, functional and morphological characteristics. Features of blood supply. Gallbladder and bile ducts. Age-related changes.

Topic 20 Modular control of the content module “Special histology and embryology of the digestive system.”

Testing on questions from the database Step 1, the test and theoretical control of topics 18-19.
Control of practical skills on topics 18-19.

Module 6. «Special Histology and embryology of internal organs»

Topic 21 Respiratory system.

Morphofunctional characteristics. Respirator and unrespirator functions, respiratory ways. Sources of development. General plan of structure of wall of respiratory ways. Characterization of the membranes of respiratory ways. Characteristics of respiratory epithelial cells (ciliated cells, goblet, basal, high plug-in, Clara cells, endocrinocytes, dendritic cells). The concept of broncho-associated lymphoid tissue, its significance for the body. The sense of smell. General characteristics. Embryogenesis. Localization. Characterization of the olfactory region. Histophysiology of the organ of smell. The structure and function of the acinus. The structure of the alveoli of the lungs. Surfactant alveolar complex. The development of the respiratory system. The air-blood barrier. Characterization of the pleura. Age - dependent changes.

Topic 22 Skin. Derivatives skin.

Skin functions and its significance. The tissue composition of the skin. Regeneration. Epidermis. Its layers, features of the structure of "thick" and "thin" skin. Keratinocytes. Processes keratinization in the epidermis. Tactile epitheliocytes. Dermis. Papillary and reticular layers. Features of the structure of the dermis in different areas of the skin. Derivatives skin. Histophysiology of sweat and sebaceous glands. The structure and physiological significance of hair. The structure, function and growth of nails. Age and gender features of the skin.

Topic 23 Urinary system.

General plan of organization of the urinary system. Embryogenesis. Sources and basic stages of development. Age - dependent changes. Kidney. The general plan of the structure. Endocrine apparatus of the kidney. General characteristics of nephrons. Features of blood supply of the kidneys. Features of blood supply of the juxtamedular nephrons. Characterization of the mucous membrane of the urinary tract. The structure of the muscular and external membranes of the urinary organs. Bladder. Age-related changes in bladder.

Topic 24 Reproductive system.

The general plan of the structure of the male reproductive system. Embryogenesis of the male reproductive system. Testis. Structure. Embryonic and post-embryonic histogenesis. Functions. Spermatogenesis. Concept of a hematotesticular barrier. Variants and anomalies of development of male genitals. Female reproductive organs. Ovaries. Ovogenesis. Changes during the ovarian-menstrual cycle, their hormonal regulation. The value of atretic follicles for the functioning of the female reproductive system. Oviducts and vagina. The mammary gland. Development, structure and functions. Hormonal regulation of the mammary gland.

Topic 25 The test control of the Module V «Special Histology and Embryology of internal organs».

Testing on questions from the database Step 1, the test and theoretical control of topics 21-24.
Control of practical skills on topics 21-24.

Topic 26 Completing test tasks. Completing test tasks.
Topic 27 Examination. Conducting the examination 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	Use the acquired knowledge for further study of physiology, pathological anatomy, and pathological physiology, propaedeutics of clinical disciplines, which involves the integration of teaching with these disciplines and the formation of skills to apply knowledge of histology, cytology, and embryology in the process of further training and solving professional tasks.
LO2	Use histological knowledge of the structure of organs and organ systems to identify pathological changes in the body.
LO3	Be able to apply histological methods of laboratory research to understand the manifestations of the disease. Be able to interpret the results of the examination, taking into account the patient's age.
LO4	Be able to prepare microscope slides, diagnose various types of tissues on microscope slides, recognize them by the presence of structural and functional elements, and establish pathology under the supervision of a supervisor.
LO5	Analyze histological preparations for differential diagnosis of cells, tissues, and organs.
LO6	Identify the stages of embryo development and the processes that occur with the embryo at different stages of physiological pregnancy.
LO7	Be able to work with professional literature, analyze and use the information obtained in terms of its practical application in the therapeutic, diagnostic, and preventive activities of a physician.

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

Programme learning outcomes achieved by the course.

For I2 Medicine:

PO2	Understanding and knowledge of fundamental and clinical biomedical sciences at a level sufficient to solve professional problems in the field of healthcare.
PO4	Identify and distinguish the leading clinical symptoms and syndromes (according to list 1); using standard methods, preliminary patient history data, patient examination data, and knowledge about the human body, its organs, and systems, establish a preliminary clinical diagnosis of the disease (according to list 2).
PO5	Collect complaints, medical history, and medical history, assess the patient's psychomotor and physical development, the condition of organs and body systems, and, based on the results of laboratory and instrumental studies, evaluate information regarding the diagnosis (according to list 4), taking into account the patient's age.

PO6	Establish a final clinical diagnosis by making an informed decision and analyzing the subjective and objective data obtained from clinical and additional examinations, conducting differential diagnostics, complying with relevant ethical and legal standards, under the supervision of a supervising physician in a healthcare facility (according to list 2).
PO7	Prescribe and analyze additional (mandatory and optional) examination methods (laboratory, functional, and/or instrumental) (according to list 4) for patients with diseases of organs and body systems for the purpose of differential diagnosis of diseases (according to list 2).
PO11	Determine the approach, plan, and tactics for managing physiological pregnancy, physiological childbirth, and the postpartum period by making informed decisions based on existing algorithms and standard protocols.
PO21	Find the necessary information in professional literature and databases of other sources, analyze, evaluate, and apply this information.

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

Program competencies addressed by the course:

For I2 Medicine:

PC1	GC 2. Ability to learn, master modern knowledge.
PC2	GC 4. Knowledge and understanding of the subject area and professional activity comprehension.
PC3	GC 10. Ability to use information and communication technologies.
PC4	GC 11. Ability to search, process and analyze information from various sources.

8. Teaching and learning activities

Topic 1. History of development histology, cytology and embryology. Histological technique. The aim and tasks of cytology.

pr.tr.1 "History of development histology, cytology and embryology. Histological technique. The aim and tasks of cytology." (full-time course)

The emergence of histology, cytology and embryology as separate sciences. The value of the research of R. Hooke, A. Levenguk, J. Purkinje, R. Brown, M. Schleiden, T. Schwann for the creation of cell theory. Cell theory is both the basis of biology and the basis for the development of embryology, histology, physiology. Systematization of information about the microscopic organization and development of cells, tissues, organs. The current state of development of histology, cytology and embryology, its achievements, problems, prospects. Relationship of histology with other sciences of medical and biological profile. Microscopic research methods in histology are as basic. Principles of manufacturing drugs for light and electron microscopy: obtaining material, fixation, dehydration, processing, embedding, sectioning on microtome and ultramicrotome. Types of histology specimens. The concept of different staining. Microscopy technique, the concept of resolution. Special methods of light microscopy. Transmission and scanning electron microscopy. The concept of histochemical, immunocytochemical and radioautographic methods. Vital research methods. Acquaintance with the scientific laboratories of the department and the principles of their work. Watching scientific films with their further discussion. Computer testing in a computer class.

Topic 2. The structure of the cell.

pr.tr.2 "General morphology of the cell. Plasmalemma. Noncellular structure of organism." (full-time course)

The concept of the cell as an elementary living system. General morphology of the eukaryotic cell. Modern idea of the elementary biological membrane as the basis of the receptor-barrier-transport system of the cell (plasmalemma). Membrane proteins and glycocalyx. Their importance for the cell's life. The structure and functions of the cytoskeleton (submembrane complex). The principle of the structure of non-cellular structures. Characteristic of complementary and opposite functions of the plasmalemma. Mechanisms for the entry of molecules into the cell. Mechanisms for removing substances from the cell. Types of secretion. Cell junctions. The characteristic of synapse. Characteristic of gap and tight junctions. Characterization of desmosomes and semi-desmosomes. The study of this topic involves theoretical and practical work in the class room, the study of histology specimen: "The general structure of the cell. Symplast (skeletal muscles). Intercellular substance (elastic cartilage)" using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of multimedia. Computer testing in a computer class.

pr.tr.3 "Cytoplasm of the cell: hyaloplasm, organelles of the general importance." (full-time course)

Main components of the cytoplasm - hyaloplasm, organelles, inclusions. Hyaloplasm - definition. Cytosol and cytomatrix, physicochemical properties, chemical composition, role in cellular metabolism. Organelles – definition, classification. Organelles of the general importance (endoplasmic reticulum, golgi complex, lysosome, peroxisomes, mitochondria). Nonmembranous organelles (ribosomes, centrosome). The study of this topic involves theoretical and practical work in the class room, the study of histology specimen (Golgi complex in nerve cells, mitochondria in kidney cells) using light microscopes and electronograms. Computer testing in a computer class.

