NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Silviculture

ЗАТВЕРДЖЕНО
навчально-методичною комісією
ННІ лісового і садово-паркового господарства

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CURRICULUM OF ACADEMIC DISCIPLINE

PEST MANAGEMENT IN FORESTS OF EASTERN EUROPE

Field of knowledge Agricultural, Forestry, Fisheries and Veterinary medicine
Specialty H4 Forestry
Academic programme Forest Management in Eastern Europe
Institute Education And Research Institute Of Forestry And Landscape-Park Management
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(position, academic degree, academic title)

Kyiv – 2025 p.

Description of the discipline "PEST MANAGEMENT IN FORESTS OF EASTERN EUROPE"

Academic degree, specialty, academic programme		
Academic degree	*master's*	
Specialty	H 4 *Forestry*	
Academic programme	*Forest Management in Eastern Europe*	
Characteristics of the discipline		
Type	optional	
Total number of hours	120	
Number of ECTS credits	4,0	
Number of content modules	2	
Course project (work) (if applicable)	*Exam*	
Indicators of the course for full-time and part-time forms of study		
	Full-time form of study	Part-time form of study
Course (year of study)	2025–2026	2025–2026
Semester	2	2
Lecture classes	30 *hours*	12 *hours*
Practical, seminar classes	15 *hours*	12 *hours*.
Self-study	15 *hours*	-
Individual assignments	60 *hours*	96 *hours*
Number of weekly classroom hours for the full-time form of study	4 *hours*	

1. Aim, objectives, competences and expected learning outcomes of the discipline

The purpose of the discipline is to train masters of the English-language master's program on the ability to timely monitor and predict epiphytosis and outbreaks of pathogens and pests and prescribe appropriate measures to combat them. Objectives of the discipline: to ensure the timely assimilation of external signs of the pathological process of the disease on the tree plant; to teach masters to make a qualified short-term, long-term and long-term forecast for the main pathogens and pests.

The subject of the discipline is to study the basics of monitoring and forecasting epiphytosis and outbreaks of pathogens and pests, reasonable prediction of the timing, level of spread and development of the pest (disease) and possible phenomena and processes in the phytosanitary state of biocenoses in the future.

The purpose of the discipline is to train masters in the ability to timely monitor and predict epiphytosis and outbreaks of pathogens and pests and prescribe appropriate measures to combat them. Monitoring the spread and development of diseases is an integral part of integrated plant protection. Lack of monitoring makes it impossible to control and predict the phytosanitary situation in plantations, timely and effective application of protection systems. Without monitoring and forecasting, the epiphytosis of many dangerous diseases, significant losses, and overspending of material and technical means are inevitable. In limiting the prevalence of forest pathogens, the main role is played by increasing the natural immunity of woody plants against infections, creating stable phytocenoses, reducing the virulence of pathogens, as well as the destruction of pathogens. The main direction should be different ways of influencing the environment, taking into account the specific environmental characteristics of forest growth.

Disease prognosis and modeling of pathogens are based on knowledge of the causes of forest diseases, biological characteristics of their pathogens, patterns of environmental conditions and meteorological factors on the virulence of the pathogen and the resistance of the host plant, the stock of infectious minimum and more. In the systems of forest protection measures a significant role should be played by general organizational: supervision, forest pathological examinations, mapping of current and potential foci of infection, study of patterns of epiphytosis, their prediction. These measures should be carried out on a forest typological basis, taking into account natural areas, in the zonal section. Accurate and timely forecasting is one of the important links in monitoring. Predictions are theoretically possible for the vast majority of diseases and for different periods. As a rule, they are based on the materials of forest pathological examinations, analysis of climatic factors and weather forecasts.

Although prediction is currently well developed for entomological objects, it is clearly insufficient for pathogens. Thus, mathematical models for predicting disease epiphytosis have been developed for only a few species of pathogens. Disease prognosis and modeling of pathogens are based on knowledge of the causes of forest diseases, biological characteristics of their pathogens, patterns of environmental

conditions and meteorological factors on the virulence of the pathogen and the resistance of the host plant, the stock of infectious origin and more.

