

**NATIONAL UNIVERSITY OF LIFE
AND ENVIRONMENTAL SCIENCES OF UKRAINE**

Department Forest Restoration and Meliorations

“APPROVED”

by the Director of the Education
and Research Institute of Forestry
and Landscape-Park Management
Roman VASYLYSHYN

“ ” June 2025

“APPROVED”

at the meeting of the Department
Forest Restoration and Meliorations
Minutes № 27 of “10” June 2025
Head of the Department
Andrii PINCHUK

“REVIEWED ”

Guarantor of the AP
“Forestry”
Oleksandr BALA

CURRICULUM OF ACADEMIC DISCIPLINE
Agroforestry systems, practices and technologies

Area of knowledge 20 “Agrarian sciences and food production

Specialty 205 “Forestry”

Academic program “Forestry”

Institute Education and Research Institute of Forestry
and Landscape-Park Management

Developed by: Professor of the Forest Restoration and Meliorations Department,
Doctor of Sciences, Professor Vasyl Yukhnovskyi
(position, academic degree, academic title)

Associate Professor of the Forest Restoration and Meliorations
Department, Candidate of Sciences, Oleksandr Sovakov
(position, academic degree, academic title)

Associate Professor of the Forest Restoration and Meliorations
Department, Candidate of Sciences Ganna Lobchenko
(position, academic degree, academic title)

Kyiv – 2025

Description of the discipline Agroforestry systems, practices and technologies

The course covers the peculiarities of agroforestry approaches, the impact of protective plantings of various structural features on reducing wind speed, distributing the canopy cover, and improving soil condition and microclimate. The directions of spatial distribution, management, and impact of agroforestry approaches are analyzed.

Area of knowledge, specialty, academic programme, academic degree		
Academic degree	Master	
Specialty	205 “Forestry”	
Academic programme	Forestry	
Characteristics of the discipline		
Type	Selective	
Total number of hours	180	
Number of ECTS credits	6	
Number of modules	3	
Course project (work) (if any)	-	
Form of assessment	Exam	
Indicators of the discipline for full-time and part-time forms of university study		
	University study	
	Full-time	Part-time
Year of study	2	
Term	3	
Lectures	20 hr.	
Practical classes and seminar	20 hr.	
Laboratory classes		
Self-study	140 hr.	
Individual assignments		
Number of hours per week for full-time students	4 hr.	

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

The aim of the discipline is to study the impact of woody plant species on improving soil conditions and environment, agro-landscapes by creating different types of agroforestry plantations, their spatial location and management of agroforestry plantations.

The subject of the discipline "Agroforestry systems, practices, technologies" is a system of general principles and approaches related to scientific and practical activities in the field of agroforestry, forestry and urban ecology, and landscape science.

The objectives of the discipline are:

- acquisition of skills to apply the theoretical knowledge obtaining in the learning process on agroforestry, phytomelioration, urban ecology.
- gaining experience in the ability to substantiate agroforestry approaches to the design and creation of agroforestry plantations, optimization of the ecological component.

Competences acquired:

Integral competence (IC):

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

General competence (GC)

GC 7. Ability to work in an international context.

Special (professional) competences (SC)

SC 3. The ability to evaluate regional peculiarities of natural and climatic conditions for the organization of effective agroforestry, the performance of various functions by forests and the increase of forest areas.

SC 5. Ability to integrate knowledge and solve complex forestry problems in broad or multidisciplinary contexts

Expected learning outcomes (ELO):

ELO 1. Specialized conceptual knowledge, which includes modern scientific achievements in the field of agroforestry and is the basis for original thinking, ensuring sustainable development and conducting research.

ELO 2. Communicate freely orally and in writing in Ukrainian and foreign languages when discussing professional issues, research and innovations in the field of forestry.

ELO 4. Search for necessary data in scientific literature, databases and other sources, analyze and evaluate these data;

ELO 7. Develop and implement scientific and applied projects in the field of forestry, taking into account available resources and risks, as well as economic, legal and environmental aspects.

ELO 11. Apply modern experimental and mathematical methods, digital technologies and specialized software to solve complex problems of forestry and hunting.

ELO 12. Conduct research and/or conduct innovative activities in order to obtain new knowledge and create new technologies and products in forestry and hunting and in wider multidisciplinary contexts.