pr.tr.4 "Cytoplasm of the cell: organelles of special importance. Inclusion." (full-time course)

Organelles of the special importance. (microfilaments, microtubules, cilia and flagella). Cytoskeleton, structure and functional. Inclusion of cytoplasm, their classification and value. The study of this topic involves theoretical and practical work in the class room, the study of histology specimen (inclusion of glycogen, pigment inclusions, fatty inclusions, ciliated epithelium) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.5 "Cell nucleus." (full-time course)

The value of the nucleus in the life of a eukaryotic cell. Shape, size, number of nuclei and nuclear-cytoplasmic ratio in different types of cells. The main components of the nucleus: nuclear envelope, chromatin, nucleolus, nuclear matrix. Nuclear envelope, its structural and functional organization: membranes, perinuclear sinterial space, nuclear pores. Chromatin, chemical composition. Chromatin as an interphase state of chromosomes, sex chromatin. The concept of euchromatin and heterochromatin. Levels of chromatin packing. Structure and function of chromosomes and cell division. Karyotype. The nucleolus, as a derivative of chromosomes. The structure of the nucleolus and its role in chromosome formation. The study of this topic involves theoretical and practical work in the class room, the study of histology specimen (a cell with a round nucleus, a cell with an elongated nucleus, a segmental nucleus neutrophil) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

Topic 3. Cell reproduction. Aging and death of the cell.

pr.tr.6 "Cell reproduction. Meiosis." (full-time course)

The cell cycle and its phases. Types of cells that exit the cell cycle. Characteristics of cells in the G phase. Methods of cell reproduction. Meiosis (characteristics of phases). The study of this topic involves theoretical and practical work in the classroom, watching films demonstrating the cell cycle, and studying micro-preparations using light microscopes and electron micrographs, computer testing.

pr.tr.7 "Mitosis. Aging and cell death." (full-time course)

Mitosis (characteristics of phases). Cell responses to damaging effects, general morphofunctional characteristics, biological significance. Types of cell aging and death. Reversible and irreversible cell changes, their morphological manifestations. Intracellular regeneration. Cell adaptation, its importance for preserving cell life in changed conditions of existence. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing educational films demonstrating types of cell aging and death) followed by discussion, and the study of micro-preparations (mitosis and amitosis) using light microscopes and electron micrographs. The preparations are demonstrated using multimedia equipment. Computer testing.

Topic 4. The test control of the Module I «Cytology».

pr.tr.8 "The test control of the Module I «Cytology»." (full-time course)

The test and theoretical control of topics 1-3.

pr.tr.9 "The test control of the Module I «Cytology»." (full-time course)

Control of practical skills on topics 1-3.

Topic 5. Bases of general embryology.

pr.tr.10 "Germ cells. Fertilization." (full-time course)

The aim and tasks of embryology, significance for medicine. Research methods. History of embryology. Theories of embryogenesis: preformism, epigenesis, neopreformism. The main stages of embryo development. The concept of biological processes underlying the development of the embryo: induction, determination, division, cell migration, growth, differentiation, cell interaction. Germ cells. Types of oocytes. Fertilization, phases, its biological significance. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (ovum, spermatozoon, syncytion) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.11 "Cleavage. Implantation." (full-time course)

Zygote as a unicellular organism. Cleavage, its definition. Methods of cleavage in different classes of vertebrates. Cleavage of the human embryo, chronology of the process. Types of blastulas. Morula. The formation of blastocysts and derivatives of tropho- and embryoblast. General characteristics of the implantation process. Characterization of implantation phases. Studying the topic involves theoretical and practical work in the class room, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (cleavage, amphiblastula) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.12 "Types of gastrulation. Early gastrulation." (full-time course)

Gastrulation, definition. Methods of the first phase of gastrulation in different classes of vertebrates. Features of gastrulation in humans. Demonstration of films followed by discussion (structures formed as a result of the first phase of gastrulation, epiblast and hypoblast, presumptive rudiments at the stage of primary streak formation, The study of this topic involves theoretical and practical work in the classroom, the study of micro-preparations (primary streak, formation of axial organ primordia) using light microscopes. The demonstration of preparations is carried out using multimedia equipment. Computer testing in the computer classroom.

pr.tr.13 "Late stage of gastrulation. Histogenesis and organogenesis." (full-time course)

This topic includes the study of the second phase of gastrulation in humans, the formation of the embryonic mesoderm, neurulation and the formation of the axial complex of organs, the differentiation of embryonic layers and their derivatives. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films) followed by discussion, and the study of micro-preparations (late stage of gastrulation) using light microscopes. The preparations are demonstrated using multimedia equipment. Computer testing in the computer classroom.

Topic 6. Extraembryonic (provisional) organs.

pr.tr.14 "Provisional organs." (full-time course)

Provisional organs in different classes of vertebrates. Provisional organs in humans: chorion, amnion, yolk sac, allantois. Their structure and significance. Demonstration of the scientific film with further discussion: Human provisor organs: chorion (formation and structure of primary, secondary and final villi), ammonium, yolk sac, allantois, umbilical cord. Their structure and meaning. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (ammonium, allantois, chorion villi) using light microscopes. Demonstration of drugs is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.15 "Placenta. Basic patterns of embryogenesis." (full-time course)

Types of placentas in different classes of vertebrates and their structure. Screening of a scientific film followed by discussion: The human placenta (fetal part, maternal part), its development, structure, and functions. Changes in the endometrium during pregnancy, fetal membranes. The "mother-fetus" system. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films), demonstrations followed by discussion, and the study of micro-preparations (maternal part of the placenta, fetal part of the placenta, umbilical cord) using light microscopes. The demonstration of preparations is carried out using multimedia equipment. Computer testing in the computer classroom.

pr.tr.16 "Developmental disorders. Critical periods of human development." (full-time course)

Дана тема ознайомлює студентів з різними вадами розвитку ембріона та їх причинами. Дає поняття про критичні періоди ембріогенезу та онтогенезу, про екстракорпоральне запліднення, його медичне та соціальне значення. Вивчення теми передбачає теоретичну та практичну роботу в навчальній кімнаті, застосування віртуальної симуляції (перегляд фільмів), методу демонстрацій з подальшим обговоренням; презентації докладів студентів. Демонстрація презентацій проводиться за допомогою мультимедійної установки.

Topic 7. The test control of the Module II «Basic and comparative Embryology».

pr.tr.17 "The test control of the Module II «Basic and comparative Embryology»." (full-time course)

The test and theoretical control of topics 5-6.

pr.tr.18 "The test control of the Module II «Basic and comparative Embryology»." (full-time course)

Control of practical skills on topics 5-6.

Topic 8. Basic principles of organization of tissues. Epithelium tissues.

lect.1 "Introduction to the doctrine of fabrics. General principles of tissue organization. Epithelial tissues." (full-time course)

The concept of fabrics. Basic principles of organization and classification of fabrics. Formation of tissues on the basis of differentiation of embryonic conception cells. Determination and differentiation of cells, their molecular genetic basis. Histogenetic series. Types of physiological regeneration. Concept of reparative regeneration and metaplasia. Epithelial tissues. Organization of epithelial layer. Genetic and morphofunctional classification of epithelial tissues. General characteristics of epithelial tissue (topography, basic morphofunctional features, function and sources of development). The structure of the glandular epithelium. Types of glandular secretion. Teaching is carried out in the form of multimedia interactive lectures.

pr.tr.19 "Basic knowledge of tissues. Simple epithelium." (full-time course)

The concept of fabrics. Basic principles of organization and classification of fabrics. Formation of tissues on the basis of differentiation of embryonic conception cells. Determination and differentiation of cells, their molecular genetic basis. Histogenetic series (differentons). Types of physiological regeneration. Concept of reparative regeneration and metaplasia. Epithelial tissues. General morphofunctional characteristics of the epithelium. Organization of epithelial layer. Cytokeratons as markers of different types of epithelial tissues. Modern ideas about the structure, origin and function of the basal membrane. Epithelium nutrition. Genetic and morphofunctional classification of epithelial tissues. Characteristics of the single-layer epithelium. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies) method of demonstrations with further discussion; study of histology specimens (simple squamous epithelium, simple cubic epithelium, simple columnar) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.20 "Multilayered epithelium." (full-time course)

