

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

V.F. Peresykin Department of Phytopathology

**APPROVED**

Faculty Plant Protection,  
Biotechnologies and Ecology  
Minutes No. 9 of “\_may\_”2026

**CURRICULUM OF ACADEMIC DISCIPLINE  
GENERAL PLANT PATHOLOGY**

Area of knowledge 20 Agricultural sciences and food  
Specialty 202 Plant Protection and Quarantine  
Academic programme Plant Protection and Quarantine  
Faculty Plant Protection, Biotechnologies and Ecology  
Developed by: Vuiek A.O., Senior Lecturer, Dr. PhD

Kyiv – 2026

## Description of the discipline GENERAL PLANT PATHOLOGY

The course “General Phytopathology” is one of the core professional disciplines in the training of specialists in Plant Protection and Quarantine. It is closely related to a number of general biological and specialized disciplines, including Botany, Plant Physiology, Microbiology, Virology, Mycology, Genetics, Biochemistry, Plant Breeding, Entomology, and Ecology. This relationship is determined by the commonality of research objects, methods, and approaches.

The course provides students with fundamental knowledge of plant diseases, including their causes, etiology, pathogenesis, epidemiology, host–pathogen interactions, and the influence of environmental factors on disease development. The acquired knowledge serves as a basis for further study of specialized disciplines and for the development of effective plant disease management strategies in agricultural crops.

Area of knowledge, specialty, academic programme, academic degree		
Academic degree	<i>bachelor's</i>	
Specialty	<i>202 Plant Protection and Quarantine</i>	
Academic programme	<i>Plant Protection and Quarantine</i>	
Characteristics of the discipline		
Type	<i>compulsory</i>	
Total number of hours	<i>240</i>	
Number of ECTS credits	<i>8</i>	
Number of modules	<i>4</i>	
Course project (work) (if any)	<i>course work</i>	
Form of assessment	<i>exam / credit</i>	
Indicators of the discipline for full-time and part-time forms of university study		
	University study	
	Full-time	Part-time
Year of study	<i>3</i>	<i>3</i>
Term	<i>5, 6</i>	<i>5, 6</i>
Lectures	<i>60 h.</i>	<i>4 h.</i>
Practical classes and seminars		
Laboratory classes	<i>90 h.</i>	<i>4 h.</i>
Self-study	<i>90 h.</i>	<i>232 h.</i>
Number of hours per week for full-time students	<i>6/4 h.</i>	<i>3</i>

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

The purpose of the course “General plant pathology” is to provide students with fundamental knowledge of plant pathological processes, the etiology of plant diseases, the role of biotic and abiotic factors in their occurrence and development, as well as the factors limiting the spread of pathogens and the diseases they cause.

During the course, students study the major groups of plant pathogens, their biological characteristics, parasitic properties, host specialization, taxonomic position, and interactions with host plants.

Course objectives: to introduce students to the nature of pathological processes in plants; to develop an understanding of the causes, distribution patterns, and development of plant diseases; to explain the influence of environmental factors on disease development; to provide training in classical and modern methods of plant disease diagnosis and pathogen identification; to develop the ability to determine disease etiology based on symptom

expression; to form skills in planning and substantiating preventive and protective measures aimed at reducing disease incidence and crop losses.

Upon successful completion of the course, students should be able to:

*know*: diagnostic characteristics and major types of plant diseases; biological features, ecology, taxonomy, and dissemination pathways of plant pathogens; modern methods of disease diagnosis and pathogen identification.

*be able to*: identify plant diseases based on characteristic symptoms; determine disease-causing agents and their taxonomic affiliation; predict disease development under different environmental conditions; justify and develop measures to prevent epiphytotics and limit the spread of plant diseases.

Prerequisite courses: “Botany”, “Plant Physiology with Fundamentals of Biochemistry”, “General Microbiology and Virology”, “General Mycology”.

### **Competences acquired:**

Integral competence (IC):

The ability to solve complex specialized tasks and practical problems of professional activity in plant protection and quarantine and to apply theoretical knowledge and methods of phytosanitary monitoring, inspection, analysis, expertise characterized by complexity and uncertainty of conditions.

General competences (GC):

GC 2. Ability to apply knowledge in practical situations.

GC 3. Knowledge and understanding of the subject area and understanding of professional activity.

Expected Learning Outcomes (ELO):

ELO 6. Correctly apply appropriate methods of observation, description, identification, classification, and cultivation of agrobiocenosis objects, as well as methods for maintaining their stability to preserve natural biodiversity.

ELO 16. To know the main historical stages of the development of the subject area.