The objectives of the discipline: to ensure the timely assimilation of external signs of the pathological process of the disease on a tree plant; to teach masters to make qualified short-term, long-term and long-term forecasts for the main pathogens and pests.

The subject of the discipline is to study the basics of monitoring and forecasting epiphytosis and outbreaks of pathogens and pests, reasonable prediction of timing, level of spread and development of pests (diseases) and possible phenomena and processes in the phytosanitary state of biocenoses in the future.

The main competencies of the student: the ability to use professional forestry knowledge and practical skills and scientific advice for the organization and effective operation of protective systems for various purposes.

Prerequisites for studying the course: studying the course requires that you have a basic knowledge of botany, entomology, phytopathology, soil science, meteorology, physics.

Acquisition of competencies:

Integral competence (IC):

The ability to solve complex tasks and problems in the field of forestry and hunting or in the process of learning, which involves conducting research or implementing innovations and is characterized by the uncertainty of conditions and requirements.

General competencies

GC 7. Ability to work in an international context.

Special (professional, subject) competencies

GC 3. Ability to assess regional features of natural and climatic conditions for the organization of efficient forestry, the implementation of forest functions of various functions and increase forest area.

Program learning outcomes (PLO):

PLO 2. Fluently communicate orally and in writing in Ukrainian and foreign languages when discussing professional issues, research and innovation in the field of forestry.

2. Programme and structure of the discipline for:

full-time (part-time) form of study

Names of content modules and topics	Number of hours											
	Full-time form						Part-time form					
	weeks	including					total	including				
		l	p	lab	ind	self		l	p	lab	ind	self
Content Module №1. PHYTOSANITARY MONITORING OF FOREST STANDS												
Topic 1. Ecology and Dynamics of Forest Diseases	14	3	2	1		9	14	1	1			12
Topic 2. Ecological groups of microorganisms of forest biocenoses: theoretical and applied aspect	13	2	1	1		9	13	1	1			11
Topic 3. Phytosanitary monitoring of dominant pests	13	2	1	1		9	13	1	1			11
Topic 4. Monitoring of dominant pathogens of woody plants	13	2	1	1		9	13	1	1			11
Topic 5. Methods and technology of pathological examinations	12	2	1	1		8	13	1	1			11
Topic 6. Basics of forecasting. Types of forecasts	12	2	1	1		8	12	0.5	0.5			11
Topic 7. Prediction of mass outbreaks of insect number	12	2	1	1		8	12	0.5	0.5			11
Total Content Module 1	90	15	8	7		60	90	6	6			78
Content Module №2. INTEGRATED FOREST PROTECTION IN EASTERN EUROPE												
Topic 8. Leaf Defoliation and Discoloration	13	2	1	1		9	13	1	1			11
Topic 9 Integrated pest management (part 1)	13	2	1	1		9	13	1	1			11
Topic 10. Integrated pest management (part 2)	13	2	1	1		9	13	1	1			11
Topic 11. Beneficial insects in the forest	13	2	1	1		9	13	1	1			11
Topic 12. Birds and bats for pest suppression	12	2	1	1		8	12	0.5	0.5			11
Topic 13. Weeds in the forest	12	2	1	1		8	12	0.5	0.5			11
Topic 14. Plant quarantine	14	3	1	2		8	14	1	1			12
Total Content Module 2	90	15	7	8		15	90	6	6			78
Total hours	180	15	15	15		30	180	12	12			156

3. Topics of lecture

№	Topic title	Hours
1	Ecology and Dynamics of Forest Diseases	3
2	Ecological groups of microorganisms of forest biocenoses: theoretical and applied aspect	2
3	Phytosanitary monitoring of dominant pests	2
4	Monitoring of dominant pathogens of woody plants	2
5	Methods and technology of pathological examinations	2
6	Basics of forecasting. Types of forecasts	2
7	Prediction of mass outbreaks of insect number	2
8	Leaf Defoliation and Discoloration	2
9	Integrated pest management (part 1)	2
10	Integrated pest management (part 2)	2
11	Beneficial insects in the forest	2
12	Birds and bats for pest suppression	2
13	Weeds in the forest	3
14	Plant quarantine	2

