

# COURSE SYLLABUS «HISTOLOGY, CYTOLOGY, EMBRYOLOGY»

Degree of higher education - Master Specialization - <u>211 Veterinary Medicine</u>

Educational program «Veterinary Medicine» Academic year – 1, 2, semester – 2, 3 Form of study - full-time Number of ECTS credits – 6 The language of instruction - English | Ukrainian

**Course lecturer** 

T. A. Mazurkevych, Associate Professor of the Department of Academician Volodymyr Kasyanenko Department of Animal Anatomy, Histology and Pathomorphology, Doctor of Veterinary Sciences, Associate Professor

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Course page in eLearn

https://elearn.nubip.edu.ua/course/view.php?id=1330 https://elearn.nubip.edu.ua/course/view.php?id=1680

#### DESCRIPTION OF THE DISCIPLINE

The academic discipline «Cytology, Histology, Embryology» is compiled in accordance with the educational and professional training program for the ED «Master» of the specialty 211 «Veterinary Medicine» of the full term of study. It is fundamental in the training of a veterinarian. Together with anatomy, physiology and biochemistry, they form the necessary basis for students to successfully master paraclinical and clinical disciplines. The discipline «Cytology, Histology, Embryology» includes four sections: «Cytology», «Embryology», «General Histology» and «Special Histology». Each of them has its own subject of study. «Cytology» studies the structure and function of cells, «Embryology» – the development and structure of germ cells and embryo development, «General Histology» – the development, structure and function of tissues, «Special Histology» – the structure of organs of their systems and apparatus. The subject of study of this discipline is the micro- and submicroscopic structure of the structural components of the organism, and their formation in the process of embryonic development.

### **Competencies of the educational programme:**

### **Integrated competence (IC):**

The ability to solve complex tasks and problems in the field of veterinary medicine, which involves research and/or implementing innovations and is characterized by uncertainty of conditions and requirements;

### **General competencies (GC):**

- 7. Ability to conduct research at the appropriate level;
- 11. Ability to evaluate and ensure the quality of work performed;

### **Professional (special) competencies (PC):**

- 1. The ability to establish the features of the structure and functioning of cells, tissues, organs, their systems and apparatus of the animals organism of different classes and species mammals, birds, fish and other vertebrates;
- 2. The ability to use tools, special devices, instruments, laboratory equipment and other technical means to carry out the necessary manipulations during professional activities;

## Program learning outcomes (PLO) of the educational programme:

- 1. Know and correctly use the terminology of veterinary medicine.
- 3. To determine the essence of the physicochemical and biological processes that occur in animals' organism in normal and pathological conditions.
- 5. Establish a link between the clinical manifestations of the disease and the results of laboratory tests.

## **COURSE STRUCTURE**

Торіс	Hours (lectures / laboratory)	Learning outcomes	Tasks	Assessment
	incornioly)	1st year of the study, 2nd ser	nester	
		Module 1. Cytology		
Topic 1. Insight into Histology. Definitions and subject of "Histology, Cytology, Embryology" and its place in the biological and veterinary sciences	2/3	Know the constituent parts of the discipline, the methods of their research and the importance for the training of a veterinary medicine doctor; the stages of making histological specimens, the structure of a light microscope and the rules for working with it.  Be able to use a light microscope to analyze cytological and histological specimens.	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn).  Execution and delivery of laboratory work (in methodical recommendations — during laboratory employment, and independently — in	Execution and delivery of laboratory and independent works, as well as Modular control in the form of tests (in eLearn) and oral/written survey – according to the evaluation log in eLearn
Topic 2. Overview of eukaryotic cells. Cell theory. The chemical composition of cells	2/3	Know the main modern provisions of cell theory and the foundations of the chemical composition and structure of cells.  Analyze intracellular structures on electrograms.	eLearn).  Doing independent work (tasks in eLearn).  Preparation and writing of a modular test (descriptive part in the form of written / oral answer – in the	
Topic 3. The structure of the eukaryotic cell	2/3	Know the parts of the eukaryotic cell. Be able, using a light microscope, to differentiate them on histological specimens and electrograms.	classroom, test – in eLearn).	
Topic 4. The structure of the eukaryotic cell	2/3	Know the compartments of eukaryotic cells and their functional features.  Be able, using a light microscope, to differentiate the compartments of the cell on histological specimens and electrograms.		
Topic 5. The structure of the eukaryotic cell. Cell division	2/3	Know the manifestations of cell life.  Be able to differentiate, using a light microscope, on histological specimens methods of cell proliferation.		
Module 2. Embryology				
Topic 6. Structure of Germ Cells	2/3	Know the features of the structure and function of germ cells.  Be able, using a light microscope, to differentiate the germ cells of males and females.	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn).	Execution and delivery of laboratory and independent works, as well as
Topic 7. Development of germ cells. Early embryonic development	2/3	Know the periods of development of the germ cells of males and females, the stages of fertilization and the main periods of embryogenesis of domestic animals.  Be able, using a light microscope, to differentiate the varieties of blastula and gastrula on histological specimens.	Execution and delivery of laboratory work (in methodical recommendations – during laboratory employment, and independently – in eLearn).	Modular control in the form of tests (in eLearn) and oral/written survey – according to the evaluation log in eLearn

