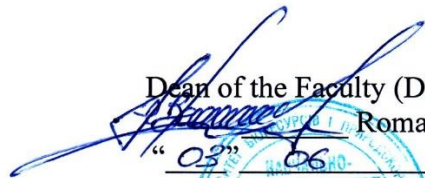



**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF  
UKRAINE  
EDUCATION AND RESEARCH INSTITUTE OF FORESTRY AND  
LANDSCAPE-PARK MANAGEMENT**

**Department of Silviculture**

**“CONFIRMED”**  
Dean of the Faculty (Director of Institute)  
  
Roman VASYLYSHYN  
“03” 06 2024 p.

**“APPROVED”**  
at the meeting of the department of Forestry  
Protocol №22 dated 28.05.2024 p.  
Head of Department  
  
Nataliia PUZRINA

**”REVIEWED ”**  
Program Coordinator of Forestry  
Program Coordinator  
  
Oleksandr BALA

**PROGRAM OF THE COURSE  
VEGETATION FIRES: SCIENCE & MANAGEMENT**

Specialization: 205 “Forestry”

Educational program: “Forestry”

Faculty (Institute): Education and Research Institute of Forestry and Landscape-Park  
Management

Developers:

Professor, Doctor of Agricultural Sciences Sergiy ZIBTSEV,

Associate Professor, Candidate of Science Oleksandr Soshenskyi

(position, academic degree, academic title)

Kyiv – 2024

## 1. Description of the course

### *Vegetation Fires: Science & Management*

(title)

<b>Field of knowledge, specialization, educational program, educational degree</b>		
Educational program	<i>Forestry</i>	
Specialization	<i>205 Forestry</i>	
Educational degree	<i>Master's</i>	
<b>Characteristics of the course</b>		
Type	Elective	
Total number of hours	180	
Number of ECTS credits	6,0	
Number of content modules	2	
Form of assessment	<i>Exam</i>	
<b>Indicators of the course for full-time and part-time forms of study</b>		
	Full-time form of study	Part-time form of study
Course (year of study)	<i>1</i>	<i>1</i>
Semester	<i>2</i>	<i>2</i>
Lecture classes	<i>30 hr</i>	<i>8 hr</i>
Practical, seminar classes	<i>30 hr</i>	<i>8 hr</i>
Laboratory classes	–	–
Self-study	<i>120 hr</i>	<i>164 hr.</i>
Individual assignments	–	–
Number of weekly classroom hours for the full-time form of study	<i>4 hr</i>	

## 2. Purpose, objectives, and competencies of the course

**Purpose:** consists in the formation of graduate students' knowledge and professional competences regarding the use of modern methods of research into the dynamics of the fire environment as a natural phenomenon in an environment caused by anthropogenic influence.

**Objectives:**

- study of patterns of occurrence and development of the burning process in natural ecosystems;
- study of the theoretical foundations of the formation and dynamics of the fire environment and the parameters that describe them;

- practical application of experiment planning, research methods of factors that influence the development of fires, including - accumulation and dynamics of fuels in different types of landscapes, pyrological state of ecosystems, fire climate, anthropogenic factors;
- study of methods of collecting experimental and analytical data for modeling the fires behavior at the level of a separate forest stand, landscape and region;
- study of research methods of post-pyrogenic successions in forest and other ecosystems;
- study of methods of collecting analytical and research information for the development of a warning system, extinguishing landscape fires and rehabilitation of ecosystems damaged by fires;
- study of methods of statistical processing of experimental data and mathematical modeling in studies of landscape fires;

**As a result of studying the discipline the student must:**

***Know:***

- the theory of the combustion process and the behavior of forest fires;
- theoretical provisions of the formation of the fire environment and the factors that determine it;
- classification of fuels, natural fire hazard and its dynamics in different landscapes;
- factors determining fire weather and its relationship with fire behavior;
- regularities of multi-year and seasonal dynamics of fire danger;
- fire regimes in different regions of Ukraine and the world and the factors that determine them;
- principles of fire management and forest fire policy;
- methods of forest pyrological research and mathematical and statistical processing of experimental results;