4. Topics of practical classes

№	Topic title	Hours
1	Different types of pests	3
2	Pests on different parts of trees	2
3	Classification of diseases	2
4	Classification of fungi	2
5	Classification of weeds	2
6	Forecasting the spread of rots of woody plants	2
7	Forecasting the development of diseases of woody plants	2
8	Insects and deseases of Quercus robur L.	2
9	Insects and deseases of Pinus sylvestris L.	2
10	Insects and deseases of Betula pendula L.	2
11	Insects and deseases of Acer platanoides L.	2
12	Insects and deseases of Aesculus hippocastanum L.	2
13	Methods of IPM	3
14	The crown canopy classes, leaf defoliation and discoloration	2

5. Independent work topics

№	Topic title	Hours
1	Forecasting the spread of insects of woody plants	60
2	Features of monitoring pests of ornamental plants	60

6. Tools for assessing expected learning outcomes:

- exam;
- credit;
- module tests;
- abstracts;
- presentation of laboratory and practical works;

7. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- practical method (practical classes);
- visual method (illustration, demonstration);
- processing learning resources (note-taking,summarising, reviewing, writing an abstract);
- video method (remote, multimedia, web-based, etc.);
- self-study (completing assignments);
- individual research work;

8. Assessment methods:

Student knowledge is evaluated on a 100-point scale and converted to a national grade according to the current "Regulations on Exams and Credits at NUBiP of Ukraine."

8.1.Distribution of points by type of academic activity

Topic	Learning outcomes	Evaluation
Module 1. Phytosanitary monitoring of forest stands (PLO 2**)**		
Topic 1. Ecology and Dynamics of Forest Diseases	Know the basics of forest biocenology as a component of forest protection. To study the causes of non-infectious pathologies of forests: windbreaks and snowdrifts, snowdrifts, snow, frost and ice, excessive moisture, drought, erosion processes, industrial emissions, recreational loads, forestry activities. cancer and vascular diseases	**10**
Topic 2. Ecological groups of microorganisms of forest biocenoses: theoretical and applied aspect	Analyse ways to preserve pathogens in adverse conditions and winter. There are primary and secondary infections. Place the types and periods of penetration of pathogens in the resident plant: through intact external protected tissue, root hairs, roots, flowers, seeds, through natural holes (stomata, lentils, etc.) through various mechanical damage and wounds. Learn the terms: inoculation, infectious downloads.	**10**
Topic 3. Phytosanitary monitoring of dominant pests	Distinguish ecological groups of microorganisms: soil saprotrophs, forest soil saprotrophs, xylotrophs, saprotrophs, xylotrophs-parasites. Distinguish mycorrhizal fungi, fungi-caprotrophs, fungi-carbonyls, fungi-mycophiles. Know the peculiarities of the nutrition of microorganisms. To study the ecology and dynamics	**10**