Structural and functional organization of various types of multilayered epithelium (multilayered squamous keratinized, multilayered squamous non-keratinized, transitional), their structural features and localization in the body. Characteristics of the process of keratinization and formation of horny scales. Features of the nutrition of multilayered epithelia. Introduction to the physiological and reparative regeneration of epithelial tissues. The study of this topic involves theoretical and practical work in the classroom, the study of micro-preparations (multilayered squamous non-keratinized epithelium - finger skin, multilayered squamous keratinized epithelium - cornea of the eye, transitional epithelium - urinary bladder) using light microscopes and electron micrographs. The specimens are demonstrated using multimedia equipment. Computer testing in the computer class.

pr.tr.21 "Glandular epithelium. Types of secretion." (full-time course)

Glandular epithelium. Structure and classification of glands (endocrine and exocrine). Characteristics of the secretory compartments and excretory ducts of exocrine glands, their classification. Characteristics of the phases of the secretory cycle, types of secretions. Types of secretion (merocrine, apocrine, holocrine). The study of this topic involves theoretical and practical work in the classroom, studying diagrams, microscope slides (apocrine type of secretion) using light microscopes, and tables. The slides are demonstrated using multimedia equipment. Computer testing in the computer Glandular epithelium. Structure and classification of glands (endocrine and exocrine). Characteristics of the secretory compartments and excretory ducts of exocrine glands, their classification. Characteristics of the phases of the secretory cycle, types of secretions. Types of secretion (merocrine, apocrine, holocrine). The study of this topic involves theoretical and practical work in the classroom, studying diagrams, microscope slides (apocrine type of secretion) using light microscopes, and tables. The slides are demonstrated using multimedia equipment. Computer testing in the computer class.

Topic 9. Internal environment tissues.

lect.2 "Internal environment tissues. Blood and lymph. Connective tissues." (full-time course)

Common morphofunctional signs of tissues of the internal environment. Origin. Classification of tissues of the internal environment. Blood as a tissue, its components, functions. Blood plasma, its composition and meaning. Molded blood elements, their functional morphology, quantitative characteristics. Hemogram and leukocytic formula, their features in newborns and children of all ages. Loose connective tissue (LCT), localization, components, functions. Cellular composition of (LCT), their origin and functional morphology. Intercellular substance (LCT), structural, functional and molecular organization of amorphous and fibrous components. Dense connective tissues, their varieties - irregular and regular. Localization, structure and functions. Teaching is carried out in the form of multimedia interactive lectures.

pr.tr.22 "Connective tissue. Blood." (full-time course)

General morphofunctional characteristics of internal environment tissues. Origin. Classification of internal environment tissues. Blood as a tissue, its components, functions. Blood plasma, its composition and significance. Formed elements of blood, their functional morphology, quantitative characteristics. Erythrocytes, their structural features, types. Characteristics of poikilocytosis and anisocytosis. Types of hemoglobin, their significance. Leukocytes, characteristics of granulocytes (neutrophils, eosinophils, basophils), their structure and functions. The study of this topic involves theoretical and practical work in the classroom, consideration of situational problems, and the study of micro-preparations (human blood, frog blood) using light microscopes and electron micrographs. The preparations are demonstrated using multimedia equipment. The study of this topic involves solving a practical task. Computer testing in the computer class.

pr.tr.23 "Leukocytes (agranulocytes). Lymph." (full-time course)

Leukocytes, characteristics of agranulocytes (lymphocytes, monocytes), their structure. Classification of lymphocytes. The importance of T-killers, T-suppressors, T-helpers, T-memory cells, B-lymphocytes. Hemogram and leukocyte formula, their characteristics in newborns and children of different ages. Lymph, main functions, composition. The study of this topic involves theoretical and practical work in the classroom, consideration of situational problems, and the study of micro-preparations (human blood, frog blood) using light microscopes and electron microscopes. The preparations are demonstrated using multimedia equipment. The study of the topic involves solving a practical task. Computer testing in the computer class.

pr.tr.24 "Hematopoiesis." (full-time course)

Hemopoiesis and lymphopoiesis. Postnatal hemopoiesis as physiological regeneration of blood. Myeloid and lymphoid tissue. Modern theory of hematopoiesis. Stem hematopoietic cell, its properties. Stem hematopoietic cell, its properties. Semi-stem cells. The concept of colony-forming units. Precursor cells, maturing and mature blood forms. Demonstration of the scientific film with further discussion: Histogenetic series: erythropoiesis, granulocytosis, monocytopoiesis, lymphoposis. Embryonal hemopoiesis (development of blood as tissue), its stages. The study of this topic involves theoretical and practical work in the class room, the study of histology specimens (red bone marrow) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.25 "Loose fibrous connective tissue. Cellular composition." (full-time course)

General morphofunctional characteristics, classification. Fibrous connective tissues, their types - loose and dense. Loose fibrous connective tissue (LFCT), localization, components, functions. Cellular composition of LFC (fibroblasts, macrophages, plasma cells, tissue basophils, lipocytes, pigment and adventitial cells), their origin and functional morphology. The body's macrophage system. Interaction between blood cells and connective tissue during inflammation. The study of this topic involves theoretical and practical work in the classroom, consideration of situational problems, and the study of a micro-preparation (loose fibrous connective tissue) using light microscopes and electron micrographs. The preparation is demonstrated using multimedia equipment. The study of this topic involves solving a practical task. Computer testing in the computer class.

pr.tr.26 "Loose fibrous connective tissue. Structure of fibers and amorphous substance." (full-time course)

Intercellular substance PVST, structural and functional and molecular organization of amorphous and fibrous components. Characteristics of collagen fibers, their structure, types, disorders in the body caused by defects in collagen synthesis. Elastic and reticular fibers, structural features and their localization in the body. Ground substance, chemical composition. Significance of the components of the ground substance. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing a scientific film) followed by discussion, consideration of situational problems, and the study of a micro-preparation (loose fibrous connective tissue) using light microscopes and electron micrographs. The preparation is demonstrated using multimedia equipment. Computer testing in the computer class.

pr.tr.27 "Dense connective tissue. Connective tissue with special properties." (full-time course)

Dense connective tissues, their varieties - irregular and regular. Localization, structure and functions. The structure of the tendon. Characterization of connective tissue with special properties (reticular, adipose (white, brown), mucous, pigment), localization, components, functions. Studying the topic involves theoretical and practical work in the class room, the use of virtual simulation (watching movies), method of demonstrations with further discussion; study of histology specimens (tendons in the transverse section, tendons in the longitudinal section, pigment tissue, reticular tissue, adipose tissue) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.28 "Cartilagenous tissue." (full-time course)

General plan of structure and function. Cellular elements (chondrobrasti, chondrocytes), isogenic groups of cells. Intercellular substance of cartilage tissue, structural-functional and molecular organization of amorphous and fierminous components. Cartilage as an organ. Types of cartilage: hyaline, elastic and fibro. Regeneration and age-related changes in cartilage tissue. Histogenesis of cartilage tissue. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), method of demonstrations with further discussion; consideration of situational problems, study of histology specimens (hyaline cartilage, elastic cartilage, fibrocartilage) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.29 "Structure of osseous tissue." (full-time course)

General plan of structure and function. Varieties of bone cells: osteoblasts, osteocytes, osteoclasts. Intercellular substance, its composition (fiber and amorphous component). Types of bone tissue. Bone as an organ. Perseverance, its role in the structure, nourishing, fasting and regeneration of bone. Osteon is a structural and functional unit of plate bone tissue. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, the study of (bone in the transverse, bone in the longitudinal section) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.30 "Histogenesis, regeneration and aging changes of osseous tissues." (full-time course)

Histogenesis of bone tissue. Demonstration of the scientific film with further discussion: intramembranous and endochondral ossification, bone remodeling in the body. Factors affecting bone growth. Bone connection. Classification. Studying the topic involves theoretical and practical work in the class room, the use of virtual simulation (watching movies), method of demonstrations with further discussion; study of histology specimens (intramembranous and endochondral ossification) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

Topic 10. Specialized connective tissue. Muscles tissues. Nervous tissue.

lect.3 "Muscles tissues." (full-time course)

General morphofunctional characteristics of muscle tissue, genetic and morphological classification. Histogenesis, structure, morphofic and histochemical characteristics of skeletal and smooth muscles. Morphological bases of contraction of skeletal and smooth muscles. Regeneration of muscle tissue. Teaching is carried out in the form of multimedia interactive lectures.