***Be able to:***

- to classify forest fuels by species, groups and role in the occurrence and development of forest fires;
- determine the humidity level and the drying coefficient of forest fuels;
- use meteorological data when calculating meteorological indicators of fire danger from weather conditions;
- apply methods of analysis and the main criteria of the actual combustibility of the forests of Ukraine;
- apply methods of compiling local scales of fire danger from weather conditions;

- apply methods of calculating the parameters of low-level forest fires.

### **Acquisition of competencies:**

*Integrated competency (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):* GC 5. Ability to develop and manage projects; GC 7. Ability to work in an international context.

*Professional (special) competencies (PC):* PC 2. Ability to ensure sustainable development of forestry; PC 4. The ability to develop and implement current and strategic plans for the development of forestry enterprises, considering resources, risks, as well as economic, legal, and environmental aspects.

### **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; PLO 3. Make effective decisions on forestry issues, including in difficult and unpredictable conditions; predict its development; determine the factors affecting the achievement of the set goals; analyze and compare alternatives; assess risks and likely consequences of decisions; PLO 5. Manage complex activities in the field of forestry and in wider contexts, ensure quality, evaluate the effectiveness and efficiency of activity; PLO 6. Assess the state of forest phytocenoses, forest resources in specific forest vegetation conditions, their potential and forecast opportunities for use; PLO 7. Develop and implement scientific and applied projects in the field of forestry, considering available resources and risks, as well as economic, legal and environmental aspects; PLO 8. Develop and improve technological and production processes, implement modern digital technologies; PLO 9. Determine efficiency criteria and choose the optimal forestry management strategy depending on external and internal conditions; PLO 11. Apply modern experimental and mathematical methods, digital technologies, and specialized software to solve complex problems of forestry and game management.

### 3. Program and structure of the course for:

- complete full-time (part-time) form of study;
- shortened full-time (part-time) form of study.

Names of content modules and topics	Number of hours													
	Full-time form							Full-time form						
	weeks	total	including					total	including					
			1	p	lab	ind	self		1	p	lab	ind	self	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Content Module 1. Theoretical foundations of fire environment dynamics and factors determining it														
Topic 1. Theoretical foundations of combustion and behavior of forest fires. Fire environment	1–3	36	6	6	–	–	24	30	1	1	–	–	28	
Topic 2. Fuels of landscape fires. Fire weather	4–6	36	6	6	–	–	24	40	2	2	–	–	36	
Topic 3. Fire regimes	7–10	32	6	6	–	–	20	30	2	2	–	–	26	
<b>Total for content module 1</b>	–	<b>104</b>	<b>18</b>	<b>18</b>	–	–	<b>68</b>	<b>100</b>	<b>5</b>	<b>5</b>	–	–	<b>90</b>	
Content Module 2. Fire management. Methods of landscape fire research														
Topic 4. Fire management	11–13	40	6	6	–	–	28	30	2	2	–	–	36	
Topic 5. Methods of landscape fire research	14–15	36	6	6	–	–	24	30	1	1	–	–	38	
<b>Total for content module 2</b>	–	<b>76</b>	<b>12</b>	<b>12</b>	–	–	<b>52</b>	<b>80</b>	<b>3</b>	<b>3</b>	–	–	<b>74</b>	
<b>Total hours</b>	–	<b>180</b>	<b>30</b>	<b>30</b>	–	–	<b>120</b>	<b>180</b>	<b>8</b>	<b>8</b>	–	–	<b>164</b>	

### 4. Practical class topics

№	Topic title	Number of hours
1	Classifications of forest fuels materials, their theoretical justification and the possibility of application for the conditions of Ukraine. Wetting and drying of forest fuels materials. Calculation of the drying coefficient of forest fuels.	6
2	The use of weather forecasts in the calculation of meteorological indicators of fire danger from weather conditions. The method of compiling local scales of fire danger from weather conditions.	6