Differentiation of Germ					
organs from which they develop and the main stages or embryogenesis of the lancelet, Ish and amphibians.  Be able, using a light microscope, to differentiate extenembryonic organs or a histological specimens.  Amphibians Tripie 9  Topie 10.  Topie 10.  Topie 11.  Comective Gomective Gometic function of the function of the structure and function and their functional characteristics.  Be able, using a light microscope, to differentiate the types of epithehial rissue.  Be able, using a light microscope, to differentiate the types of epithehial rissue.  Be able, using a light microscope, to differentiate the types of epithehial rissue.  Be able, using a light microscope, to differentiate the types of epithehial rissue.  Be able, using a light microscope, to differentiate blood cells of amphibians, fish, birds and mammals insmears.  Be able, using a light microscope, to differentiate blood cells of amphibians, fish, birds and mammals insmears.  Be able, using a light microscope, to differentiate plood cells of amphibians, fish, birds and mammals insmears.  Be able, using a light microscope, to differentiate plood cells of amphibians, fish, birds and mammals insmears.  Be able, using a light microscope, to differentiate plood cells of amphibians, fish, birds and mammals insmears.  Be able, using a light microscope, to differentiate plood cells of amphibians, fish, birds and mammals insmears.  Be able, using a light microscope, to differentiate loose and dense fibrous connective tissue and their structural and function and classification of supportive tissue.  Be able, using a light microscope, to differentiate loose and dense fibrous connective tissue and their structural and function and classification of supportive tissue.  Be able, using a light microscope, to differentiate loose and dense fibrous connective tissue and their structure and function and classification of supportive tissue.  Be able, using a light microscope, to differentiate cardiac, selected and smooth muscle tissue on a histological specimens.  To	Topic 8.	2/3	Know the structures of the animal	Doing independent	
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Test 30					
	Total for 1 se	mester			70
Total 100	Test				30
1 100	Total				100

		2nd year of the study, 3rd sen	nester	
Module 4. Special Histology. Cardiovascular, Lymphatic and Endocrine systems				
Topic 16. Cardiovascular system	2/3	Know the patterns of the structure of tubular and parenchymal organs, the composition of the cardiovascular system, development, structure and function of the heart, blood and lymphatic vessels.  Be able, using a light microscope, to differentiate the heart, types arteries, veins and microcirculatory vessels on	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical	Execution and delivery of laboratory and independent works, as well as Modular control in the form of tests (in eLearn) and
Topic 17. Lymphatic system (Central organs of hematopoiesis and lymphopoiesis)	2/3	histological specimens.  Know the composition and general characteristics of the lymphatic system, the classification of the organs of hematopoiesis and immune defense, their development, structure and function.  Be able, using a light microscope, to differentiate the central organs of hematopoiesis and immune defense on histological specimens.	recommendations — during laboratory employment, and independently — in eLearn).  Doing independent work (tasks in eLearn).  Preparation and writing of a modular test (descriptive part in	oral/written survey – according to the evaluation log in eLearn
Topic 18. Lymphatic system (Peripheral organs of hematopoiesis and lymphopoiesis)	2/3	Know the composition and general characteristics of the lymphatic system, the classification of the organs of hematopoiesis and immune defense, their development, structure and function.  Be able, using a light microscope, to differentiate the peripheral organs of hematopoiesis and immune defense on histological specimens.	the form of written / oral answer – in the classroom, test – in eLearn).	
Topic 19. Endocrine system	2/3	Know the general characteristics, classification of the organs of the endocrine system and the peculiarities of their structure and function.  Be able, using a light microscope, to differentiate the endocrine glands on histological specimens.		
Module	5. Special	Histology. Integumentary system. Dige	estive, respiratory and	urinary systems
Topic 20. Integumentary system	2/3	Know the composition of the integumentary system, functions, structure and development of the skin and its derivatives.  Be able, using a light microscope, to differentiate the skin, its glandular and horny derivatives on histological specimens.	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical	Execution and delivery of laboratory and independent works, as well as Modular control in the form of tests (in eLearn) and
Topic 21. Digestive system (Oral structures. Extramural salivary gland)	2/3	Know the organs of the oral cavity, extramural salivary glands, their features of development, structure and function. Be able, using a light microscope, to differentiate the components and stages of development of teeth, mechanical and taste papillae of the tongue and types of extramural salivary glands on histological preparations.	recommendations — during laboratory employment, and independently — in eLearn).  Doing independent work (tasks in eLearn).  Preparation and writing of a modular	oral/written survey – according to the evaluation log in eLearn
Topic 22. Digestive system (Esophagus. Glandular stomach. Compound stomach)	2/3	Know the features of the development, structure and function of the esophagus, glandular and compound stomachs.  Be able, using a light microscope, to differentiate the esophagus, glandular and compound stomachs on histological specimens.	test (descriptive part in the form of written / oral answer – in the classroom, test – in eLearn).	