	of pathogens of woody plants and terminology in forest pathology.	
Topic 4. Monitoring of dominant pathogens of woody plants	Know bacteria, viruses, rickettsiae, mycoplasmas as integral components of the forest biocenosis. Know the role of microorganisms in the processes of small circulation and in forest pathology and trophic connections. Features of distribution and differences of bacterioses, viruses, rickettsitosis, mycoplasmosis. Know the basic research methods.	**10**
Topic 5. Methods and technology of pathological examinations	Know the features of monitoring, ferromonitoring. Get acquainted with traditional methods of monitoring pathogens, the nature of the formation and localization of diapause stages, critical periods of development of pathogens. Distinguish between phenological and synoptic forecast.	**10**
Topic 6. Basics of forecasting. Types of forecasts	To study the features of monitoring, development and harmfulness of the dominant pathogens. Be able to predict the spread and harmfulness. Know sampling methods.	**10**
Topic 7. Prediction of mass outbreaks of insect number	To study the features of monitoring pathogens on buds, leaves and fruits. Be able to conduct surveys of forest crops and young growth, medieval plantations. Know the basics of forest pathological monitoring. Analysis of world trends in modern technologies of biomethod development.	**10**
Credit test 1		**30**
Total Module 1.		**100**
Module 2. Integrated forest protection in eastern Europe (PLO 2**)**		
Topic 8. Leaf Defoliation and Discoloration	Know the general basics of forecasting. Distinguish types of forecast, their purpose. Acquaintance with the rules of forecasting: short-term, long-term, long-term. Assess the factors that affect the intensity of plant damage and the course of the disease. To study the types of infectious chains. Be able to develop a mathematical model for long-term prediction of pathogens, taking into account the conditions for their favorable development.	**10**
Topic 9. Integrated pest management (part 1)	Phytosanitary and climatic information for forecasting. Ecological and biological features of the causative agents of major diseases of needles and leaves. Drawing up a protection system based on the results of the forecast. Drawing up a protection system based on the results of the forecast. Compilation of nomograms to determine the timing of chemical treatments against diseases of pine needles and leaves according to meteorological data. Construction of prognostic models of epiphytosis of pine and leaf diseases.	**10**
Topic 10. Integrated pest management (part 2)	Analyse phytosanitary and climatic information for forecasting. Study of ecological and biological features of pathogens of major vascular diseases. Study of ecological and biological features of the causative agents of major cancers. Make a prognosis for the development of the	**10**

	causative agent of poplar cytosporosis, infectious drying of oak, pine sulfur cancer, larch cancer, vascular mycosis of oak, elm graphosis, pine cancer. Drawing up a protection system based on the results of the forecast. Forecasting the spread of vascular and root diseases on the basis of phytosanitary and meteorological information.	
Topic 11. Beneficial insects in the forest	Analyse the integrated-dynamic theory of mass reproduction of pests. Know the regulatory mechanisms of the dynamics of the number of major coniferous and leaf-eating species of pests. Know the basics of predicting mass outbreaks of leaf-eating, coniferous rodents, stem and polyphagous pests. Drawing up a protection system based on the results of the forecast. Construction of prognostic models of mass outbreaks of pests.	**10**
Topic 12. Birds and bats for pest suppression	Analyse the problems facing forest protection in terms of modeling. To have an idea of the mathematical model and the universal method of cognition of reality - the method of mathematical modeling. Know the main parameters of the model - realism, accuracy, generality. Identify the main stages of modeling complex systems: problem selection; setting a task and limiting the degree of its complexity; defining a hierarchy of goals and objectives; choice of ways to solve the problem; modeling; evaluation of possible strategies; implementation of results.	**10**
Topic 13. Weeds in the forest	Ability to mathematically formalize a real object. Know the main types of mathematical models: deterministic and stochastic; static and dynamic; constructive and descriptive (descriptive); matrix; optimization; self-organizing; simulation models and their general characteristics.	**10**
Topic 14. Plant quarantine	Know the main factors of population size: initial (initial) population size (density); weather conditions (biohydrothermal index (BHTI); entomophages and pathogens; resistance and protective reaction of the plantation). Know the critical periods in the development of major coniferous and leaf-eating pests and the number of generations required to analyse the weather conditions that have developed for them. Be able to calculate BHTI conditions for the development of coniferous and leaf-eating forest pests and the appropriate level of threat to plantations.	**10**
Credit test 1		**30**
Total Module 2.		**100**
Total		**(M1 + M2)/2*0,7 ≤ 70**
Exam		**30**
Total per course		**(Total + Exam) ≤ 100**

9. Distribution of points received by students

The assessment of students' knowledge and skills is conducted by means of a 100-point scale and is converted into national grades according to Table 1 of the current *Exam and Credit Regulations at NULES of Ukraine*.