lect.4 "Nervous tissue. Nervous system." (full-time course)

General morphofic characteristics of nerve tissue. Histogenesis. Neurons, general structure plan, morphological and functional classification. The concept of neurotransmitters. The structure of the synapse. Neuroglia. General characteristics, main varieties. Nerve fibers, varieties (myelin and unmyelin), their microscopic and ultramicroscopic structure. Nerve endings. Peripheral nervous system. Sensitive nerve nodes (spinal cord and cranial). Sources of development. Fabric composition. Spinal cord. General morphofunctional characteristic. Central nervous system. Gray and white matter. Brain. The concept of cyto- and myeloarchitectonic of the cerebral cortex. Cerebellum. Structure and functions. Teaching is carried out in the form of multimedia interactive lectures.

pr.tr.31 "Transverse-striated skeletal muscle tissue." (full-time course)

General morphofunctional characteristics of muscle tissue, genetic and morphological classification. Smooth muscle tissue (somatic type). Localization, histogenesis, functional features. Muscular fiber as a structural and functional unit, microscopic, ultrastructural (structure of actin and myosin), molecular organization. Morphological bases of contraction of skeletal muscles. Types of muscle fibers. Muscle as an organ. Endomysium, perimysium, epimysium. Regeneration of skeletal muscle tissue. Studying the topic involves theoretical and practical work in the study room, the use of virtual simulation (watching movies), method of demonstrations with further discussion; consideration of situational problems, study of histology specimen (skeletal muscles in the transverse section, skeletal muscles in the longitudinal section) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.32 "Smooth muscle tissue." (full-time course)

Smooth muscle tissue of mesenchym origin. Histogenesis, structure, morphofunctional and histochemical characteristics. Myocyte. Organization of shrinking apparatus. Regeneration of smooth muscle tissue. Unstressed muscle tissues of epidermal and neural origin. The study of this topic involves theoretical and practical work in the class room, the study of histology specimen (smooth muscles in the transverse, smooth muscles in the longitudinal section) using light microscopes and electronograms.

pr.tr.33 "Nervous tissue (structure of neurons)." (full-time course)

General morphofunctional characteristics. Histogenesis. Neurons, general structure, morphological and functional classification. Cytophysiology of neurons. Features of the structure of the perikaryon, dendrites, and axon. Chromophobic substance, its significance. Axonal transport (anterograde and retrograde). Structure of the reflex arc. Concept of neurotransmitters. Secretory neurons. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films), demonstrations followed by discussion; consideration of situational problems, study of micro-preparations (neurofibrils in nerve cells, Nissl substance) using light microscopes and electron micrographs. The demonstration of preparations is carried out using multimedia equipment. Computer testing in the computer class.

pr.tr.34 "Nervous tissue (neuroglia)." (full-time course)

Neuroglia. General characteristics, main types. Macroglia (ependymal cells, astrocytes, oligodendrocytes), their structure and functions. Microglia, their structure and functions. Origin of neuroglia cells. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing a scientific film), demonstrations followed by discussion, consideration of situational problems, and the study of electrograms. Electrograms are demonstrated using multimedia equipment. Computer testing in the computer class.

pr.tr.35 "Nervous tissue (nerve fibers)." (full-time course)

Nerve fibers, types (myelinated and unmyelinated), their microscopic and ultramicroscopic structure. Structure and formation of the myelin sheath during fiber development. Formation of mesaxons, Ranvier nodes, their histological significance. The speed of nerve impulse transmission in myelinated and unmyelinated nerve fibers. Regeneration of nerve tissue. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films), demonstrations followed by discussion; consideration of situational problems, study of micro-preparations (myelinated nerve fibers, unmyelinated nerve fibers) using light microscopes and electron micrographs. The demonstration of preparations is carried out using a multimedia installation. Computer testing in a computer classroom.

pr.tr.36 "The structure of nerve endings." (full-time course)

Nerve endings. General morphofunctional characteristics of exteroceptors and interoceptors. Receptors and effectors, their classification and structure. The concept of a synapse. Interneuronal synapses (classification, structure, mediators). The mechanism of excitation transmission in synapses. The morphological substrate of the reflex activity of the nervous system (the concept of simple and complex reflex arcs). Neural theory. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing a scientific film), demonstrations followed by discussion, consideration of situational problems, and the study of electrograms. Electrograms are demonstrated using multimedia equipment. Computer testing in the computer class.

pr.tr.37 "Autonomic nervous system." (full-time course)

Somatic and autonomic (autonomic) nervous system. The concept of a metasympiotic nervous system. Demonstration of the scientific film with further discussion: parasympic and sympathetic departments of the autonomous nervous system. Nucleus of the central parts of the autonomic nervous system. The structure of the ganglia vegetative nervous system. The structure of nerve trunks. Features of their reaction to damage, recovery processes. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, study of histology specimen (vegetative nervous ganglion) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation.

Topic 11. The test control of the Module III «General Histology».

pr.tr.38 "The test control of the Module III «General Histology»." (full-time course)

The test and theoretical control of topics 8-10.

pr.tr.39 "The test control of the Module III «General Histology»." (full-time course)

Control of practical skills on topics 8-10.

pr.tr.40 "Diagnosis of histological preparations." (full-time course)

Diagnosis of histological preparations.

Topic 12. Nervous system.

pr.tr.41 "Peripheral nervous system." (full-time course)

General morphofunctional characteristic. Embryogenesis. Classification (anatomical and physiological). Peripheral nervous system. Sensitive nerve nodes (spinal cord and cranial). Sources of development. The position of the nodes in the reflector arcs. Spinal cord. General morphofunctional characteristic. The structure of gray matter. Neural composition of the cores of the spinal cord, own apparatus of the spinal cord. White matter. Leading ways. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, the study of histology specimen (dorsal root ganglion, nerve trunk, spinal cord) with the use of light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.42 "Central nervous system. Brain." (full-time course)

Central nervous system. Gray and white matter. Nerve centers. Brain membranes. Cerebrum. Screen-type structure of cerebral cortex centers. Concepts of cyto- and myeloarchitectonics of the cerebral cortex. Concepts of the modular principle of cerebral cortex organization. Interneuronal connections. Glia cells. Blood-brain barrier, structure, significance. Brain stem. Medulla oblongata. The most important associative nuclei. Reticular formation. Diencephalon. Thalamus nuclei. Hypothalamus, main nuclei. Functions of the diencephalon. The study of this topic involves theoretical work in the classroom, consideration of situational problems, and the study of micro-preparations (cerebral cortex) using light microscopes and electron micrographs. Preparations and electron micrographs are demonstrated using multimedia equipment. Computer testing in the computer classroom.

pr.tr.43 "Central nervous system. Cerebellum." (full-time course)

Cerebellum. Structure and functions. Gray and white matter. Concepts of cyto- and myeloarchitectonics of the cerebellar cortex. Layers of the cerebellar cortex, their neuronal composition. Interneuronal connections. Afferent and efferent fibers. Cerebellar glial cells. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (viewing scientific films) followed by discussion; consideration of situational problems, study of micro-preparations (cerebellar cortex) using light microscopes and electron micrographs. The demonstration of preparations and electron micrographs is carried out using multimedia equipment. Computer testing in the computer classroom.