Modules and topics	Number of hours													
	full-time							part-time						
	weeks	total	including					in	including					
		l	p	lab	ind	s.st	total	l	p	lab	ind	s.st		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
<b>MODULE 1. INTRODUCTION TO PLANT DISEASES</b>														
Introduction	1	1	1					2	2					
1.1. History of the development of phytopathology	1	7	3				4	6						6
1.2. The pathological process and its variability	1,2	7	1		2		4	7						7
1.3. Harmfulness of plant diseases	2	5	1		2		2	5						5
1.4. Classification of plant diseases	2,3	9	1		4		4	9						9
1.5. Types of plant diseases	3	9	1		4		4	9						9
1.6. Non-infectious plant diseases	4,5	12	4		4		4	12						12
1.7. Infectious plant diseases	5,6	12	4		4		4	12						12
Introduction	2,3	9	1		4		4	9						9

Total for module 1	<b>62</b>	<b>16</b>	<b>20</b>	<b>26</b>	<b>62</b>	<b>2</b>				<b>60</b>
<b>MODULE 2. PLANT PATHOGENS</b>										
2.1. Properties of plant pathogens determining disease development in plants	7	8	2	2	4	8				8
2.2. Bacteria, actinomycetes, mycoplasmas, and rickettsiae	7,8	10	2	4	4	10				10
2.3. Viruses and viroids	9	10	2	4	4	10				10
2.4. Parasitic flowering plants	10	8	2	2	4	8				8
2.5. Morphological, biological, and pathogenic characteristics of lower fungi and their taxonomy	11-15	22	6	12	4	22				22
Total for module 2	<b>58</b>	<b>14</b>	<b>24</b>	<b>20</b>	<b>58</b>					<b>58</b>
<b>MODULE 3. EPIDEMIOLOGY OF PLANT DISEASES</b>										
3.1. Morphological, biological, and pathogenic characteristics of higher fungi and their taxonomy	1-6	28	12	12	4	28	2			26
3.2. Penetration of pathogens into plants	7	10	2	4	4	10				10
3.3. Influence of environmental factors on plant infection	8	10	2	4	4	10				10
3.4. Routes and modes of pathogen dissemination	9	8	2	2	4	8				8
3.5. Concepts of disease distribution areas and epiphytotics	10	8	2	2	4	8				8
Total for module 3	<b>64</b>	<b>20</b>	<b>24</b>	<b>20</b>	<b>64</b>	<b>2</b>				<b>62</b>
<b>MODULE 4. PLANT DISEASE DIAGNOSIS AND PRINCIPLES OF DISEASE MANAGEMENT</b>										
4.1. Methods of plant disease diagnosis. Molecular diagnostic methods	11,12	14	2	8	4	14				14
4.2. Methods and means of plant disease management										
4.2.1. Compliance with agronomic practices for crop cultivation	13	7	1	2	4	7				7
4.2.2. Host plant resistance (immunological method of plant protection)		5	1	2	2	5				5
4.2.3. Biological control method		10	2	4	4	10				10
4.2.4. Physical and mechanical control method		5	1	2	2	5				5
4.2.5. Chemical control method		8	2	2	4	8				8
4.2.6. Plant quarantine measures		7	1	2	4	7				7
Total for module 2	<b>56</b>	<b>10</b>	<b>22</b>	<b>24</b>	<b>56</b>					<b>56</b>

Total hours	150	20	20			110	150	2				148
Course project (work) <hr/> (if included in the curriculum)		-	-	-		-		-	-	-		-
Total hours	240	60	90			90	240	4				236

## 2. Topics of lectures

No.	Topic	Hours
1.	History of the development of phytopathology	4
2.	The pathological process and its variability	1
3.	Harmfulness of plant diseases	1
4.	Classification of plant diseases	1
5.	Types of plant diseases	1
6.	Non-infectious plant diseases	4
7.	Infectious plant diseases	4
8.	Properties of pathogens determining disease development in plants	2
9.	Bacteria, actinomycetes, mycoplasmas, and rickettsiae	2
10.	Viruses and viroids	2
11.	Parasitic flowering plants	2
12.	Morphological, biological, and pathogenic characteristics of lower fungi and their taxonomy	6
13.	Morphological, biological, and pathogenic characteristics of higher fungi and their taxonomy	12
14.	Pathogen penetration into plants	2
15.	Influence of environmental conditions on infection	2
16.	Routes and modes of pathogen dissemination	2
17.	Concepts of disease distribution areas and epiphytotics	2
18.	Methods of plant disease diagnosis. Molecular diagnostic methods	2
19.	Methods and means of plant disease management	
20.	Compliance with agronomic requirements for crop production	1
21.	Host plant resistance	1
22.	Biological control method	2
23.	Physical and mechanical control method	1
24.	Chemical control method	2
25.	Plant quarantine measures	1
	Total hours	<b>60</b>