3	Analysis of the actual combustibility of the forests of Ukraine. The main criteria for assessing the actual combustibility of forests in Ukraine.	6
4	Strategies and tactics of fire suppression. Planning of prescribed burning. Organization of prescribed burning. Forecasting the spread of smoke.	6
5	The process of burning forest fuels. Calculation of the main combustion parameters. Calculation of parameters of low-level forest fires.	6
Total hours		30

## 5. Self-study topics

№	Topic title	Number of hours
1	The behavior of fires, types of fires and factors influencing the development of fires. Properties and components of fuels and their complexes. Classification of fuels.	18
2	Preparation of a presentation based on the results of an assessment of the influence of stocks and humidity of fuels on the development of fires.	18
3	Preparation of a concise scientific report on fire sources and possibilities of fire prevention	18
4	Preparation of a concise scientific report on the significance of weather forecasts for fire prevention	18
5	Preparation of a presentation based on the results of studying the economic aspects of landscape fires.	18
Total hours		90

## 6. Samples of control questions, tests for assessing the level of knowledge acquisition by students

1. The nature of the forest and forest fires?
2. Define the concept of "burning"?
3. Foreign fire hazard assessment systems?
4. The influence of weather conditions on fire danger in the forest?
5. Methods of determining fire danger according to weather conditions in different countries?
6. Conditions for the occurrence and development of forest fires?

7. Influence of weather elements on the drying of forest fuels?
8. The influence of wind on the distribution of precipitation and the rate of drying of forest fuels?
9. Fire hazard assessment based on weather conditions in the forests of Ukraine?
10. Scale of fire danger?
11. Advantages and disadvantages of Nesterov's fire hazard index under weather conditions?
12. Fire hazard assessment according to the Canadian FWI system?
13. Devices for determining fire danger?
14. Analysis of the actual combustibility of forests?
15. The main criteria for assessing the actual combustibility of forests. Methods of their calculation?
16. Keeping fire statistics, identifying areas with the highest probability of fire occurrence?
17. The relationship between the meteorological indicator of fire danger and the daily number of fires?
18. Methodology for compiling local scales of fire danger according to weather conditions?
19. What two major categories are forest fuels divided into in the American NFDRS-78 system?
20. According to what principle are dead fuels divided in the USA?
21. What is the main criterion for the allocation of groups of forest fuels?
22. The humidity of which group of forest fuels can change dramatically during the day and depends on weather conditions?
23. What determines the combustibility of forest fuels and the composition of substances released during combustion?
24. What substances reduce the intensity of flame burning?
25. What has the greatest influence on the humidity of forest fuels?
26. What possibilities does the mapping of fuels provide?
27. What is attribute information for maps of forest fuels?
28. What is the main reason for the difficulty of assessing the consequences and accounting for forest fires?
29. What is needed to improve forest fire management at the global and regional levels?
30. What is the name of the historically complex process that determines the conditions for the occurrence, spread and development of fires and their long-term consequences in forests?
31. Which regions have an increased risk of environmental pollution due to the occurrence of forest fires?

## **7. Teaching methods**

Teaching method is an interrelated activity of the teacher and students aimed at mastering the system of knowledge, acquiring skills, their education and general development. There are three groups of teaching methods: verbal, visual, and practical.

Verbal teaching methods:

- A lecture is a teaching method that involves the disclosure in verbal form of the essence of phenomena, scientific concepts, processes that are logically related to each other and united by a common theme. The lecture is usually used in high school and higher education. In addition to educational (academic) lectures, there are public lectures. Each type of lecture has certain requirements for its preparation and delivery.

A prominent place in the group of verbal methods is occupied by the method of working with a book. Its belonging to this group is somewhat conditional. Students should realize that the main source of scientific information is a book. That is why it is so important to teach students the methods and techniques of independent work with it: reading, retelling, writing out, drawing up a plan, tables, diagrams, etc.

