SYLLABUS OF THE EDUCATIONAL COMPONENT

CYTOLOGY, HISTOLOGY, EMBRYOLOGY

speciality	**211 Veterinary medicine**	**mandatory discipline**	**mandatory**
educational program	**«Veterinary medicine»**	**faculty**	**veterinary medicine**
educational level	**master**	**department**	**normal and pathological morphology**

TEACHER

Olena Viktorivna BYRKA

Scientific degree - Candidate of Veterinary Sciences in the specialty 16.00.02 - pathology, oncology and morphology of animals
Academic title - associate professor
Work experience - 19 years

Indicators of professional activity on the subject of the course:

- author and co-author of about 60 scientific publications;
- experience of scientific work of 19 years;
- participant of scientific and methodical conferences.

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GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

Aim	providing students with the necessary theoretical knowledge on the structure, development, and functioning of the animal organism at the subcellular, cellular, tissue, and organ levels of structural organization; practical skills and abilities regarding a complex of methods for preparing histological preparations and their microscopy.
Form	lectures, laboratory classes, independent work, marking of drawings of histological preparations by students with subsequent supervision by the teacher, writing tests of content modules, written test or oral examination, educational practice in histological technique.
Detailing of learning results and forms of their control	• the ability to understand the regularities of the structure of cells, tissues and organs from the standpoint of the unity of structure and function; microstructural features of cellular and tissue elements that participate in biological processes at the level of light and electron microscopy (GC1, GC7, SC1, SC2, PLO1, PLO3) / control in laboratory classes, consultations, test and exam; • ability to microscopically examine histological preparations; identify tissues, their cellular and non-cellular structures at the microscopic and submicroscopic levels (GC1, GC7, SC1, SC2, SC6, PLO1, PLO3) / control in laboratory classes, consultations, tests and exams; • the ability to identify organs, their tissue and cellular elements at the microscopic level; recognize the structural features of cells, tissues and organs in connection with various physiological and protective and adaptive reactions of the body (GC1, GC3, GC7, SC1, SC2, SC6, PLO1, PLO3) / control in laboratory classes, consultations, test and exam; • ability to analyze the patterns of embryonic development of farm animals, analyze tasks and achievements in solving practical issues of animal husbandry (GC1, GC3, SC1, SC2, SC6, PLO1, PLO3) / control in laboratory classes, consultations, tests and exams;
	• ability to think abstractly, analyze, synthesize, search, and process information from various sources (GC 1, GC3, GC7, SC1, SC2, PLO1, PLO3) / control in laboratory classes, consultations, tests, and exams.
Scope and forms of control	8 ECTS credits (240 hours): 34 hours of lectures, 68 hours of laboratory classes, 108 hours of independent studies, 30 hours of teaching practice, current control (4 tests); final control in the second semester - undifferentiated credit, in the third semester - exam, in the fourth semester - teaching practice - differentiated credit.
Requirements of the teacher	timely completion of tasks, activity, demonstration of knowledge, skills and abilities when working with a microscope.
Enrollment conditions	according to the curriculum

COMPLEMENTS THE STANDARD OF EDUCATION AND THE EDUCATIONAL PROGRAM

Competencies	GC1. Ability to think abstractly, analyze and synthesize, search, and process information from various sources. GC3. Knowledge and understanding of the subject area and profession. GC7. Ability to conduct research at the appropriate level. SC1. The ability to establish the features of the structure and functioning of cells, tissues, organs, their systems and apparatuses of the body of animals of different classes and species - mammals, birds, insects (bees), fish and other vertebrates. SC2. Ability to use tools, special devices, instruments, laboratory equipment and other technical means to perform the necessary manipulations during professional activities. SC6. Ability to select, package, fix and ship samples of biological material for laboratory research.	**Program learning**	PLO1. Know and correctly use the terminology of veterinary medicine. PLO3. Determine the essence of physicochemical and biological processes that occur in the body of animals in normal and pathological conditions.