Student rating, points	National grade based on exam results	
	Exams	Credits
90-100	Excellent	Passed
74-89	Good	
60-73	Satisfactory	
0-59	Unsatisfactory	Not passed

To determine a student's rating in the discipline $\mathbf{R_{DIS}}$ (up to 100 points), the received assessment rating $\mathbf{R_A}$ (up to 30 points) is added to the academic performance raiting $\mathbf{R_{AP}}$ (up to 70 points): $\mathbf{R_{DIS}} = \mathbf{R_{AP}} + \mathbf{R_A}$.

9. Teaching and learning aids

- e-learning course of the discipline (https://elearn.nubip.edu.ua/course/view.php?id=4318*)*;
- lectures and presentations (in electronic form);
- manuals, tutorials;

1. Tokareva O.., Meshkova V.., Puzrina N. Pest management in Forests of Eastern Europe. Kyiv: NULES of Ukraine Publishing house. 285 p.

- guidelines for studying a discipline by full-time and part-time students;
- internship programmes of the discipline (if included in the curriculum).

- methodical materials on the study of the academic discipline for students of higher education full-time and part-time forms of higher education;
- the program of educational practice of the academic discipline.

10.Recommended sources of information

1. Bohumil Stary. Atlas of Insects Beneficial to Forest Trees, Elsevier . 1988. 100 p.
2. David G. James. Beneficial Insects, Spiders, and Other Mini-Creatures in Your Garden. Washington : Washington State University, 2014. 21 p.
3. Hanisch B., Kilz E. Monitoring of Forest Damage: Spruce and Pine, 1991. 334 p.

4. Lakatos F., Mirtchev S. Manual for visual assessment of forest crown condition. FAO. 2014. 23 p.

5. Marshall Bradley, Fern, Barbara W. Ellis, and Deborah L. Martin, eds. The Organic Gardener's Handbook of Natural Pest and Disease Control: A Complete Guide to Maintaining a Healthy Garden and Yard the Earth-Friendly Way. New York: Rodale Press, 2010. 408 p.

6. Miller K. V., Miller J. H. Forestry herbicide influences on biodiversity and wildlife habitat in southern forests. Wildlife Society Bulletin, 2004. Vol.32, No. 4, 1049–1060.

7. Morris J. M. The use of plant pathogens for biological weed control in South Africa. Agriculture Ecosystems & Environment, 1991. Vol.37, No.1-3, 239–255.

8. Sandy Perry, Carolyn Randall. Forest Pest Management. Michigan : Michigan State University, 2000 111 p.

9. Sow A., Seye D., Faye E., Benoit L., Galan M., Haran J., Brevault T. Birds and bats contribute to natural regulation of the millet head miner in tree-crop agroforestry systems. Crop Protection, 2020. 32 p.

10. Vasic V., Konstantinovic B., Orlovic S. Weeds in Forestry and Possibilities of Their Control, 2012. 26 p.

11. Forests. Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests. Hamburg, Germany. 2010. URL : http://www.icp-forests.org/Manual.htm.

12. Frank S., Bradley L., Moore K. Integrated Pest Management. 2018. URL : http://content.ces.ncsu.edu/8-integrated-pest-management-ipm.

13. Klass C., Hoffmann M.P. Attracting Beneficial Insects. 2014. URL : http://blogs.cornell.edu/horticulture/about/basic-gardening-info/garden-beneficialinsects/

14. Merrill Richard. Attracting Beneficial Insects to the Garden with Beneficial Flowers. Renee's Garden. 2014. URL : http://www.reneesgarden.com/articles/beneficials.html.

15. Pest Management Options: Birds and Bats for Pest Suppression. URL : https://intermountainfruit.org/pest-management/birds-bats.

16. Plant Quarantine. URL : https://www.bioversityinternational.org/fileadmin/bioversity/publications/Web_version/174/ch09.htm.

17. Sanitary rules in the forest of Ukraine. URL : https://zakon.rada.gov.ua/laws/show/555-95-%D0%BF#Text.

18. The Law of Ukraine On Plant Quarantine. URL : http://www.vertic.org/media/National%20Legislation/Ukraine/UA_Law_Plant_Quarantine.pdf.