Topic 13. Sense organs.

pr.tr.44 "Sense organs. Vision organ (front section)."" (full-time course)

General characteristics of the senses. The doctrine of touch systems. Classification of the senses by the structure and origin of the receptor cells. A demonstration of a scientific film with further discussion: The organ of vision. General characteristics. Embryogenesis. The general plan of the structure of the eyeball. Tunics, their sections and derivatives. The main functional apparatuses: dioptric, accommodation, receptor. The structure of the protein tunics (sclera and cornea). Structure of the cardiovascular tunics (choroid, ciliary body, iris). Chambers of the eyeball: the front, back, their walls. Vitreous body, lens. Accommodation apparatus of the eye. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, the study of histology specimen (cornea of the eye) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.45 "Sense organs. Vision organ (retina)." (full-time course)

Neural composition of the retina. Photoreceptor cells, their microscopic, ultramicroscopic and cytochemical features. Retinal neuroglia. The structure of the yellow and blind spots of the retina. Optic nerve. Accessory apparatus of the eye. Age-related changes. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, the study of histology specimen (neural composition of the retina) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.46 "Sensory organs. Auditory organ." (full-time course)

General characteristics of the auditory organ. External, middle (auditory ossicles, auditory tube) and inner ear. A demonstration of the science film followed by discussion: Bone and weed mazes. Modiolus (auditory) part of the fluid-filled membranous labyrinths (cochlear duct). The structure of the spiral organ of Corti. Hair and supporting cells. Histophysiology of the organ of hearing. Embryogenesis of the organ of hearing. Age-related changes. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, the study of histology specimens (modiolus, cochlear duct, spiral organ of Corti) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

pr.tr.47 "Sensory organs. Equilibrium organ." (full-time course)

General morphofunctional characteristics of the equilibrium organ. The structure of the bone and fluid-filled membranous labyrinths of the equilibrium organ. Vestibular part fluid-filled membranous labyrinths: the utricule, the saccule and the crista ampoullaris. The structure of hair and supporting cells. Otolithic membrane and cupula. Histophysiology of the vestibular apparatus. Embryogenesis of the equilibrium organ. Age-related changes. The study of this topic involves theoretical and practical work in the class room, consideration of situational problems, the study of histology specimens (equilibrium organ) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation. Computer testing in a computer class.

Topic 14. Cardiovascular system.

pr.tr.48 "Cardiovascular system. Arteries. Veins." (full-time course)

General morphofunctional characteristics of the cardiovascular system. Embryogenesis of the cardiovascular system. Dependence of the structure of blood and lymph vessels on hemodynamic conditions. Arteries, their classification. The structure of the arteries of elastic, muscular and mixed types. General morphofunctional characteristics of the cardiovascular system. Embryogenesis of the vascular system. Dependence of the structure of blood and lymph vessels on hemodynamic conditions. Arteries, their classification. The structure of the arteries of elastic, muscular and mixed types. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (elastic artery, muscular artery, vein) using light microscopes.

pr.tr.49 "Cardiovascular system. Lymphatic vessels." (full-time course)

Lymphatic vessels. Classification. Structure of different types of lymphatic vessels. Dependence of the structure of lymphatic vessels on hemodynamic conditions. Features of the structure of lymphatic capillaries and postcapillaries, their participation in microcirculation. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing a scientific film), demonstrations followed by discussion, and the study of electron micrographs and micro-preparations (lymphatic vessels) using light microscopes. The demonstration of preparations and electronograms is carried out using multimedia equipment. In addition, the study of the topic involves solving situational tasks and preparation for Step-1. Computer testing in a computer classroom.

pr.tr.50 "Cardiovascular system. Blood vessels of the microvasculature." (full-time course)

Hemomicrocirculator channel, its components. Capillaries, their microscopic and ultramicroscopic structure. Classification of capillaries in the structure of endotelia and basal membrane. Function of the capillaries. The structure of the main lymphatic trunks. Features of the structural organization of the venous and arterial links of the microvasculature. Arterio-venular anastomoses, general characteristic. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (arterioles, veinules and capillaries) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.51 "Cardiovascular system. Heart." (full-time course)

Heart development in human embryogenesis. The general structure of the heart wall. Endocardium, heart valves. Myocardium. Features of the structure and function of heart muscle tissue. Morphofunctional characteristic of contractile, conductive and secretory cardiomyocytes. The structure of the epicardium and pericardium. Possibilities of myocardial regeneration. Newborn heart. Restructuring, development and age changes hearts. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (myocardium, Purkinje fibers) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

Topic 15. Organs of hematopoiesis and immune defense.

pr.tr.52 "Organs of hematopoiesis and immune defense. Bone marrow. Thymus." (full-time course)

General characteristics and classification of organs of hematopoiesis and immune defense. Red bone marrow. The interaction of hematopoietic, stromal and vascular components of the red bone marrow. Age-related changes in red bone marrow. Regeneration of the red bone marrow. Yellow bone marrow. General characteristics of the thymus as a central organ of lymphocytopoiesis and immunogenesis. The blood-thymus barrier. Development and age-related changes in the thymus. Accidental involution of the thymus and its regeneration. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (red bone marrow, thymus) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.53 "Lymph node." (full-time course)

Lymph nodes. Structure and functions of the cortical, medullary, and paracortical zones. Concepts of T and B zones. Sinus system, structural components, significance. Hemolymphatic nodes. Structure and functions of venous sinuses. Unified immune system of the mucous membranes: lymphatic nodules in the walls of the airways, digestive tract, and other organs. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films), demonstrations followed by discussion, and the study of micro-preparations (lymph node) using light microscopes and electron micrographs. Preparations are demonstrated using multimedia equipment. The study of the topic involves solving situational problems and preparing for Step 1. Computer testing in a computer classroom.

pr.tr.54 "Spleen." (full-time course)

Spleen. White and red pulp. Features of the structure and significance of the T- and B-zones of the white pulp. Features of the blood supply to the spleen. Structure and functions of venous sinuses. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films), demonstrations followed by discussion, and the study of micro-preparations (spleen) using light microscopes and electron micrographs. Preparations are demonstrated using multimedia equipment. The study of the topic involves solving situational problems and preparing for Step - 1. Computer testing in a computer classroom.

pr.tr.55 "Cellular basis of immune responses. Cellular immunity." (full-time course)

General characteristics. Antigens. Antibodies, their structure, types. Characteristics of the major histocompatibility complex (MHC-I, MHC-II). Characteristics of histocompatibility antigens. Types of T lymphocytes and their significance (T killers, T helpers, T suppressors, T memory cells). CD nomenclature of T lymphocytes. Characteristics of cells involved in immune responses (macrophages, T lymphocytes, B lymphocytes, plasma cells, antigen-presenting cells). The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films followed by discussion). Films are shown using multimedia equipment and a TV. The study of the topic involves solving situational problems.

pr.tr.56 "Cellular basis of immune responses. Humoral immunity." (full-time course)

Characteristics of processes occurring during the humoral immune response. Cells involved in humoral immunity and their interaction. Intercellular interactions in ensuring the body's immune defense. The study of the topic involves theoretical work in the classroom, the use of virtual simulation (viewing scientific films followed by discussion). Films are shown using multimedia equipment and a TV. The study of the topic involves solving a case-oriented task. Computer testing takes place in the computer lab.

pr.tr.57 "Cellular basis of immune responses. Allergy. Inflammation." (full-time course)

Characteristics of processes occurring during inflammation and allergies. Cells involved in inflammation and allergies (antigen-presenting cells, T lymphocytes, B lymphocytes, plasma cells, macrophages). Their interaction. Antibody formation and its significance. The class involves theoretical work in the classroom using demonstrations followed by discussion. The class includes solving situational problems and preparing for Step - 1.

Topic 16. Endocrine system.

pr.tr.58 "Central endocrine organs. Hypothalamus. Epiphysis." (full-time course)

General morphofunctional characteristic. The concept of hormones and their importance to the body. Target cells and hormone receptors. Mechanism of action of hormones. The principle of feedback. Classification of endocrine glands. Central and peripheral links of the endocrine system. Neuroendocrine system of regulation of body functions. The hypothalamus. The structure and function of the neurosecretory cells of the hypothalamus. General characteristics of the pituitary gland. Hypothalamus-adenohypophysis and hypothalamus-neurohypophysis systems, their role. Blood supply connection of the hypothalamus and adenohypophysis. Age-related changes. Epiphysis. Hormones of the pineal gland, their effect. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (pituitary gland) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV.

pr.tr.59 "Peripheral organs of the endocrine system. Thyroid and parathyroid glands." (full-time course)

Thyroid gland. Development, structure, cellular composition. Structure of follicles. Morphofunctional characteristics of follicular endocrine cells. Features of the secretory cycle of thyrocytes. Parafollicular endocrine cells, sources of development, localization. Hormones and their action. Parathyroid glands. Development, structure, cellular composition. Parathyroid hormone, its role in the regulation of mineral metabolism. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films), demonstrations followed by discussion, and the study of micro-preparations (thyroid gland, parathyroid gland) using light microscopes and electron micrographs. The demonstration of preparations is carried out using multimedia equipment and a TV. The study of the topic involves solving a practice-oriented task. Computer tests are taken in the computer class.

pr.tr.60 "Peripheral organs of the endocrine system. Adrenal glands." (full-time course)

Adrenal glands. Embryogenesis. Fetal and definitive adrenal cortex. Zones of the cortex, their structure. Functional morphology of endocrinocytes of the glomerular, fascicular, and reticular zones. The role of adrenal hormones in the development of general adaptation syndrome. Adrenal medulla, structure, cellular composition. Hormones, their action. Isolated hormone-producing cells (dissociated endocrine system). Classification by origin. APUD system cells, localization, hormones, and their action. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing a scientific film), demonstrations followed by discussion, and the study of micro-preparations (adrenal gland) using light microscopes and electron micrographs. The demonstration of preparations is carried out using multimedia equipment and a TV. The study of the topic involves solving a case-oriented task, preparation for Step - 1. Taking computer tests in the computer class.

