Annex 2
to Order No. 646 of May 21, 2025

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Veterinary Epidemiology and Animal Health

APPROVED
Faculty of Veterinary Medicine
« 4 » June 2025

CURRICULUM OF ACADEMIC DISCIPLINE "VETERINARY MICROBIOLOGY"

Area of knowledge 21 Veterinarian
Specialty 211 Veterinary Medicine
Academic programme - Veterinary Medicine
Faculty of Veterinary Medicine
Developed by: **Ganna Kozlovska,** Associate Professor at the Department of Veterinary Epidemiology and Animal Health, Candidate of Veterinary Sciences, Associate Professor

Kyiv – 2025

Description of the discipline
"VETERINARY MICROBIOLOGY"

The course encompasses the study of the structure, properties, classification, distribution, and the role of microorganisms in the development of infectious diseases in animals. Particular attention is given to pathogenic bacteria, fungi, mycoplasmas, and chlamydiae, as well as methods for their diagnosis, prevention, and control. The course also covers the principles of immunity, the basics of immune prophylaxis, vaccination, sterilization, and disinfection. Studying this discipline provides students with fundamental knowledge for understanding the etiology and pathogenesis of infections, laboratory diagnostic methods, and modern approaches to ensuring well-being within the One Health framework.

Area of knowledge, specialty, academic programme, academic degree		
Academic degree	Master's	
Specialty	Veterinary Medicine	
Academic programme	Veterinary Medicine	
Characteristics of the discipline		
Type	Regulatory	
Total number of hours	180	
Number of ECTS credits	6	
Number of modules	4	
Course project (work) (if any)	-	
Form of assessment	an examination	
Indicators of the discipline for full-time and part-time forms of university study		
	full-time study	extramural study
Year of study	2	
Term	3	
Lectures	30 hours	
Practical classes and seminars	30 hours	
Laboratory classes	30 hours	
Self-study	90 hours	
Number of hours per week for full-time students		
Year of study	6 hours	

Aim, competences and expected learning outcomes of the discipline

The aim of the course "Veterinary Microbiology" is to provide students with fundamental knowledge of the biology, genetics, and ecology of microorganisms, their role in pathological processes, as well as to develop practical skills in the identification of microorganisms, diagnosis, prevention, and control of infectious diseases in animals.

Competences acquired:

Integral competence (IC): the ability to apply acquired theoretical knowledge and practical skills for the identification, diagnosis, prevention, and control of microbial infections in animals in order to ensure epizootic well-being and the safety of animal-origin products in professional practice.

General competencies (GC):

GC 1. The ability for abstract thinking, critical analysis, and synthesis.

GC 2. The ability to apply theoretical knowledge in practical contexts.

GC 3. A sound knowledge and understanding of the academic field and professional domain.

GC 4. Proficiency in oral and written communication in the state language.

GC 5. Proficiency in communication in a foreign language.

GC 6. Competence in the use of information and communication technologies.

GC 7. The ability to carry out research at an appropriate academic level.

GC 8. The capacity for lifelong learning and mastery of contemporary knowledge.

GC 9. The ability to make well-founded and responsible decisions.

GC 10. The ability to interact effectively with professionals from other disciplines and sectors.

GC 11. The ability to assess and ensure the quality of work performed.

GC 12. A commitment to environmental sustainability and protection.

Professional (special) competencies (PC):

PC 1. Ability to follow the rules of labor protection, asepsis and antiseptics during professional activities.

PC 2. Ability to carry out procedures for selection, packaging, preservation and transfer of samples of biological material for microbiological research;

PC 3. Ability to organize, conduct and analyze the results of microbiological research.

PC 4. ability to protect the environment from pollution during microbiological research.

Program learning outcomes (PL):

PL 1. Know and correctly use microbiological terminology.

PL 2. Use information from domestic and foreign sources to develop strategies in microbiological diagnostics.

PL 3. Develop measures aimed at protecting the population from bacterial diseases common to animals and humans.

PL 4. Understand the logical sequence of actions and be able to draw up appropriate documentation during microbiological research.

PL 5. Know the rules and requirements of biosafety, bioethics and animal welfare.

PL 6. To have specialized software tools for performing professional tasks.

Day-One Competences (DOC)

DOC 1. Demonstrate an understanding of the ethical and legal frameworks within which a veterinary practitioner must operate, including professional responsibilities, animal welfare, client relations, public health, and the broader societal and environmental implications of veterinary practice.