STRUCTURE OF THE EDUCATIONAL COMPONENT					
Part 1. Basics of cytology. General embryology.					
Lecture 1 (L 1)	Introduction. Fundamentals of cytology. General principles of the structure of a somatic cell. Nucleus.	**Laboratory class 1 (Lc1)**	**General cytology.** Methods of histological research. Principles of the structure of a somatic cell. Structure of the cell nucleus. Somatic cells (neurons) from a section of the spinal ganglion of a cat. Somatic cells (hepatocytes) from a section of the liver of a sheep.	**Independent work**	History of the development of cytology, histology, and embryology. *Notes in the notebook and oral test.*
		Lc 2	Membrane (mitochondria, Golgi complex) organelles.		Chemical composition of cell protoplasm. Cell life. Intercellular contacts. Embryogenesis of lancelet, fish, and amphibians. Stages of embryonic development of a chick. Periods of intrauterine development of mammals. Features of the formation and structure of the placenta in different species of domestic animals.
L 2	Cytoplasm. Membranous and non-membranous organelles. Inclusions of the cytoplasm. Non-cellular structures. Vital activity and reproduction of cells.	**Lc 3**	Non-membrane (centrosome) organelles.		
		Lc 4	Cellular inclusions: glycogen inclusions, fatty inclusions, secretory and pigment inclusions.		
L 3	Progenesis. Gametes. Development of germ cells (gametogenesis).	**Lc 5**	Cell life. Mitosis of plant cells. Amitosis of bladder epithelial cells.		
		Lc 6	**General embryology.** Female germ cells: oligolecithal type egg, mesolecithal type egg. Male germ cells: sperm smear from a male and a female rooster.		
L 4	Embryogenesis. Fertilization. Cleavage. Gastrulation. Embryogenesis of birds and placental mammals.	**Lc 7**	Gametogenesis.		
		Lc 8	Fertilization of the egg (division of maturation of the egg).		
		Lc 9	Zygote cleavage (complete uniform cleavage of the zygote of horse roundworm, complete uneven cleavage of the frog zygote, of frog blastula). Gastrulation, its types.		
		Lc 10	Germ layers (total preparation of the chicken embryo, germ layers and axial organs). Germ membranes (trunk and amniotic folds, placenta).		
Part 2. General histology.					

L 5	Epithelial tissues.	**Lc 11**	**General histology.** Epithelial tissues: single-layered squamous epithelium, single-layered single-row prismatic borderline epithelium, single-layered multi-row prismatic ciliated epithelium.	**Independent work**	Specialized structures of the apical surface of epithelial cells. Regeneration of epithelial tissues. *(abstract, report).*
		Lc 12	Glandular epithelium: stratified squamous non-keratinized epithelium.		
L 6	Connective tissues. General characteristics. Mesenchyme, blood, hematopoiesis, lymph, adipose, pigment, mucous, endothelium, reticular.	**Lc 13**	Connective tissues: mesenchyme, the blood of mammals.		Embryonic and postembryonic hematopoiesis (hemocytopoiesis) Connective tissues with special properties. Intercellular substance of fibrous connective tissues.
		Lc 14	Bird blood, reticular tissue.		
L 7	Connective tissues. Loose connective tissue. Dense connective tissue.	**Lc 15**	Loose fibrous connective tissue. Dense connective tissue is collagenous, dense connective tissue is elastic.		Histogenesis and regeneration of cartilage tissue.
L 8	Connective tissues. Cartilaginous and bone tissues.	**Lc 16**	Cartilage tissue: hyaline, elastic, fibrous.		Histogenesis and regeneration of bone tissue
		Lc 17	Bone tissue: lamellar bone tissue, development of bone tissue in place of hyaline cartilage tissue.		Histogenesis and regeneration of muscle tissue
L 9	Muscle tissue.	**Lc 18**	Muscle tissue: striated skeletal, striated cardiac muscle tissue, non-striated muscle tissue.		Histogenesis and regeneration of nervous tissue. Regeneration of nerve fibers. Nerve endings.
L 10	Nervous tissue.	**Lc 19**	Nervous tissue: multipolar nerve cells, myelinated and unmyelinated nerve fibers, cross-section of a nerve.		
Part 3. Nervous system, sensory organs. Cardiovascular system. Organs of hematopoiesis and immunity. Endocrine system, general integument of the body.					
L 11	Introduction to special histology. Nervous system. Sense organs.	**Lc 20**	Cerebral cortex, cerebellar cortex, giant pyramidal cells, spinal ganglion.		The autonomic nervous system. Development of the nervous system. The organ of hearing and balance. Histophysiology of hearing. Development of the inner ear. Lymphatic vessels. Development and regeneration of the heart, blood vessels, and
		Lc 21	Anterior wall of the eye, posterior wall of the eye, spiral organ.		
L 12	Cardiovascular system. Organs of hematopoiesis and immunological defense.	**Lc 22**	Artery, vein, vessels of the microcirculatory system.		
		Lc 23	Thymus, lymph node, spleen.		