Visual methods involve, first of all, the use of demonstration and illustration.

- demonstration is a teaching method that involves showing objects and processes in their natural form, in dynamics.

- Illustration is a teaching method that involves showing objects and processes in their symbolic representation (photographs, drawings, diagrams, graphs, etc.).

Practical teaching methods are aimed at achieving the final stage of the cognitive process. They contribute to the formation of skills and abilities, the logical completion of the cognitive process in relation to a particular section or topic.

## **8. Forms of assessment**

The main forms of control of students' knowledge are control during lectures, seminars and practical classes, during extracurricular activities, consultations, tests and examinations.

I. Control during the lecture may be conducted as a selective oral questioning of students or with the use of tests on previously presented material, especially on the sections of the course that are necessary for understanding the topic of the lecture or to determine the degree of mastery of the lecture (usually held at the end of the first or beginning of the second hour of the lecture).

The current control at the lecture is designed to accustom students to systematically study the material covered and prepare for the upcoming lecture, to establish the degree of mastery of the theory, to identify the most difficult sections for students to understand with their subsequent explanation. Controlling a lecture should not be time-consuming.

In terms of time spent on control, oral questioning is inferior to card-based control.

II. Current control at practical, seminar and laboratory classes is carried out to determine the readiness of students for classes in the following forms:

1. Written (up to 45 minutes) control work.



2. Colloquium on independent sections of the theoretical course (topics or modules).

III. Exams. Exams are the final stage of studying the whole discipline or part of it and are aimed at testing students' knowledge of theory and identifying skills in applying the acquired knowledge in solving practical problems, as well as skills in working independently with educational and scientific literature.

## 9. Distribution of grades received by students

Evaluation of student knowledge is carried out on a 100-point scale and is converted to national grades according to Table 1 "Regulations and Examinations and Credits at NULES of Ukraine" (order of implementation dated 03.03.2021, protocol №7)

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

In order to determine the rating of a student (listener) in the discipline  $R_{dis}$  (up to 100 points), the rating from the exam  $R_{ex}$  (up to 30 points) is added to the rating of a student's academic work  $R_{aw}$  (up to 70 points):

$$R_{dis} = R_{aw} + R_{ex}.$$

## 10. Educational and methodological support

1. Advisory Group on Environmental Emergencies (ACEE) (OCHA/UNEP) <http://ochaonline.un.org/vvebpage.asp?Page=640>
2. Association of Southeast Asian Nations (ASEAN) [www.haze-online.or.id](http://www.haze-online.or.id)
3. Bi-spectral Infrared Detection (BIRD) satellite mission of the German Aerospace Center (DLR) [www.eid.dlr.de/os/forschung/projekte/bird/](http://www.eid.dlr.de/os/forschung/projekte/bird/)
4. Bushfire Cooperative Research Centre (CRC) [www.bushfirecrc.com/](http://www.bushfirecrc.com/)
5. Canadian Forest Service (CFS) [www.nrcan.gc.ca/cfs-scf/](http://www.nrcan.gc.ca/cfs-scf/)
6. Committee Technique International du Feu (CTIF - International Technical Committee for the Prevention and Extinction of Fire/International Association of Fire and Rescue Services) [www.ctif.org/](http://www.ctif.org/)  
[www.ctif.org/index.php?page\\_id=2024](http://www.ctif.org/index.php?page_id=2024)  
[www.ctif.org/index.php?page\\_id=1998&bloc\\_id=1659](http://www.ctif.org/index.php?page_id=1998&bloc_id=1659)
7. Commission for Agricultural Meteorology (CagM) (WMO) [www.vvmo.ch/web/wcp/agm/CAg.WCAgMmenu.htm](http://www.vvmo.ch/web/wcp/agm/CAg.WCAgMmenu.htm)