## 3. Topic of laboratory (practical, seminars) classes

No	Topic title	Hours
1	Decolorization, staining, and fixation of microscopic preparations. Artificial inoculation of plants with pathogens. Observation of living organisms and pathological changes in plants.	4
2	Assessment of plant disease severity based on symptoms and disease incidence.	2
3	Familiarization with visual symptoms of plant diseases according to their classification.	4
4	Use of Internet resources for plant disease identification.	4

5	Symptoms of plant diseases caused by abiotic factors.	4
6	External symptoms of plant organ damage caused by pathogens of different parasitic groups.	2
7	Pathogen host specificity and the role of minimal inoculum load in infection development.	2
8	Morphological characteristics of phytopathogenic bacteria. Types of bacterial diseases. Staining, fixation, and artificial inoculation of plants.	4
9	Morphological characteristics of actinomycetes, mycoplasmas, and rickettsia-like organisms.	2
10	Symptoms of viral plant diseases. Identification of mosaic and yellowing diseases. Artificial inoculation of healthy plants with viral pathogens as proof of infectivity. Diagnosis of viral plant diseases. Morphological characteristics of viroids.	2
11	Symptoms of parasitic flowering plants (mistletoe, dodder, broomrape). Mechanisms of plant infection.	2
12	Sensitivity of lower fungi to abiotic factors. Fungal antagonism within species and against other organisms. Basic principles of fungal systematics. Taxonomic principles of classification: Class Plasmodiophoromycetes.	2
13	Taxonomic principles of classification: Class Chytridiomycetes.	2
14	Taxonomic principles of classification: Class Oomycetes.	6
15	Taxonomic principles of classification: Class Zygomycetes.	2
16	Characteristics of mycelium used to classify fungi as higher fungi. Mechanisms of plant infection.	2
17	Systematics of higher fungi: Class Ascomycetes.	6
18	Systematics of higher fungi: Class Basidiomycetes.	6
19	Mitospore (asexual) fungi: taxonomic principles and classification.	4
20	Plant infection under different temperature, moisture, and light conditions.	2
21	Direct and passive transmission of pathogens from diseased plants or plant organs to healthy ones.	2
22	Development of epiphytotics under different meteorological conditions, pathogen pressure, and host resistance (simulation and prediction of disease outbreaks).	2
23	Methods of plant disease diagnosis. Laboratory diagnostic methods.	6
24	Molecular methods of plant disease diagnosis.	4
25	Simulation of different agronomic backgrounds affecting the development of specific disease groups.	2
26	Role of cultivars in plant disease development. Identification of disease-resistant varieties of major agricultural crops.	2
27	Influence of mycoparasitic fungi and their metabolites on the growth and development of phytopathogenic fungi.	2
28	Evaluation of infected and healthy seed quality as evidence for the need of seed cleaning. Methods of thermal seed disinfection.	2
29	Effect of chemical plant protection products on spore germination and mycelial development of pathogens.	2
30	Symptoms of major quarantine plant diseases and sporulation characteristics of their pathogens	2
<b>Total</b>		<b>90</b>

#### 4. Topics of self-study

No s/n	Topic title	Hours
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1	Determination of plant disease severity	5
2	Disease symptoms according to etiology	5
3	Types of disease manifestation in plants	5
4	Study of symptoms of diseases caused by abiotic factors	5
5	External symptoms of plant organ damage caused by pathogens of different parasitic groups	6
6	Host specificity of plant pathogens. Role of minimal inoculum load in infection development	5
7	Morphological characteristics of phytopathogenic bacteria. Types of bacterial diseases. Staining, fixation, and artificial inoculation of plants. Morphological features of actinomycetes, mycoplasmas, and rickettsia-like organisms	4
8	Symptoms of viral plant diseases. Identification of mosaic and yellowing disease groups. Artificial inoculation of healthy plants with viral pathogens as evidence of infectivity. Diagnosis of viral plant diseases. Morphological characteristics of viroids	4
9	Parasitic flowering plants. Mechanisms of plant infection	4
10	Fundamentals of lower fungi systematics. Principles of taxonomic classification. Classes Plasmodiophoromycetes, Chytridiomycetes, Oomycetes, and Zygomycetes	4
11	Characteristics of mycelium used for classification of fungi as higher fungi. Mechanisms of plant infection	2
12	Systematics of higher fungi: class Ascomycetes	2
13	Systematics of higher fungi: class Basidiomycetes	2
14	Mitospore fungi: systematics and classification principles	2
15	Plant infection under different temperature, moisture, and light conditions	2
16	Direct and passive transmission of plant pathogens from diseased plants or plant organs to healthy ones	5
17	Characteristics of mycelium used for classification of fungi as higher fungi. Mechanisms of plant infection	5
18	Methods of plant disease diagnosis. Laboratory diagnostic methods	10
19	Molecular methods of plant disease diagnosis	8
20	Methods and means of plant disease management	6
Total		90