Topic 17. The test control of the Module IV «Special Histology of regulatory and sensory systems».

pr.tr.61 "The test control of the Module IV «Special Histology of regulatory and sensory systems»." (full-time course)

Computer testing on questions from the database Step - 1 on topics 12-16.

pr.tr.62 "The test control of the Module IV «Special Histology of regulatory and sensory systems»." (full-time course)

Theoretical test on topics 12–16.

pr.tr.63 "The test control of the Module IV «Special Histology of regulatory and sensory systems»." (full-time course)

Control of practical skills on topics 12-16.

Topic 18. Oral cavity organs

pr.tr.64 "Organs of oral cavity." (full-time course)

General morphofunctional characteristics of digestive system. Embryogenesis of the digestive system. Digestive channel. General plan of structure of wall. Oral cavity. Features of structure of different organs in oral cavity. Features of the structure of the lips, cheek, gums, tonsils, tongue. Organ of taste. General characteristics. Embryogenesis. Taste buds, their localization and structure. Taste, supporting and basal cells. Histophysiology of the organ of taste. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (filiform papillae of the tongue, fungiform papillae of the tongue) using light microscopes and electronograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.65 "Tooth development." (full-time course)

Tooth morphogenesis: 1) formation of the dental plate and dental buds; 2) formation of dental epithelial organs; 3) histogenesis of tooth tissues. Primary teeth: formula, structural features, eruption timing. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films) followed by discussion; the study of micro-preparations (development of the enamel organ, histogenesis of tooth tissues) using light microscopes. The preparations are demonstrated using multimedia equipment and a TV. The study of the topic involves solving situational problems. Computer tests are taken in the computer class.

pr.tr.66 "Teeth structure." (full-time course)

Permanent teeth: their formula, characteristics of each type of tooth. Timing of permanent tooth eruption. Tooth tissues, their distribution by anatomical parts. Enamel (enamel prism, enamel plates, enamel bundles, Scherer's lines, Retzius' lines); dentin (predentin, pulp dentin, mantle dentin, Korf's fibers, Ebner's fibers, secondary dentin); cementum (acellular, cellular) - structure, chemical composition, function. Tooth pulp, structure, function. Structure and function of the periodontium, periodontium. Parts of the tooth. Crown surfaces. General structure of teeth. Age-related changes in teeth. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing scientific films) followed by discussion; the study of micro-preparations using light microscopes. Preparations are demonstrated using multimedia equipment and a TV. The study of the topic involves solving situational problems, preparation for Step - 1. Taking computer tests in the computer classroom.

pr.tr.67 "Large salivary glands." (full-time course)

The general plan of the structure of the salivary glands. Structure and types of final secretory departments. Structure and functions of the system ducts. Morphofunctional characteristic of the parotid, submandibular and submandibular salivary glands. Embryogenesis and regeneration of the salivary glands. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (the parotid, submandibular and submandibular salivary glands) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

Topic 19. Digestive system organs.

pr.tr.68 "Esophagus. Stomach." (full-time course)

Morphological characteristics of esophagus and pharynx. Morphological characteristics of the wall of the esophagus in different parts. General morphological and functional characteristics of the stomach. Characterization of the gastric glands. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (esophagus, junction between esophagus to stomach, body of stomach) using light microscopes. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.69 "Small intestine." (full-time course)

Small intestine. Features of the mucosal relief (circular folds, villi, crypts). The "crypt-villus" system. Types of epithelial cells, their structure and functions. Characteristics of Paneth cells, columnar epithelial cells without a border. Histophysiology of digestion. The role of microvilli of columnar epithelial cells in parietal digestion and absorption. Features of the structure of the duodenum, jejunum, and ileum. Aggregated lymphatic nodules in the ileum. Regeneration of the epithelium in different parts of the small intestine. Age-related changes. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films), demonstrations followed by discussion, and the study of micro-preparations (duodenum, jejunum) using light microscopes and electron micrographs. Specimens are demonstrated using multimedia equipment and a TV. The study of the topic involves solving a practical task. Computer tests are taken in the computer lab.

pr.tr.70 "Large intestine." (full-time course)

The large intestine. Features of the mucous membrane relief. Histophysiology of the large intestine. The vermiform appendix, its structure and functions. The rectum, its sections, structure, and functions. The endocrine system of the digestive tract, its structure and functions. Regeneration of the epithelium in different sections of the digestive tract. Age-related changes. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films), demonstrations followed by discussion, and the study of micro-preparations (large intestine) using light microscopes and electron micrographs. The demonstration of preparations is carried out using multimedia equipment and a TV. The study of the topic involves solving a practice-oriented task. Computer tests are taken in the computer class.

pr.tr.71 "Liver." (full-time course)

Liver. Embryogenesis, functional and morphological characteristics. Features of blood supply. Structure of a classic hepatic lobule: intrahepatic capillaries, hepatic beams, bile capillaries. Cytochemical and ultramicroscopic characteristics of hepatocytes, their bilateral secretion. Structure of intra-lobular hemocapillaries. Perisinusoidal space, perisinusoidal lipocytes, their structure and functions. Concept of hepatic acinus and portal lobule. Regeneration. Age-related changes. Gallbladder and bile ducts. Age-related changes. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films), demonstrations followed by discussion, and the study of micro-preparations (pig liver, human liver) using light microscopes and electron micrographs. The demonstration of preparations and electron micrographs is carried out using multimedia equipment and a TV. Computer tests are taken in the computer class.

pr.tr.72 "Pancreas." (full-time course)

Pancreas. General morphofunctional characteristics. Development. Microscopic and ultramicroscopic structure of the endocrine and exocrine divisions of the pancreas. Structure of the pancreatic acinus and duct system. Cytophysiology of the secretion process. Langerhans islets as a structural and functional unit of the endocrine section. Hormones and their significance. Regenerative capabilities, age-related changes. Age-related changes. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (viewing films), demonstrations followed by discussion, and the study of micro-preparations (pancreas) using light microscopes and electron micrographs. The demonstration of preparations is carried out using multimedia equipment and a TV. The study of this topic involves solving practical tasks. Completing computer tests.

Topic 20. Modular control of the content module “Special histology and embryology of the digestive system.”

pr.tr.73 "Modular control of the content module “Special histology and embryology of the digestive system.”" (full-time course)

Computer testing on questions from the database Step - 1 on topics 18-19.

pr.tr.74 "Modular control of the content module “Special histology and embryology of the digestive system.”" (full-time course)

Theoretical test on topics 18–19.

pr.tr.75 "Modular control of the content module “Special histology and embryology of the digestive system.”" (full-time course)

Control of practical skills on topics 18-19.

Topic 21. Respiratory system.

pr.tr.76 "Organs of the respiratory system. Airways." (full-time course)

Morphofunctional characteristics. Respirator and unrespirator functions, respiratory ways. Sources of development. General plan of structure of wall of respiratory ways. Characterization of the membranes of respiratory ways. Characteristics of respiratory epithelial cells (ciliated cells, goblet, basal, high plug-in, Clara cells, endocrinocytes, dendritic cells). The concept of broncho-associated lymphoid tissue, its significance for the body. The sense of smell. General characteristics. Embryogenesis. Localization. Characterization of the olfactory region. Histophysiology of the organ of smell. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (trachea, large bronchus, small bronchus) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.77 "Organs of the respiratory system. Lungs." (full-time course)

Morphological and functional characteristics of the lungs. The structure and function of the acinus. The structure of the alveoli of the lungs. Surfactant alveolar complex. The development of the respiratory system. The air-blood barrier. Characterization of the pleura. Age - dependent changes. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (lung) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

Topic 22. Skin. Derivatives skin.

pr.tr.78 "The structure of the skin." (full-time course)

Skin. General morphofunctional characteristics. Tissue composition of the skin. Regeneration. Epidermis. Its layers, structural features of "thick" and "thin" skin. Keratinocytes. Keratinization processes in the epidermis. Tactile epithelial cells. Dermis. Papillary and reticular layers. Structural features of the dermis in different areas of the skin. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching films), demonstrations followed by discussion, and the study of micro-preparations (thick skin, skin with hair) using light microscopes and electron micrographs. The preparations are demonstrated using multimedia equipment and a TV. The study of the topic involves solving a practical task. Computer tests are taken in the computer lab.

pr.tr.79 "Skin derivatives. Skin glands, hair structure, nails." (full-time course)

Skin derivatives. Skin glands: sebaceous, sweat, mammary (structure, histophysiology, types of secretion). Hair: development, structure, growth, change. Nails: development, structure, growth. The study of the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching films), demonstrations followed by discussion, and the study of micro-preparations (skin with hair, nail structure) using light microscopes and electron micrographs. The demonstration of preparations is carried out using multimedia equipment and a TV. The study of the topic involves solving a practice-oriented task. Computer tests are taken in the computer class.