DOC 2. Understand scientific research methods, the contributions of basic and applied research to veterinary science, and the implementation of the 3Rs principles (Replacement, Reduction, Refinement).

DOC 3. Promote and ensure health and safety for oneself, patients, animal owners, colleagues, and the environment during professional activities; demonstrate knowledge of quality assurance principles; apply risk management practices in the veterinary context.

DOC 4. Work effectively as part of a multidisciplinary team when providing veterinary services and recognize the contributions of all team members.

DOC 5. Demonstrate critical thinking skills, including the ability to review and evaluate scientific literature and presentations.

DOC 6. Understand and apply the principles of the One Health concept to ensure good clinical practice and the integration of evidence-based veterinary medicine.

DOC 7. Use professional expertise to promote the advancement of veterinary knowledge and support the One Health approach in improving the health, safety, and welfare of animals, humans, and the environment, as well as contributing to the achievement of the United Nations Sustainable Development Goals (SDGs).

DOC 8. Demonstrate a commitment to lifelong learning, personal improvement, and professional development. This includes documenting and reflecting on professional experience and taking appropriate steps to enhance professionalism and competence.

DOC 9. Collect, store, and transport specimens properly; select appropriate diagnostic tests; interpret results and understand the limitations of diagnostic

findings.

DOC 10. Communicate clearly and collaborate with diagnostic laboratories, including the interpretation and integration of diagnostic results into patient case histories.

DOC 11. Correctly apply principles of biosecurity and evaluate biosecurity protocols.

DOC 12. Perform post-mortem examinations on all common animal species, including sample collection, submission for testing, and appropriate reporting.

DOC 13. Advise the public and implement disease prevention and eradication programs based on the disease and species involved, in accordance with accepted animal health standards, animal welfare principles, public health, and environmental protection.

1. Programme and structure of the discipline

Modules and topics	Hours					
	Full-time					
	Total	including				
		L	Lab	P	Ind	Self
1	2	3	4	5	6	7
Module 1. Morphology, taxonomy and physiology of microorganisms						
Topic 1. Introductory lecture. Subject and problems of microbiology.		2	2	2		6
Topic 2. Morphology and taxonomy of microorganisms.		2	2	2		6
Topic 3. Morphology of microscopic fungi and base of their taxonomy.		2	2	2		6
Total for module 1.	**36**	**6**	**6**	**6**		**18**
Module 2. Genetics and ecology of microorganisms						
Topic 4. Physiology of microorganisms.		2	2	2		6
Topic 5. Genetics of microorganisms.		2	2	2		6
Topic 6. Ecology of microorganisms.		2	2	2		6
Total for module 2.	**36**	**6**	**6**	**6**		**18**

Module 3. Bacterial causative agents of animals: bacilli, clostridia, cocci, enterobacteria.						
Topic 7. The causative agent of anthrax.		2	2	2		6
Topic 8. Pathogenic cocci.		2	2	2		6
Topic 9. Causative agent of anaerobic infections.		2	2	2		6
Topic 10. Pathogenic enterobacteria		2	2	2		6
Total for module 3.	**48**	**8**	**8**	**8**		**24**
Module 4. Bacterial pathogens of animals: listeria, pasteurella, yersinia, leptospira, mycoplasma, chlamydia, rickettsia.						
Topic 11. Brucella and tularemia pathogen		2	2	2		6
Topic 12. The causative agent of tuberculosis.		2	2	2		6
Topic 13. The causative agent of swine. Pasterellosis. Listeriosis.		2	2	2		6
Topic 14. Pathogenic leptospira.		2	2	2		6
Topic 15. Pathogenic mycoplasmas. Chlamydia and Rickettsia.		2	2	2		6
Total for module 4.	**60**	**10**	**10**	**10**		**30**
Total hours	**180**	**30**	**30**	**30**		**90**

2. Topics of lectures

#	Topic	Hours
Module 1. Morphology, taxonomy and physiology of microorganisms		
1	Topic 1. Introductory lecture. Subject and problems of microbiology.	2
2	Topic 2. Morphology and taxonomy of microorganisms.	2
3	Topic 3. Morphology of microscopic fungi and base of their taxonomy.	2
Module 2. Genetics and ecology of microorganisms		
4	Topic 4. Physiology of microorganisms.	2
5	Topic 5. Genetics of microorganisms.	2
6	Topic 6. Ecology of microorganisms.	2
Module 3. Bacterial causative agents of animals: bacilli, clostridia, cocci, enterobacteria.		
7	Topic 7. The causative agent of anthrax.	2
8	Topic 8. Pathogenic cocci.	2
9	Topic 9. Causative agent of anaerobic infections.	2
10	Topic 10. Pathogenic enterobacteria	2
Module 4. Bacterial pathogens of animals: listeria, pasteurella, yersinia, leptospira, mycoplasma, chlamydia, rickettsia.		
11	Topic 11. Brucella and tularemia pathogen	2
12	Topic 12. The causative agent of tuberculosis.	2
13	Topic 13. The causative agent of swine. Pasterellosis. Listeriosis.	2