	T - 12		T	
Topic 23.	2/3	<i>Know</i> the features of the structure,		
Digestive		function and development of the small		
system (Small		and large intestine, liver and pancreas.		
and large		Be able, using a light microscope, to		
intestine. Liver		differentiate the small and large intestine,		
and pancreas)		liver and pancreas on histological		
		specimens.		
Topic 24.	2/3	Know the general characteristics and		
Respiratory		composition of the respiratory apparatus,		
system		their structural and developmental		
system		features.		
		Be able, using a light microscope, to		
		differentiate the components of the		
		airways and the respiratory part of the		
		lungs on histological specimens.		
		Distinguish the cells of the alveolar wall		
T 25	0.10	on the electron micrograph.	-	
Topic 25.	2/3	<i>Know</i> the functions and composition of		
Urinary system		the urinary system organs, their structure		
		and development, the histophysiology of		
		urine formation, the endocrine complex of		
		the kidneys.		
		Be able, using a light microscope, to		
		differentiate the urinary system organs on		
		histological specimens.		
M	Indule 6 Si	pecial Histology. Reproductive, ner	vous systems and ser	ice organs
Topic 26.	2/3	Know the composition and functions of		
	2/3		1	
Female		the male reproductive system, the	lectures (preliminary	delivery of
reproductive		structure of the testes, excretory (genital)	acquaintance with the	laboratory and
system		ducts, accessory glands and penis.	presentation and full-	independent
		Be able, using a light microscope, to	text lecture in eLearn).	works, as well as
		differentiate the organs of the male	Execution and delivery	Modular control in
		reproductive system on histological	of laboratory work (in	the form of tests (in
		specimens.	methodical	eLearn) and
Topic 27. Male	2/3	<i>Know</i> the composition, functions and	recommendations –	oral/written survey
reproductive		structure of the female reproductive	during laboratory	<ul> <li>according to the</li> </ul>
system		system – ovary, oviduct, uterus, vagina,	employment, and	evaluation log in
		and vulva.	independently – in	eLearn
		Be able, using a light microscope, to	eLearn).	
		differentiate the organs of the female	Doing independent	
		reproductive system on histological	work (tasks in eLearn).	
		specimens.	Preparation and	
Topic 28.	2/3	<i>Know</i> the general characteristics,	writing of a modular	
Nervous	_, _	classification, development and structure	test (descriptive part in	
system		of the organs of the nervous system.	the form of written /	
System		Be able, using a light microscope, to	oral answer – in the	
		differentiate the brain and spinal cord,	classroom, test – in	
		nerve nodes and nerves on histological	eLearn).	
		specimens.	ezemi).	
Topic 29.	2/3	Know the general characteristics of	1	
	2/3			
Analyzers. Eye		analyzers and their composition, their		
		classification, development and structure		
		of the eye and ocular adnexa.		
		Be able, using a light microscope, to		
		differentiate the membranes of the eyeball		
		and their layers on histological		
		specimens.		
Topic 30.	2/3	Know the general characteristics of		
Analyzers.		analyzers and their composition, their		
Spiral organ.	Ī	classification, development and structure		
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Vestibular		of the spiral organ and vestibular appar.		
		of the spiral organ and vestibular appar.		
Vestibular		of the spiral organ and vestibular appar.  Be able, using a light microscope, to		
Vestibular		of the spiral organ and vestibular appar.  Be able, using a light microscope, to differentiate a spiral organ and its		
Vestibular		of the spiral organ and vestibular appar.  Be able, using a light microscope, to		