Topic 23. Urinary system.

pr.tr.80 "Kidney development. Histophysiology of nephron." (full-time course)

General plan of organization of the urinary system. Embryogenesis. Sources and basic stages of development. Age - dependent changes. Kidney. The general plan of the structure. General characteristics of nephrons. Features of blood supply of the kidneys. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (kidney) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.81 "Endocrine kidney apparatus. Urinary tract." (full-time course)

Endocrine apparatus of the kidney. Features of blood supply of the juxtamedular nephrons. Characterization of the mucous membrane of the urinary tract. The structure of the muscular and external membranes of the urinary organs. Bladder. Age-related changes in bladder. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (urinary passages, bladder) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

Topic 24. Reproductive system.

pr.tr.82 "Male reproductive system. Testis." (full-time course)

The general plan of the structure of the male reproductive system. Embryogenesis of the male reproductive system. Testis. Structure. Embryonic and post-embryonic histogenesis. Functions. Spermatogenesis. Concept of a hematotesticular barrier. Endocrynocytes of the testis, their function. Morphological characteristics of the sustentocytes. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (testis) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.83 "Male reproductive system. Excurrent ducts." (full-time course)

Excurrent ducts. The structure and function of the epididymis. The structure and functions of the ductus deferens and ejaculator ducts. Structural features of the male ureter. Morphofunctional characteristic of seminal vesicles. Bulbourethral glands. Embryogenesis and structure of the prostate gland, its age-related changes. Prostaglandins, their significance. Variants and anomalies of development of male genitals. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (epididymis, prostate glands) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.84 "Female reproductive system. Ovaries." (full-time course)

Female reproductive organs. Ovaries. Ovogenesis. Changes during the ovarian-menstrual cycle, their hormonal regulation. The value of atretic follicles for the functioning of the female reproductive system. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimen (ovaries) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.

pr.tr.85 "Female reproductive system. Uterus. Fallopian tubes." (full-time course) General structural features of the uterus. Histophysiology of the fallopian tubes. Oviducts and vagina. Ovarian-menstrual cycle. The mammary gland. Development, structure and functions. Hormonal regulation of the mammary gland. Studying the topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies), the method of demonstrations with further discussion; study of histology specimens (uterus. fallopian tubes) using light microscopes and electrograms. Demonstration of histology specimen is carried out with the help of a multimedia installation and TV. In addition, studying the topic, it is envisaged to solve a practice-indicative task. Computer testing in a computer class.
Topic 25. The test control of the Module V «Special Histology and Embryology of internal organs».
pr.tr.86 "The test control of the Module V «Special Histology and Embryology of internal organs»." (full-time course) Computer testing on questions from the database Step - 1 on topics 21-124
pr.tr.87 "The test control of the Module V «Special Histology and Embryology of internal organs»." (full-time course) Theoretical test on topics 21–24.
pr.tr.88 "The test control of the Module V «Special Histology and Embryology of internal organs»." (full-time course) Control of practical skills on topics 21-24.
Topic 26. Completing test tasks.
pr.tr.89 "Preparation for the integrated test exam “Step-1”" (full-time course) Testing based on questions from the “Step - 1” database.
pr.tr.90 "Conducting the integrated test exam “Step-1” in histology." (full-time course) Testing based on questions from the “Step - 1” database.
Topic 27. Examination.
assessm.1 "Practically oriented exam" (full-time course) It is conducted in accordance with regulations

9. Teaching methods

9.1 Teaching methods

Course involves learning through:

TM1	Lecture teaching
TM2	Team Based Learning
TM3	Practical training
TM4	Research Based Learning

TM5	Self-study
TM6	Electronic learning

Lectures provide students with theoretical materials on histology, cytology, and embryology, which form the basis of self-study for higher education seekers majoring in Medicine (LO1). Practical classes are the main method of teaching histology, which gives students the opportunity to study human histology directly using micro-preparations and electron micrographs (LO1-LO7). Modular learning promotes the integration of knowledge, skills, and abilities acquired by students while studying content modules (LO1-LO7). Practical-oriented learning provides students with the opportunity to apply the knowledge gained in histology in their professional activities (LO1-LO6). While preparing multimedia presentations, students will develop self-learning, critical thinking, analysis, and synthesis skills.

9.2 Learning activities

LA1	Interactive lectures
LA2	Completion of group practical assignment
LA3	Study of histology specimen using the light microscope and electronic microphotographs.
LA4	Individual research project (student research paper, article, abstract, etc.)
LA5	Working with textbooks and relevant information sources
LA6	E-learning in systems (Google Meet, MIX.sumdu.edu.ua).
LA7	Preparing for Step-1
LA8	Preparation for the current, final tests and exam

10. Methods and criteria for assessment

10.1. Assessment criteria

Definition	National scale	Rating scale
Outstanding performance without errors	5 (Excellent)	$90 \leq RD \leq 100$
Above the average standard but with minor errors	4 (Good)	$82 \leq RD < 89$
Generally sound work with some errors	4 (Good)	$74 \leq RD < 81$
Fair but with significant shortcomings	3 (Satisfactory)	$64 \leq RD < 73$
Performance meets the minimum criteria	3 (Satisfactory)	$60 \leq RD < 63$
Fail – some more work required before the credit can be awarded	2 (Fail)	$21 \leq RD < 59$
Fail – considerable further work is required	2 (Fail)	$0 \leq RD < 20$

10.2 Formative assessment

	Description	Deadline, weeks	Feedback
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FA1 Peer assessment	Interaction aimed at improving the results of educational activities by comparing one's current level of success with previous indicators. It provides the opportunity to analyze one's own educational activities.	Throughout the entire period of studying the discipline.	Peer correction of learning approaches based on assessment results
FA2 Survey and oral comments of the teacher on the results of the survey	It provides an opportunity to identify the state of students' acquired learning experience in accordance with the set goals, to determine the prerequisites for the formation of the results obtained, the reasons for the difficulties, to adjust the learning process, to track the dynamics of the formation of learning outcomes and to predict their development.	Throughout the entire period of studying the discipline	Based on the analysis of the results obtained from teaching, it is proposed to assign a grade as an indicator of the achievements of the teaching activities of teachers.
FA3 Teacher's instructions in the process of practical tasks	The guidelines describe methods of pedagogical control over the professional activities of applicants. Effectiveness 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 practical competence.	Throughout the entire period of studying the discipline	Consulting students on working with microscopes and microscope slides, direct and indirect observation of students' work during the performance of practical tasks, followed by determination of their level of practical training
FA4 Consulting with the teacher during the preparation of an individual research project (presentation at a conference, research paper competition)	An important factor in the formation of professional qualities of future specialists is the research work of students. Involving them in research activities contributes to the formation of their scientific worldview, diligence, work capacity, initiative, etc.	Throughout the entire period of studying the discipline	Teacher's oral comments. The student is given additional incentive points (from 3 to 10), depending on the type of research project

FA5 Tasks for assessing the level of theoretical training	Assessment of acquired theoretical knowledge on the subject of the discipline. Conducted at each practical class in accordance with the specific objectives of each topic based on a comprehensive assessment of the student's performance, which includes monitoring the level of theoretical training and completion of independent work in accordance with the thematic plan.	Throughout the entire period of studying the discipline	Feedback aimed at supporting students' independent work, identifying shortcomings, and assessing the level of acquired theoretical knowledge
FA6 Tests (automated tests) to monitor the academic achievements of applicants	The method of effective testing of knowledge acquisition that allows you to check learning outcomes for each topic of the academic discipline.	Throughout the entire period of studying the discipline	The student must provide 60% of correct answers to receive a positive grade.
FA7 Solving situational tasks from Step-1	It develops critical thinking, allows to assess the level of theoretical training acquired during the period of studying the discipline.	The penultimate lesson in the discipline.	To be admitted to the exam, a student must get at least 80% of correct answers.