14	Topic 14. Pathogenic leptospira.	2
15	Topic 15. Pathogenic mycoplasmas. Chlamydia and Rickettsia.	2
Total hours		**30**

3. Topics of practical classes

#	Name of Topic	Hours
Module 1. Morphology, taxonomy and physiology of microorganisms		
1	Rules and safety at work in the microbiological laboratory. Light microscope. The main forms of bacteria	5
2	Preparation, fixation and staining of smears simple method. Special staining techniques of bacteria	5
3	The study of bacteria in the living state. Morphology of microscopic fungi and their methods research.	5
Module 2. Genetics and ecology of microorganisms		
4	Methods of sterilization. Equipment in Microbiology laboratory. Nutrient media for culturing microorganisms.	5
5	Technology seeding bacteria on nutrient media. Pure cultures of microorganisms.	5
6	Cultural properties of microorganisms. Biochemical properties of microorganisms.	5
Total hours		**30**

4. Topics of laboratory classes

#	Name of Topic	Hours
Module 3. Bacterial causative agents of animals: bacilli, clostridia, cocci, enterobacteria.		
1	Effect on bacteria physical, chemical and biological factors. Methods for studying microbial antagonism. Sanitary and microbiological objects of the environment.	2
2	The causative agent of anthrax. Pathogenic coccus.	4
3	Pathogenic clostridia.	2
4	The causative agent of colibacillosis and salmonellosis	4
Module 4. Bacterial pathogens of animals: listeria, pasteurella, yersinia, leptospira, mycoplasma, chlamydia, rickettsia.		
5	The causative agent of brucellosis. The causative agent of intestinal yersiniosis.	4
6	The causative agent of tuberculosis. The causative agent of pseudotuberculosis. The causative agent of leptospirosis.	2
7	The causative agent of erysipelas. Listeria. The causative agent of pasteurellosis.	4
8	Pathogenic mycoplasmas. Chlamydia and Rickettsia.	4
9	Pathogens of mycoses and mycotoxicosis.	4
Total hours		**30**

5. Topics of self-work

#	Name of Topic	Hours
Module 1. Morphology, taxonomy and physiology of microorganisms		
1	The use of microorganisms in various fields (food, pharmaceutical, medical, oil refining, etc.).	6
2	Methods of preservation of microorganisms. Methods of lyophilic drying of microorganisms.	6
3	Chemical nature, classification and functions of microbial toxins.	6
Module 2. Genetics and ecology of microorganisms		
4	Bacteria as possible agents of bacteriological weapons	6
5	Sanitary-indicative microorganisms	6
6	Immune prophylaxis and immunotherapy of infectious diseases	6
Module 3. Bacterial causative agents of animals: bacilli, clostridia, cocci, enterobacteria.		
7	The causative agent of borreliosis (biology, pathogenic properties, laboratory diagnosis)	6
8	Proteus as pathogens of food poisoning	6
9	Staphylococcal toxicosis (etiology, pathogenesis, laboratory diagnosis)	6
10	Pathogens of hemophilia (biology, pathogenic properties, laboratory diagnosis)	6
Module 4. Bacterial pathogens of animals: listeria, pasteurella, yersinia, leptospira, mycoplasma, chlamydia, rickettsia.		
11	Allergic methods for the diagnosis of zoonoses	6
12	Pathogens of mycotoxicosis	6
13	The causative agent of intestinal yersiniosis (biology, pathogenic properties, laboratory diagnosis)	6
14	Listeria as a causative agent of food poisoning	6
15	Pathogenic spirochetes in human infectious pathology	6
Total hours		**90**

6. Methods of assessing expected learning outcomes:

– oral or written survey;
– test;
– self-assessment.

7. Teaching methods*:*

– problem-based method;
– practice oriented studying method;
– project education method;
– team work, brainstorm method
– gamification studying method.

8. Results assessment.

The student's knowledge is assessed by means of a 100-point scale converted into the national grades according to the "Exam and Credit Regulations at NULES of Ukraine" in force.