Total for 2 semester	70
Exam	30
Total for course	100

#### **ASSESSMENT POLICY**

Policy regarding deadlines and resits:	Laboratory, independent and modular works must be submitted in the planned time before the end of the study of the current module. Violation of the deadlines without a good reason entitles the teacher to lower the grade. Reassignment of modular control work occurs in the presence of valid reasons (for example, hospital) and is allowed in the term before the end of the following module.
Academic honesty policy:	Copying, use of mobile devices, and additional literature when writing modular tests, tests and exams are strictly prohibited.
Attendance policy:	Attendance at lectures and laboratory classes is mandatory for all students in the group. Late classes are not allowed. A lab coat is a must in laboratory classes. For objective reasons (for example, illness, international internship) training can take place according to an individual curriculum approved in a certain order. Missed lectures, after their processing by the applicant of higher education, are worked out in the form of an interview with the teacher. Missed laboratory classes are worked out by students in the laboratory of the department, information about the practice is entered into the departmental journal of the practice of missed classes.

### SCALE OF ASSESSMENT OF STUDENT KNOWLEDGE

Student rating,	National grade based on exam results	
points	credits	credits
90-100	excellent	passed
74-89	good	
60-73	satisfactory	
0-59	unsatisfactory	not passed

## RECOMMENDED SOURCES OF INFORMATION

#### **Basic literature**

- 1. Хомич В.Т. Лекції з цитології, ембріології та гістології свійських тварин: Навчальний посібник. К.: ТОВ "Аграр Медіа Груп", 2012. 296 с.
- 2. Новак В.П., Пилипенко М.Ю., Бичков Ю.П. Цитологія, гістологія, ембріологія: підручник за заг. ред. В.П.Новака (2-е вид., змін. і доп.) К.: Дакор, 2008. 512 с.
- 3. Хомич В.Т., Мазуркевич Т.А., Дишлюк Н.В., Стегней Ж.Г. Практикум з цитології, гістології та ембріології свійських тварин: Навчальний посібник /За редакцією В.Т. Хомича.-К.:ЦП Компринт, 2017. 228 с.
- 4. Хомич В.Т., Мазуркевич Т.А., Дишлюк Н.В., Стегней Ж.Г. Цитологія, ембріологія і гістологія свійських тварин у запитаннях і відповідях. Навчальний посібник К.:, Аграр Медіа Груп, 2013. 232 с.
- 5. Melnyk N. Histology, cytology and embryology. K., 2020. 370 c.
- 6. Ulrich D. Color atlas of embryology. Thieme, 1995. 383 p.

#### **Supporting literature**

- 1. Хомич В.Т., Рудик С.К., Левчук В.С. Морфологія сільськогосподарських тварин. К.: Вища освіта, 2003. 527 с.
- 2. Луцик О.Д., Іванова А.І., Кабак К.С. Гістологія людини. Львів: Мир, 1992. 400 с.
- 3. Banks W.J. Applied Veterinary Histology. 1993. 527 p.

- 4. Dellmann H.-D., Carithers J.R. Cytology and Microscopic Anatomy. 1996. 406 p.
- 5. Bacha W.J., Wood L.M. Color Atlas of Veterinary Histology. 1990. 269 p.

## **Information Resources**

- 1. « LUMEN Histology from Loyola. Excellent slides plus explanatory text.
- \*\*\* <a href="http://www.meddean.luc.edu/lumen/MedEd/Histo/frames/histo\_frames.html">http://www.meddean.luc.edu/lumen/MedEd/Histo/frames/histo\_frames.html</a>
- 2. https://elib.vsmu.by/bitstream/123/9813/1/Miadzelets-
- AD\_Selected%20themes%20of%20histology%20cytology%20and%20embryology%20core\_2005.pdf