### 5. Methods of assessing expected learning outcomes:

*(select necessary or add)*

- oral or written survey;
- interview;
- test;
- defending laboratory/practical, design/graphical works, projects;
- peer-to-peer assessment, self-assessment.

### 6. Teaching methods *(select necessary or add)*:

- problem-based method;
- practice oriented studying method;
- case method;
- project education method;
- flipped classroom, mixed education method;
- research based method;
- learning discussions and debates method;
- team work, brainstorm method

## 7. 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	
<i>Module 1. STRUCTURE OF FUNGI</i>			
Lecture 1.	During the implementation of the program, students study various groups of plant pathogenic microorganisms, their parasitic properties, specialization, and taxonomic position. The objectives of General Phytopathology are: to introduce students to the pathological process in plants;		
Lecture 2.			
Lecture 3.			
Lecture 4.			
Lecture 5.			
Lecture 6.			
Lecture 7.			
Laboratory work 1.	to study the causes, patterns of distribution, and development of plant diseases, and to understand the influence of environmental factors on these processes;	10	
Laboratory work 2.	to master classical and modern methods of plant disease diagnosis with subsequent identification of their causal agents;	10	
Laboratory work 3.	to determine the etiology of diseases based on their symptoms in plants;	10	
Laboratory work 4.	to develop the ability to plan and design preventive and control measures aimed at preventing plant diseases and reducing crop losses.	10	
Laboratory work 5.		10	
Laboratory work 6.		10	
Self-study 1.		10	
Module control work 1.		30	
<b>Total for module 1</b>		<b>100</b>	
<i>MODULE 2. PLANT PATHOGENS</i>			
Lecture 8.	During the implementation of the program, students study various groups of plant pathogenic microorganisms, their parasitic properties, specialization, and taxonomic position. The objectives of General Phytopathology are: to introduce students to the pathological process in plants;		
Lecture 9.			
Lecture 10.			
Lecture 11.			
Lecture 12.			
Laboratory work 7.		to study the causes, patterns of distribution, and development of plant diseases, and to understand the influence of environmental factors on these processes;	5
Laboratory work 8.		to master classical and modern methods of plant disease diagnosis with subsequent identification of their causal agents;	5
Laboratory work 9.	to determine the etiology of diseases based on their symptoms in plants;	5	
Laboratory work 10.	to develop the ability to plan and design preventive and control measures aimed at preventing plant diseases and reducing crop losses.	5	
Laboratory work 11.		10	
Laboratory work 12.		10	
Laboratory work 13.		10	
Laboratory work 14.		10	
Laboratory work 15.		10	
Self-study 2.		10	

Module control work 2.		<b>30</b>	
<b>Total for module 1</b>		<b>100</b>	
<i>MODULE 3. EPIDEMIOLOGY OF INFECTIOUS PLANT DISEASES</i>			
Lecture 13.	<p>During the implementation of the program, students study various groups of plant pathogenic microorganisms, their parasitic properties, specialization, and taxonomic position.</p> <p>The objectives of General Phytopathology are: to introduce students to the pathological process in plants;</p> <p>to study the causes, patterns of distribution, and development of plant diseases, and to understand the influence of environmental factors on these processes;</p> <p>to master classical and modern methods of plant disease diagnosis with subsequent identification of their causal agents;</p> <p>to determine the etiology of diseases based on their symptoms in plants;</p> <p>to develop the ability to plan and design preventive and control measures aimed at preventing plant diseases and reducing crop losses.</p>		
Lecture 14.			
Lecture 15.			
Lecture 16.			
Lecture 17.			
Laboratory work 16.		5	
Laboratory work 17.		10	
Laboratory work 18.		10	
Laboratory work 19.		10	
Laboratory work 20.		10	
Laboratory work 21.		5	
Laboratory work 22.		10	
Self-study 3.		10	
Module control work 3.		30	
<b>Total for module 1</b>		<b>100</b>	
<i>MODULE 4. PLANT DISEASE DIAGNOSIS AND PRINCIPLES OF DISEASE MANAGEMENT</i>			
Lecture 18.		<p>During the implementation of the program, students study various groups of plant pathogenic microorganisms, their parasitic properties, specialization, and taxonomic position. The objectives of General Phytopathology are: to introduce students to the pathological process in plants;</p> <p>to study the causes, patterns of distribution, and development of plant diseases, and to understand the influence of environmental factors on these processes;</p> <p>to master classical and modern methods of plant disease diagnosis with subsequent identification of their causal agents;</p> <p>to determine the etiology of diseases based on their symptoms in plants;</p> <p>to develop the ability to plan and design preventive and control measures aimed at preventing plant diseases and reducing crop losses.</p>	
Lecture 19.			
Lecture 20.			
Lecture 21.			
Lecture 22.			
Lecture 23.			
Lecture 24.			
Lecture 25.	5		
Laboratory work 23.	5		
Laboratory work 24.	5		
Laboratory work 25.	5		
Laboratory work 26.	10		
Laboratory work 27.	10		
Laboratory work 28.	10		
Laboratory work 29.	30		
Laboratory work 30.	100		
Self-study 4.	5		
Module control work 4.	5		
<b>Total for module 2</b>	<b>5</b>		
<b>Class work</b>	<b><math>(M1 + M2)/2 * 0,7 \leq 70</math></b>		
<b>Exam/credit</b>	<b>30</b>		
<b>Total for year</b>	<b><math>(\text{Class work} + \text{exam}) \leq 100</math></b>		
Course project/work (if any)		<b>100</b>	