8.1 Distribution of points by types of learning activities

Educational activity	Results	Assessment
Module 1. Morphology, taxonomy and physiology of microorganisms		
Laboratory Work 1.	Be able to use a light microscope; prepare bacterial slides for microscopy using simple staining methods.	**18**
Self-work 1.	Know about the use of microorganisms in various industries (food, pharmaceutical, medical, oil refining, etc.).	**5**
Laboratory Work 2.	Be able to apply advanced staining techniques to study the morphology of microorganisms and differentiate them.	**18**
Self-work 2.	Know methods for preserving microorganisms, including lyophilization (freeze-drying).	**5**
Laboratory Work 3.	Be able to study bacteria in their living state.	**18**
Self-work 3.	Know the chemical nature, classification, and functions of microbial toxins.	**6**
Modular Test 1.	Test	**30**
Total for module 1.		**100**
Module 2. Genetics and ecology of microorganisms		
Laboratory Work 4.	Be able to microscopically examine microscopic fungi and cultivate them.	**18**
Self-work 4.	Know about bacteria as potential agents of bacteriological weapons.	**5**
Laboratory Work 5.	Be able to prepare and sterilize glassware, instruments, and nutrient media for bacteriological research. Master bacteriological techniques and isolate pure bacterial cultures.	**18**
Self-work 5.	Know about microorganisms as bio degraders of industrial waste.	**5**
Laboratory Work 6.	Be able to collect samples of water, soil, and air and perform their bacteriological examination; determine bacterial sensitivity to antibiotics.	**18**
Self-work 6.	Analyze the results of sanitary-microbiological assessments of objects.	**6**
Modular Test 2.	Test	**30**
Total for module 2.		**100**
Module 3. Bacterial causative agents of animals: bacilli, clostridia, cocci, enterobacteria.		
Laboratory Work 7.	Be able to study the effects of physical\chemical and biological factors on bacteria. Master methods for determining bacterial sensitivity to antibiotics.	**12**
Self-work 7.	Know the biology and laboratory diagnostic methods of the Lyme disease pathogen (Borrelia).	**5**

Laboratory Work 8.	Be able to collect samples of water, soil, and air and conduct bacteriological examinations of them.	**12**
Self-work 8.	Know about Proteus bacteria as causative agents of foodborne infections.	**5**
Laboratory Work 9.	Be able to detect and identify the anthrax pathogen. Analyze the results of bacteriological studies.	**13**
Self-work 9.	Know the biology and laboratory diagnostic methods of the intestinal yersiniosis pathogen.	**5**
Laboratory Work 10.	Be able to detect and identify causative agents of coccal infections. Analyze the results of bacteriological studies.	**13**
Self-work 10.	Know the biology and laboratory diagnostic methods of pathogens causing haemophilosis.	**5**
Modular Test 3.	Test	**30**
Total for module 3.		**100**
Module 4. Bacterial pathogens of animals: listeria, pasteurella, yersinia, leptospira, mycoplasma, chlamydia, rickettsia.		
Laboratory Work 11.	Be able to detect and identify pathogens of anaerobic infections. Analyze the results of bacteriological studies.	**10**
Self-work 11.	Know about allergic diagnostic methods for zoonoses.	**4**
Laboratory Work 12.	Be able to detect and identify pathogens of pasteurellosis, listeriosis, and erysipelas. Analyze the results of bacteriological studies.	**10**
Self-work 12.	Know the biology and laboratory diagnostic methods of mycotoxicosis pathogens.	**4**
Laboratory Work 13.	Be able to detect and identify pathogens of leptospirosis and brucellosis. Analyze the results of bacteriological studies.	**10**
Self-work 13.	Know the biology and laboratory diagnostic methods of the bubonic plague pathogen.	**4**
Laboratory Work 14.	Be able to detect and identify the tuberculosis pathogen. Analyze the results of bacteriological studies.	**10**
Self-work 14.	Know the biology and laboratory diagnostic methods of the leprosy pathogen.	**4**
Laboratory Work 15.	Be able to detect and identify pathogens of salmonellosis and escherichiosis. Analyze the results of bacteriological studies.	**10**
Self-work 15.	Know the biology and laboratory diagnostic methods of the syphilis pathogen.	**4**

Modular Test 4.	Test	**30**
Total for module 4.		**100**
Class work		**(M1 + M2+M3+M4)/4*0,7 ≤ 70**
Exam/credit		**30**
Total for year		**(Class work + exam) ≤ 100**