8. Community-based fire management (CBFiM) [www.fire.uni-freiburg.de/Manag/CBFiM.htm](http://www.fire.uni-freiburg.de/Manag/CBFiM.htm)
9. Council of Europe (CoE) [www.coe.int/t/dg4/majorhazards/default EN.asp](http://www.coe.int/t/dg4/majorhazards/default_EN.asp)
10. Convention on Biological Diversity (CBD) [www.biodiv.org/default.shtml](http://www.biodiv.org/default.shtml)
11. Timo V. H. Wildland Fire Management: Handbook for Trainers [Электронный ресурс] / V. H. Timo, G. Roy, J. Mike // Helsinki Kirjapaino Topnova Oy. – 2007. – URL: <https://gfmc.online/wp-content/uploads/Fire-Management-Handbook-2007-1.pdf>. (дата звернення 10.02.2020).

## **11. Recommended sources of information**

1. Earth Observing System - Data and Information System (EOS-DIS) <http://spsosun.gsfc.nasa.gov/eosinfo/EOSDIS Site/index.html>
2. Economic Commission for Europe (ECE) [www.unec.org/trade/timber/ff-stats.html](http://www.unec.org/trade/timber/ff-stats.html)
3. Environmental Emergencies Partnership (EEP) [www.humanitarianinfo.org/eep/proiectupdates.htm](http://www.humanitarianinfo.org/eep/proiectupdates.htm)
4. Eurasian Fire in Nature Conservation Network (EFNCN) [www.fire.uni-freiburg.de/programmes/natcon/natcon.htm](http://www.fire.uni-freiburg.de/programmes/natcon/natcon.htm)
5. European and Mediterranean Major Hazards Open Partial Agreement (EUROPA) [www.coe.int/t/dg4/majorhazards/default EN.asp](http://www.coe.int/t/dg4/majorhazards/default_EN.asp)
6. European Forest Fire Information System (EFFIS) <http://effis.jrc.it/Home/>
7. Food and Agriculture Organization of the United Nations (FAO) [www.fao.org/forestry/site/infonote/en](http://www.fao.org/forestry/site/infonote/en)
8. FAO Committee on Forestry (COFO) [www.fao.org/forestry/site/2962/en](http://www.fao.org/forestry/site/2962/en)
9. FAO Technical Cooperation Programme (TCP) [www.fao.org/tc/tcp/](http://www.fao.org/tc/tcp/)
10. Fire Management Working Papers: Thematic Paper series Available at the Fire Management Web site: [www.fao.org/forestry/site/35853/en](http://www.fao.org/forestry/site/35853/en)
11. Working Paper FPF/1E Guidelines on Fire Management in Temperate and Boreal Forests. November 2002.
12. Working Paper FM/2E International Wild land Fire Management Agreements Template.
13. Tom Frey, Ricardo Velez Munoz. January 2004.
14. Working Paper FM/3E Legal Frameworks for Forest Fire Management: International Agreements and National Legislation. Fernando Fernandez Arriaga, Frederic St-Martin, Tom Frey, Ricardo Velez Munoz. March 2004.
15. Working Paper FM/4E Community-Based Fire Management in Spain. Ricardo Velez Muhoz. April 2005'.
16. Working Paper FM/5E Report on Fires in the South American Region. Maria Isabel Manta Noiasco. March 2006.

17. Working Paper FM/6E Report on Fires in the North East Asian Region. Leonid Kondrashov. March 2006.
18. Working Paper FM/7E Report on Fires in the Baltic Region and adjacent countries. Ilkka Vanha-Majamaa. March 2006.
19. Working Paper FM/8E Report on Fires in the Mediterranean Region. A.P. Dimitrakopoulos and I.D. Mitsopoulos. March 2006.
20. Working Paper FM/9E Report on Fires in the Sub-Saharan Africa (SSA) Region. Alexander Held. March 2006.
21. Working Paper FM/10E Report on Fires in the South East Asian Region. B.J. Shields, R.W. Smith and D. Canz. March 2006.
22. Working Paper FM/11E Report on Fires in the Balkan Region. N. Nikolov. March 2006.