2. Program and structure of the discipline

Modules and topics	Number of hours													
	Full-time							Part-time						
	weeks	total	including					total	including					
			<i>l</i>	<i>p</i>	<i>lab</i>	<i>ind</i>	<i>s.st</i>		<i>l</i>	<i>p</i>	<i>lab</i>	<i>ind</i>	<i>s.st.</i>	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Module 1. Structure, anthropogenic impacts and monitoring of agroforestry landscape														
Topic 1. Agroforestry is a key element of land use	1	16	2	2			46							
Topic 2. Structure of agroforestry landscape and anthropogenic impacts	2-3	28	4	4										
Topic 3. Agroforestry monitoring	4-5	16	2	-										
Total for module 1		60	8	6			46							
Module 2. Aboveground and Belowground Interactions in Tree-Crop Agroforestry														
Topic 4. Differentiation of the territory according to erosion processes	6	20	2	4			47							
Topic 5. Methods of conducting research on wind speed and snow accumulation in	7-8	20	2	2										

field protective forest plantations													
Topic 6. Methods of planning and analyzing soil research in field protective forest plantations	9-10	20	2	2									
Total for module 2		60	6	8			47						
Module 3. Agroforestry and the Global Goals													
Topic 7. Agroforestry for ecosystem services and environmental benefits	11	26	2	4									
Topic 8. Social and economic implications of agroforestry for rural economic development	12-13	20	2	2			48						
Topic 9. Agroforestry practices implementation in Ukraine: current state, policy, challenges and prospective	14-15	14	2	-									
Total for module 2		60	6	6			48						
Total hours		180	20	20			140						

3. Topics of lectures

No.	Topic	Hours
1	Agroforestry is a key element of land use	2
2	Structure of agroforestry landscape and anthropogenic impacts	4
3	Agroforestry monitoring	2
4	Differentiation of the territory according to erosion processes	2
5	Methods of conducting research on wind speed and snow accumulation in field protective forest plantations	2
6	Methods of planning and analyzing soil research in field protective forest plantations	2
7	Agroforestry for ecosystem services and environmental benefits	2
8	Social and economic implications of agroforestry for rural economic development	2
9	Agroforestry practices implementation in Ukraine: current state, policy, challenges and prospective	2

4. Topics of practical classes

No.	Topic	Hours
1	Analysis of the structural components of the landscape.	2
2	Determination of anthropogenic loads on landscapes	4
3	Landscape modeling in Archicad	4
4	Simulation of wind speed reduction in fields under protection of windbreaks. Determination of total wind protection and uniformity coefficient	2
5	Simulation of analysis of soil properties in fields under protection of windbreaks.	2
6	Restoration Opportunities Assessment Methodology (ROAM) as a tool of involving	4

	agroforestry practices in forest landscape restoration and Individual Act	
7	PESTE analysis of Agroforestry practices implementation	2

5. Topics of self-study

No.	Topic	Hours
1.	Structure of agroforestry landscape and anthropogenic impacts	46
2.	Aboveground and Belowground Interactions in Tree-Crop Agroforestry	47
3.	SWOT-analysis of different agroforestry practice types	48

6. Methods of assessing expected learning outcomes:

In the process of studying the discipline, an explanatory and illustrative teaching method is used, with the help of which students gain knowledge in lectures and practical classes, from educational and teaching-methodical literature. This method is widely used when submitting a large array of information.

The method of problem presentation is used in the process of practical classes, when the teacher poses a problem to the presentation of the material, formulates a cognitive task based on various sources and means, and shows the method of solving the task.

7. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- video method (remote, multimedia, web-based, etc.);
- independent work (task completion);
- problem-based learning method;
- practice-oriented learning method;
- case method;
- project-based learning method;
- research-based learning method;
- educational discussions and debates;
- teamwork, brainstorming
- gamified learning 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 educational activities

Educational activity	Results	Assessment
Module 1. Structure, anthropogenic impacts and monitoring of agroforestry landscape		
Practical work 1. Analysis of the structural components of the landscape.	ELO. 1, 2, 4, 7, 11, 12. As well as analyze structural components of the landscape and determine anthropogenic pressures on landscapes. Formulate the structure of agroforestry landscapes and anthropogenic influences on them.	20
Practical work 2. Determination of anthropogenic loads on landscapes		40
Self-study 1. Structure of agroforestry landscape and anthropogenic impacts		10
Module control work 1. Module test		30
Total for module 1		100
Module 2. Aboveground and Belowground Interactions in Tree-Crop Agroforestry		
Practical work 3. Landscape modeling in ArchiCAD	ELO. 1, 2, 4, 7, 11, 12. Perform landscape modeling in ArchiCAD, model wind speed reduction and snow distribution depending on the influence of shelterbelts of various designs. Determine the overall wind protection	20
Practical work 4. Simulation of wind velocity reduction under protection of windbreaks. Determination of total wind protection and uniformity coefficient		20