8.2 Scale for assessing student's knowledge

Student's rating, points	National grading (exam/credits)
90-100	excellent
74-89	good
60-73	satisfactory
0-59	unsatisfactory
Student's rating, points	National grading (exam/credits)

8.3Assessment Policy

Policy on Deadlines and Retakes	Assignments submitted late without valid reasons will receive a lower grade. Module retakes are allowed only with the lecturer's permission and in case of valid reasons (e.g., medical leave).
Policy on Academic Integrity	Cheating during tests and exams is prohibited, including the use of mobile devices. Written assignments must include proper citations for all referenced literature.
Policy on Attendance	Attendance is mandatory. In cases of valid reasons (e.g., illness, international internship), individual learning arrangements may be made with the approval of the faculty dean.

9. Teaching and learning aids:

1. **Electronic training course of the academic discipline** [Електронний ресурс]. – Режим доступу: https://elearn.nubip.edu.ua/course/view.php?id=1151

2. Kozlovska G. **Bioecology and pathogenicity of bacteria of the genus *Proteus*: literature review** // *Ukrainian Journal of Veterinary Sciences*. – 2023. – Vol. 15, No. 4. – P. 91–107. – DOI: 10.31548/veterinary4.2023.91

3. Kozlovska G. V., Melnyk M. V. **Veterinary Microbiology: textbook**. – Київ: ПК «Компринт», 2023. – 252 с.

4. McVey D. Scott, Kennedy Melissa, Chengappa M.M. **Veterinary Microbiology**. – 3rd ed. – Wiley-Blackwell, 2013. – 648 p.

5. Yehorov O. V., Malyuk M. O., Kozlovska G. V. **Sterility monitoring of cat stored donor blood** // *Ukrainian Journal of Veterinary Sciences*. – 2020. – Vol. 11, No. 1. – P. 143–152. – DOI: 10.31548/ujvs2020.01.015

6. Yehorov O. V., Malyuk M. O., Kozlovska G. V. **Sterility monitoring of canine packed red blood cells** // *Ukrainian Journal of Veterinary Sciences*. – 2021. – Vol. 12, No. 2. – P. 67–73. – DOI: 10.31548/ujvs2021.02.007

7. Zaviryukha H. A., Yanenko U. M., Vasylieva T. B., Kosyanchuk N. I., Sorokina N. H., Kozlovska H. V., Kravtsova O. L., Marchuk O. O., Muzykina L. M. **Influence of antibacterial agents on vaccine strains of Anthrax** // *Ukrainian Journal of Ecology*. – 2020. – Vol. 10, No. 5. – P. 29–35. – DOI: 10.15421/2020_202

8. **Ветеринарна мікробіологія: підручник** / В. Г. Скибіцький, В. В. Власенко, Г. В. Козловська та ін.; за ред. В. Г. Скибіцького, В. В. Власенка. – 2-ге вид., змін. і доп. – Київ: ЦП «Компринт», 2016. – 420 с.

9. **Індикація *Citrobacter* spp. у біологічному матеріалі, харчових продуктах, кормах та об'єктах довкілля: науково-практичні рекомендації** / О. В. Тімченко, Г. В. Козловська, В. П. Бердник, А. А. Кіт. – Харків: Стиль Іздат, 2018. – 24 с.

10. Козловська Г. В., Васильєва Т. Б., Мазур Т. В. **Ешерихіози тварин: монографія**. – Київ: ФОП Ямчинський О. В., 2021. – 113 с.

11. Козловська Г. В., Ібатулліна Ф. Ж., Мельник М. В. **Програма та методичні вказівки з навчальної практики з дисципліни «Ветеринарна мікробіологія»**. – Київ: ЦП «Компринт», 2017. – 14 с.

12. **Маласезіоз у тварин. Методичні рекомендації з діагностики, терапії і профілактики** / В. Г. Скибіцький, М. Ф. Туяхов, Г. В. Козловська, М. В. Мельник, Ф. Ж. Ібатулліна, О. А. Герасимова, А. В. Козловська. – Київ: НУБіП України, 2019. – 16 с.

10. Recommended sources of information

1. http://www.microbiologyonline.org.uk/media/transfer/doc/sgm_basic_practical_microbiology_2.pdf

2. http://www.imv.kiev.ua/index.php/ru/publications/magazin/archiv-magazinhttp://jcm.asm.org/

3. http://www.microbiologyinpictures.com/index.html

4. http://www.microbiologyinpictures.com/microbiology%20images%20links.html