## 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

<b>Deadlines and exam retaking rules</b>	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
<b>Academic integrity rules</b>	Cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct references to the literature used
<b>Attendance rules</b>	Attendance is compulsory. For good reasons (e.g. illness, international internship), training can take place individually (online by the faculty dean's consent)

### 9. Teaching and learning aids:

- e-learning course of the discipline  
<https://elearn.nubip.edu.ua/course/view.php?id=3039>
- references to digital educational resources:
  - <https://www.indexfungorum.org/names/names.asp> ;
  - <http://www.ascofrance.com/>
  - <http://www.forestryimages.org/pests.cfm6>
  - <http://www.mycobank.org>
  - <http://pyrenomycetes.free.fr/>
  - <https://mycolog.com/index.htmltextbooks> ;

1. Bashta O.V., Voloshchuk N.M. Guidelines for writing a course paper in general phytopathology for bachelor's degree students majoring in 202 Plant protection and quarantine. Recommended for publication by the academic council of the faculty of plant protection, biotechnology and ecology.
2. Bashta O.V., Voloshchuk N.M., Vuiek A.O. Guidelines for laboratory classes in general phytopathology for bachelor's degree students majoring in 202 Plant protection and quarantine. Recommended for publication by the academic council of the faculty of plant protection, biotechnology and ecology.
3. Pikovskyi M.Y., Bashta O.V., Hentosh D.T., Voloshchuk N.M., Artemchuk I.P. Guidelines for practical training in phytopathology for bachelor's degree students majoring in 202 Plant protection and quarantine. Recommended for publication by the academic council of the faculty of plant protection, biotechnology and ecology.

### Recommended sources of information

1. American Phytopathological Society (APS). Available at: <https://www.apsnet.org>
2. British Mycological Society (BMS). Available at: <https://www.britmycolsoc.org.uk>
3. CAB Abstracts Database. Available at: <https://www.cabi.org>

4. Fungal Biology Journal (Elsevier). Available at: <https://www.sciencedirect.com/journal/fungal-biology>
5. Index Fungorum. Available at: <https://www.indexfungorum.org>
6. Journal of Fungi (MDPI). Available at: <https://www.mdpi.com/journal/jof>
7. MycoBank Database. Available at: <https://www.mycobank.org>
8. National Center for Biotechnology Information (NCBI). Available at: <https://www.ncbi.nlm.nih.gov>
9. SpringerLink – Mycology Collection. Available at: <https://link.springer.com>

## **10. Recommended Literature**

1. Agrios G.N. Plant Pathology. 6th ed. Amsterdam: Elsevier Academic Press, 2024. 930 p.
2. Schumann G.L., D'Arcy C.J. Essential Plant Pathology. 3rd ed. St. Paul, MN: APS Press, 2021. 336 p.
3. Lucas J.A. Plant Pathology and Plant Pathogens. 4th ed. Hoboken, NJ: Wiley-Blackwell, 2020. 432 p.
4. Strange R.N. Plant Disease: A Threat to Global Food Security. 2nd ed. Wallingford: CABI Publishing, 2021. 320 p.
5. Bhardwaj D., Sharma P., Sharma S. (Eds.). Plant Disease Management: Principles and Practices. Singapore: Springer Nature, 2023. 458 p.