Practical work 5. Simulation of analysis of soil properties in fields under windbreaks protection.	coefficient and uniformity coefficient. Perform modeling of soil properties in fields and determine the soil improvement coefficient.	20
Self-study 2. Aboveground and Belowground Interactions in Tree-Crop Agroforestry		10
Module control work 2. Module test		30
Total for module 2		100
Module 3. Agroforestry and the Global Goals		
Practical work 6. Restoration Opportunities Assessment Methodology (ROAM) as a tool of involving agroforestry practices in forest landscape restoration and Individual Act	ELO. 1, 2, 4, 7, 11, 12. Use the restoration potential assessment methodology as a tool for involving agroforestry in forest landscape restoration and individual actions. Conduct a PESTE analysis of agroforestry implementation and a SWOT analysis of its various types.	30
Practical work 7. PESTE analysis of Agroforestry practices implementation		20
Self-study 3. SWOT-analysis of different agroforestry practice types		20
Module control work 3. Module test		30
Total for module 3		100
Class work		70
Exam/credit		30
Total for year		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

8.3. Assessment policy

Deadlines and exam retaking rules	<i>EXAMPLE:</i> works that are submitted late without valid reasons will be assessed with a lower grade. Module tests may be retaken with the permission of the lecturer if there are valid reasons (e.g. a sick leave).
Academic integrity rules	<i>EXAMPLE:</i> cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct references to the literature used
Attendance rules	<i>EXAMPLE:</i> Attendance is compulsory. For good reasons (e.g. illness, international internship), training can take place individually (online by the faculty dean's consent)

9. Educational and methodological support

1. E-learning course of the discipline <https://elearn.nubip.edu.ua/course/view.php?id=4321>
2. Agroforestry. Working program, methodic advices to the practical classes and self-works for students of Education level «Bachelor» Specialty: 193 - Geodesy and land inventory / V. Yukhnovskyi, O. Sovakov, G. Lobchenko. K.: Comprint, 2024. 36 p.

3. Малюга В.М., Дударець С.М., Лобченко Г.О. Агролісомеліорація. Робоча програма, методичні поради для виконання практичних занять і самостійної роботи студентів освітнього ступеня «Бакалавр» спеціальність 193 – «Геодезія та землеустрій» К: ВЦ НУБІП України, 2020.

10. Recommended sources of information

1. Burgess PJ, Rosati A (2018) Advances in European agroforestry: results from the AGFORWARD project. *Afor Syst* 92:801–810. <https://doi.org/10.1007/s10457-018-0261-3>
2. Douglas G., Walcroft A., Hurst S. et al. Interactions between widely spaced young poplars (*Populus* spp.) and introduced pasture mixtures. *Agroforestry Systems*. 66(2). 2006. 165-178.
3. Forest restoration and melioration in Ukraine: origins, current state, challenges of the present and prospects in the anthropocene. Collective monograph (to the 100th anniversary of the Department of Forests Restoration and Forest Meliorations). K. NULESU, 2019. 350 p.
4. Garrett H., Buck L., Gold M. et al. Agroforestry: An Integrated Land-Use Management System for Production and Farmland Conservation. Resource Conservation Act (RCA) Appraisal of U.S. Agroforestry USDA Natural Resources Conservation Service, 1994. 58 p.
5. Graves AR, Burgess PJ, Palma JHN, Herzog F, Moreno G, Bertomeu M, Dupraz C, Liagre F, Keesman K, van der Werf W, de Nooy AK, van den Briel JPP (2007) Development and application of bio-economic modelling to compare silvoarable, arable, and forestry systems in three European countries. *Ecol Eng* 29:434–449. <https://doi.org/10.1016/j.ecoleng.2006.09.018>
6. Gruenewald H, Brandt BKV, Schneider BU, Bens O, Kendzia G, Hüttel RF (2007) Agroforestry systems for the production of woody biomass for energy transformation purposes. *Ecol Eng* 29:319–328. <https://doi.org/10.1016/j.ecoleng.2006.09.012>
7. Hasanuzzaman M. Classification of agroforestry systems – [Електронний ресурс], режим доступу: <http://hasanuzzaman.webs.com/forstudents.htm>.
8. Kuemmel B (2003) Theoretical investigation of the effects of field margin and hedges on crop yields. *Agr Ecosyst Environ* 95:387–392. [https://doi.org/10.1016/S0167-8809\(02\)00086-5](https://doi.org/10.1016/S0167-8809(02)00086-5)
9. Long AJ, Nair PKR (1999) Tree outside forests: agro-, community, and urban forestry. *New Forests* 17(1–3):135–174.
10. Moreno G, Aviron S, Berg S, Crous-Duran J, Franca A, García de Jalón S, Hartel T, Mirck J, Pantera A, Palma JHN, Paulo JA, Re GA, Sanna F, Thenail C, Varga A, Viaud V, Burgess PJ (2018) Agroforestry systems of high nature and cultural value in Europe: provision of commercial goods and other ecosystem services. *Agrofor Syst* 92:877–891. <https://doi.org/10.1007/s10457-017-0126-1>
11. Mosquera –Losada M., Moreno G., Pardini L. et al. Past, Present and Future of Agroforestry Systems in Europe. [Електронний ресурс]. Реж.дост.: http://www.agrooof.net/agrooof_researches/documents/201210_eu_agroforesterie.pdf.
12. Mosquera-Losada M-R., Pantera A., Rosati A., Amaral J., Smith J., Rigueiro-Rodn'guez A., Watte J., Dupraz C. What priorities for European Agroforestry? The First European agroforestry conference (Brussel, 9-10 October, 2012). 73.
13. Nuberg IK (1998) Effect of shelter on temperate crops: a review to define research for Australian conditions. *Agrofor Syst Int J* 41(1998):3–34.
14. Palma JHN, Graves AR, Burgess PJ, van der Werf W, Herzog F (2007) Integrating environmental and economic performance to assess modern silvoarable agroforestry in Europe. *Ecol Econ* 63:759–767. <https://doi.org/10.1016/j.ecolecon.2007.01.011>
15. Reidsma P, Ewert F, Lansink AO, Leemans R (2010) Adaptation to climate change and climate variability in European agriculture: the importance of farm level responses. *Eur J Agron* 32:91–102. <https://doi.org/10.1016/j.eja.2009.06.003>
16. Reisner Y., de Filippi, Herzog F. et al. Target regions for silvoarable agroforestry in Europe. *Ecological Engineering*. 29(4). 2007. P. 401–418.
17. Rigueiro-Rodriguez A., VcAdam J., Vosquera-Losada MR. Agroforestry in Europe Current Status and Future Prospect. Springer. 2009.