L 13	Endocrine system. General body covering.	**Lc 24**	Cloacal sac, palatine tonsil.		lymphatic vessels. Nutrition of blood vessels and lymphatic vessels. Red bone marrow. Development of red bone marrow. Lymphoid formations associated with mucous membranes. Interrenal and chromaffin endocrine system. Diffuse endocrine system. Horny and special glandular derivatives of the skin.
		Lc 25	Pituitary gland, thyroid gland, adrenal gland.		
		Lc 26	Hairy skin, lactating and non-lactating mammary glands.		
Part 4. Organs of the digestive system. Organs of respiration and urination. Organs of the reproductive system of males and females.					
L 14	Digestive organs: oral cavity, esophagus, stomach.	**Lc 27**	Oral organs: filiform and leaf-shaped papillae. Submandibular salivary gland. Development of the tooth in the pig embryo. Early stage: laying of the epithelial tooth organ.		Teeth development. Esophageal groove of the stomach.
		Lc 28	Esophagus. Single-chamber stomach. Multi-chamber stomach of small cattle: rumen, mesh, book.		
L 15	Digestive organs: intestines, liver, pancreas.	**Lc 29**	Small intestine: duodenum, jejunum. Large intestine: rectum.		Peritoneum. Development of the digestive system organs. Histophysiology of voice formation. Development of the respiratory organs. Notes in the notebook and oral test during the module exam. Blood vessels of the kidney. Development of the urinary organs. Accessory sex glands. Development of the reproductive organs.
		Lc 30	Liver. Pancreas.		
L 16	Respiratory and excretory organs.	**Lc 31**	Trachea, lungs.		
		Lc 32	Kidney, urinary bladder.		
L 17	The reproductive system of the male and female.	**Lc 33**	Testicle, epididymis, prostate gland.		
		Lc 34	Ovary, corpus luteum, uterus.		

BASIC LITERATURE AND METHODOLOGICAL MATERIALS

Main literature

1. Albanese Francesco. Canine and Feline Skin Cytology. Springer International Publishing Switzerland, 2017. 535 p.
2. Burton AG Clinical atlas of small animal cytology. 2018. 380
3. Dellmann's Textbook of Veterinary Histology (6th Edition), Blackwell Publishing, Iowa, USA, 2006.
4. Francesco C., Freeman KP Veterinary Cytology: Dog, Cat, Horse, and Cow. Taylor & Francis Group, LLC, 2017. 240 p.
5. Hans-Georg Liebig. Veterinary Histology of Domestic Mammals and Birds 5th Edition, 5M Books, 2019.
6. Lorenzo R., Wiley J. Normal cell morphology in canine and feline cytology: an identification guide. Ressel & Sons Ltd, 2018.
7. Pawlina, Wojciech, and Ross, Michael H.. Histology: A Text and Atlas: With Correlated Cell and Molecular Biology. USA, Wolters Kluwer Health, 2018.
8. Raskin RE, Meyer DJ, Atlas of Canine and Feline Cytology . Saunders , Elsevier , St. Louis . 2016. 240.
9. Ross, Michael H, et al. Atlas of Descriptive Histology. GB, Sinauer, 2009.
10. Wolfgang Kuehnel. Color Atlas of Cytology, Histology, and Microscopic Anatomy, Thieme Stuttgart · New York, 2003.

Methodological support

1. Byrka O., Kushch M., Zhigalova O. Album of histology for students of the faculty of veterinary medicine on specialty 211: Veterinary Medicine, 212: Veterinary hygiene, sanitation and expertise. Part I. Kharkiv. 2022. 56 p. (Україна).
2. Byrka O., Kushch M., Zhigalova O. Album of histology for students of the faculty of veterinary medicine on specialty 211: Veterinary Medicine, 212: Veterinary hygiene, sanitation and expertise. Part II. Kharkiv. 2022. 58 p. (Україна).
3. Kushch M., Byrka O., Zhigalova O. Cytology, histology, embryology: Manual for students of the Faculty of Veterinary Medicine. Part I. Basics of cytology. Kharkiv. 2021. 64 p.(Україна).
4. Byrka O., Kushch M., Zhigalova O. Cytology, histology, embryology. Part I. Textbook for students on specialty 211: Veterinary Medicine, 212: Veterinary hygiene, sanitation and expertise. Kharkiv. 2021. 240 p.

ELECTRONIC RESOURCES

Veterynary cytology https://veterinarycytology.org/

https://www.youtube.com/@francescocian226/videos

Electronic course of the discipline "Cytology, Histology, Embryology"
for students in the specialty "Veterinary Medicine"

http://moodle.btu.kharkiv.ua/course/view.php?id=1681

EVALUATION SYSTEM

SYSTEM		POINTS	ACTIVITY TO BE EVALUATED
Final assessment (different credit, exam)	**100 points ECTS (standard)**	**up to 100**	**40 % - Final testing** **60 % - student's current work during the semester**
Final assessment (non-differential credit)	**100 points ECTS (standard)**	**up to 100**	**100 % - average grade for sections**
Rating of section	**100 points total**	**up to 30**	**30 % - answers to test questions**
		up to 30	**30 % - the result of mastering the block of independent work**
		up to 40	**40 % - student activity in class (oral answers)**

NORMS OF ACADEMIC ETHICS AND INTEGRITY

All participants in the educational process (including students) must adhere to the code of academic integrity and the requirements set forth in the regulation " On Academic Integrity of Participants in the Educational Process of DBTU ": to show tolerance, discipline, politeness, respect each other's dignity, show kindness, honesty, and responsibility.