10.3 Summative assessment

	Description	Deadline, weeks	Feedback
SA1 Intermediate module control in the form of an oral interview	An effective method of assessing a student's level of knowledge on individual topics. It allows the student to demonstrate the acquired knowledge, develops logical thinking and the ability to systematize the material being studied.	According to the calendar - thematic plan	The received points are a component of the semester grade.
SA2 Final control: exam	The exam is conducted in the form of computer testing. All students are admitted to the exam, regardless of the number of current points earned during 1-2 semesters.	According to schedule.	The applicant can receive 80 points for the exam. The minimum number of points a student must receive is 48 points. The total score for the discipline must be at least 120.

SA3 Current assessment of the level of theoretical training	It includes oral and computer-based testing. Students have the opportunity to demonstrate their acquired knowledge on a specific topic of the discipline.	Throughout the entire period of studying the discipline.	Throughout the entire period of studying the discipline
SA4 Defense of an individual research project (incentive activity, additional points)	An important factor in the formation of professional qualities of future specialists is the research work of students. Involving them in research activities contributes to the formation of their scientific worldview, diligence, work capacity, initiative.	Throughout the entire period of studying the discipline.	The student can receive a maximum of 10 points.

Form of assessment:

	Points	Можливість перескладання з метою підвищення оцінки
The first semester of teaching	200 scores	
SA1. Intermediate module control in the form of an oral interview	80	
	80	No
SA3. Current assessment of the level of theoretical training	120	
Oral interview	90	No
Current testing	30	No
The second semester of teaching	200 scores	
SA1. Intermediate module control in the form of an oral interview	45	
	45	No
SA2. Final control: exam	80	
	80	No
SA3. Current assessment of the level of theoretical training	65	
Oral interview	50	No
Current testing	15	No
SA4. Defense of an individual research project (incentive activity, additional points)	10	
	10	No

For their current activities in each practical class, students receive grades for their theoretical preparation, which is tested by means of computer testing and questioning. The maximum score is 5 points (grades are given in the traditional 4-point grading system). At the end of the academic

semester, the student's arithmetic mean of academic performance (oral questioning and testing) is calculated. The maximum number of points a student can receive in practical classes during the first semester is 120 (oral questioning and testing), and 80 points for content modules. The maximum number of points a student can earn in practical classes during the second semester is 120 points (65 points for practical classes and 45 points for content modules (interim module control) and 10 incentive points. At the end of the academic year, the student's arithmetic mean of academic performance is calculated. The maximum number of points a student can earn in practical classes during the academic year is 120. The final assessment is in the form of an exam. All students are admitted to the exam, regardless of the number of current points they have earned during the two semesters. The exam is held according to the schedule set by the dean's office. The exam is conducted using computer testing, which includes: theoretical questions – tests on the entire histology course; tests – practical questions, which include virtual diagnosis of micro-preparations and electronograms. The exam is considered passed if the student scores at least 48 points out of 80, and the total score is at least 120. If, during the semester assessment, the applicant receives a grade of “unsatisfactory” with a score of 70-119 points, they have the right to retake the final assessment in the academic discipline twice: the first time with the teacher (first retake), the second time to the commission (second retake), which is created by the director of the institute. If, during the semester assessment for the main subject, the applicant received a grade of “unsatisfactory” with a score of up to 69 points inclusive, they have the right to retake the final assessment for the academic discipline once – before a commission created by the director of the institute. Bonus points are added to the course grade for: preparing presentations – 2 points, abstracts in scientific collections - 5 points, presentations at scientific conferences - 10 points, prize places in the second round of the All-Ukrainian Olympiad - 10 points, prize places in the All-Ukrainian competition of student scientific works - 10 points. The total score for the discipline cannot exceed 200.

11. Learning resources

11.1 Material and technical support

MTS1	Library collections
MTS2	Computers, computer systems, and networks
MTS3	Laboratory equipment: microscopes and microscope slides
MTS4	Models and replicas of individual organs
MTS5	Multimedia, video and audio playback, projection equipment (video cameras, projectors, screens, laptops, TVs)
MTS6	Software (for supporting distance learning, online surveys), integrated information system (SumDU web system, e-learning information system)
MTS7	Information and communication systems
MTS8	Technical resources (educational video materials)

11.2 Information and methodical support

Essential Reading

1	Wheater's Functional Histology / Geraldine O'Dowd, Sarah Bell, Sylvia Wright. - 7th ed., Elsevier, 2023. - 480 p. https://www.amazon.com/Wheaters-Functional-Histology-Geraldine-FRCPath/dp/0702083348
2	Histology: A Text and Atlas: With Correlated Cell and Molecular Biology / Wojciech Pawlina. - 9th ed., Lippincott Williams & Wilkins, 2024. - 1104 p. - ISBN 978-1975181536.
3	Langman's Medical Embryology / T. W. Sadler. - 15th ed., Lippincott Williams & Wilkins, 2023. - 472 p. - ISBN 978-1975179960.
5	Atlas of human embryology : нав. посібник / Куптенко Л. І., Понирко А. О., Теслик Т. Р., Ілляшенко В. Ю. - Суми, Сумський державний університет, 2024. - 119 с.
Supplemental Reading	
1	Langman's Medical Embryology / T. W. Sadler — Philadelphia : Wolters Kluwer, 2019. — 429 p. https://www.slideshare.net/slideshow/langman-s-medical-embryology-14th-ed-pdf/277934339#10
2	Nervous tissue, nervous system, sensory system: нав. посіб. / Л.І Кіптенко, В.С. Світайло, Н.Б. Гринцова, О.О Тимакова. - Суми: Сумський Державний університет, 2021. – 84с.
3	Cytology: study guide [Electronic resource]/ L.I. Kiptenko, N.B. Gryntsova, O.O. Timakoval. Sumy: Sumy State University, 2022. 77 p.
4	CHANGES IN THE CHARACTERISTICS OF ORAL FLUID AT THE STAGES OF TREATMENT AND REHABILITATION OF PATIENTS WITH MANDIBULAR FRACTURES / Patalakha O., Cherkashyna L. Kiptenko L., Shklyar A., Vynnychenko L. , Demikhova N. // Azerbaijan Medical Journal this link is disabled, 2023, (2), P. 97–102. (Scopus).
5	Morphological characteristics and correction of long tubular bone regeneration under chronic hyperglycemia influence / Dudchenko Y.S., Maksymova O.S., Pikaliuk, V.S., Muravskiy, D.V., Kiptenko, L.I., Tkach, G.F. // Analytical Cellular Pathology . – 2020. – Vol. 2020. Article ID 5472841, 7 pages. doi.org/10.1155/2020/5472841 (Scopus)
6	Structural and functional changes in osteogenic cells and biomarkers of bone remodeling in chronic hyperglycemia / Ponyrko A., Bumeister V., Korenkov O., Dmytrur S., Kiptenko L., Ryabenko T., Teslyk T., Ryabenko D. // Eastern Ukrainian Medical Journal, 2023, Т. – 11, P. - 398-407. DOI: 10.21272/eumj.2023;11(4):398-407 (Scopus)
7	Melnyk, N.O. Histology, cytology and embryology (short course) / N. O. Melnyk. — К. : Book-plus, 2019. — 415 с.
8	Eroschenko, V. P. Atlas of Histologi with Functional Correlations / V. P. Eroschenko. — thirteenth edition. — Philadelphia : Wolters Kluwer, 2017. — 617 p.

9	The role of liquid biopsy in the diagnosis of endometrial cancer: a bibliometric analysis / Nataliia Hyriavenko, Roman Moskalenko, Liudmyla Kiptenko // Eastern Ukrainian Medical Journal. – 2026. – Vol. 14(2). P. 338-347. (Scopus)
Web-based and electronic resources	
1	https://www.youtube.com/watch?v=h18rpO8DRuY
2	https://www.youtube.com/watch?v=iYp4Crm_SFw
3	https://www.youtube.com/watch?v=xw_ALdt5n-A
4	https://www.youtube.com/watch?v=SC5fKdrYi6w
5	https://www.youtube.com/watch?v=uQeBiHLovTI