18. Sharma N., Singh R. Dry Matter Accumulation and Nutrient Uptake by Wheat (*Triticum aestivum* L.) under Poplar (*Populus deltoides*) Based Agroforestry System. *Agronomy*. 2012. Article ID 359673. 1–7.
19. Smith J, Pearce BD, Wolfe MS (2013) Reconciling productivity with protection of the environment: is temperate agroforestry the answer? *Renew Agric Food Syst* 28:1–13. <https://doi.org/10.1017/S1742170511000585>
20. Stancheva J., Bencheva S., Petkova K. et al. Possibilities for agroforestry development in Bulgaria: Outlooks and limitations. *Ecological Engineering*. 29(4). 382–387.
21. Агролісомеліорація. Терміни і визначення понять : ДСТУ ISO 4874:2007. [Чинний від 01.01.2009]. К. Держспоживстандарт України, 2010. 18 с. (Національний стандарт України).
22. Юхновський В.Ю. Агролісомеліорація: підручник / Юхновський В.Ю., Дударець С.М., Малюга В.М. К.: Кондор, 2012. 372 с.
23. Гладун Г.Б., Юхновський В.Ю. Агролісівництво як організаційно-просторове, екологічне і економічне удосконалення землекористування в Україні. Матеріали міжн. наук.-практ. конф. «Освіта, наука та інновації у лісовому і садово-парковому господарстві України в контексті регіональних та глобальних викликів». К. НУБіП України, 2010. С. 141–142.
24. Гладун Г.Б., Юхновський В.Ю. Перспективи розвитку агролісівництва в Україні. Матеріали конференції науково-педагогічних працівників, наукових співробітників і аспірантів та 63-ї студентської наукової конференції. К. НУБіП України. 2009. С. 130–132.
25. Лісові меліорації: підручник / [Пилипенко О.І., Юхновський В.Ю., Дударець С.М., Малюга В.М.] ; за ред. В.Ю. Юхновського. К. : Аграрна освіта, 2010. 282 с.
26. European agroforestry federation [Electronic resource] URL: www.agforward.eu . (дата звернення 06.06.2025 р.)
27. Pan-European Biological and Landscape Diversity Strategy and Landscape Strategy. URL: <http://www.unep.org/ro/PromotingBiodiversityConservation/tabid/54597/Default.aspx>. (дата звернення 06.06.2025 р.)
28. AFTA (Association for Temperate Agroforestry) Definitions. [Electronic resource] URL: <http://www.agroforestry.ac.uk/systems/index.html>. (дата звернення 06.06.2025.)
29. Food Agricultural Organization [Electronic resource] URL: <http://www.fao.org>. (дата звернення 06.06.2025 р.)
30. The Law of Ukraine "On Land Development" of January,14, 2000. Number 1389-XIV // *Governmental Courier*. 2000. № 29. Р. 3-10.
31. The Concept of Agroforestry in Ukraine [approved by the Cabinet of Ministers of Ukraine of September, 18, 2013. № 725-р].
32. Правила утримання та збереження полезахисних лісових смуг, розташованих на землях сільськогосподарського призначення (Постанова Кабінету Міністрів України від 22 липня 2020 р. № 650) URL: <https://zakon.rada.gov.ua/laws/show/650-2020-%D0%BF#Text> (дата звернення 06.06.2025 р.)