

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF
UKRAINE**
Department of Plant Science



"APPROVED"

Dean of the Agrobiological Faculty
Vitaliy Kovalenko
_____ 2024 y.

"APPROVED"

at the meeting of the Department of Plant Science _
Minutes №. 20 of "15" May 2024 y.
Head of the Department
Svitlana Kalenska

"REVIEWED"

Guarantor of the AP "Agronomy"

Vitaliy Kovalenko

CURRICULUM OF ACADEMIC DISCIPLINE

PLANT SCIENCE

Field of knowledge	20 Agricultural sciences and food
Specialty	201 Agronomy
Academic programme	Agronomy
Faculty	Agrobiological
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Kyiv – 2024

Description of the discipline Plant Science

(name)

Academic degree, specialty, academic programme		
Academic degree	Bachelor's	
Specialty	201 Agronomy	
Academic programme	<i>Agronomy</i>	
Characteristics of the discipline		
Type	Compulsory	
Total number of hours	270	
Number of ECTS credits	9	
Number of modules	6	
Course project (work) (if any)	yes	
Form of assessment	<i>Exam</i>	
Indicators of the discipline for full-time and part-time forms of university study		
	Full-time	Part-time
Year of study	2-3	4-5
Semester	3-5	8-9
Lectures	<i>90 hours</i>	<i>36 hours</i>
Practical classes and seminars	<i>105 hours</i>	<i>40 hours</i>
Laboratory classes	<i>- hours</i>	<i>hours</i>
Self-study	<i>75 hours</i>	<i>194 hours</i>
Number of hours per week for full-time students	<i>4/6/3 hours</i>	

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

Aim of the academic discipline "Plant Science" is to provide students with knowledge about field crops, their growth and development characteristics, requirements for external environmental factors, modern techniques and technologies of cultivation aimed at obtaining sustainable high-quality yields with minimal labor, resource, and financial inputs. "Plant Science" is a specialized discipline taught at agronomic faculties, which ensures the formation of students' knowledge and skills in conducting technological practices for maximizing the realization of the biological potential of crop yields. It is an essential sector of the Ukrainian economy.

Objectives of the educational discipline that need to be addressed during its study are as follows:

- Studying the state of the crop production industry and ways to intensify the sector.

- Substantiating the fundamental laws and general regularities of the interconnection of plant life factors, their significance in the practical activities of professionals.
- Studying a brief history of crops, the biological peculiarities of major agricultural crops, their importance, and distribution.
- Justifying and understanding the formative processes of crops based on the main stages of organogenesis and phases of development to manage the processes of achieving high yields and product quality.
- Independently scientifically substantiating a complex of agrotechnological techniques for cultivating crops in a unified technological process specific to a particular soil and climatic zone.
- Upon completion of the discipline, the student should know: the state and prospects of crop production, the morphological and biological characteristics of field crops, modern cultivation technologies, including intensive methods; ways and methods to improve the quality of agricultural products and reduce labor and resource costs in crop cultivation.

Acquisition of competences:

Integral competence (IC):_

The ability to solve complex specialized tasks and practical problems in agronomy, which involves the application of theories and methods of the relevant science and is characterized by complexity and compliance with zonal conditions.

General competences (GC):_

GC6. Knowledge and understanding of the subject area and comprehension of professional activities;

GC7. Ability to apply knowledge in practical situations.

Special (professional) competences (SC):

SC1. Basic knowledge of the main branches of agricultural science (crop production, farming, breeding and seed production, agrochemistry, fruit growing, vegetable growing, soil science, fodder production, mechanization in crop production, plant protection);

SC3. Knowledge and understanding of the basic biological and agrotechnological concepts, rules, and theories related to the cultivation of agricultural and other plants.

SC4. The ability to apply knowledge and understanding of the physiological processes of agricultural plants to solve production and technological problems

SC9. The ability to manage complex actions or projects and take responsibility for decision-making in specific production conditions.

Expected Learning Outcomes (ELO): _

ELO4. To compare and evaluate modern scientific and technical achievements in the field of agronomy.

ELO6. To demonstrate knowledge and understanding of fundamental disciplines to the extent necessary for acquiring relevant skills in the field of agronomy.

ELO7. To demonstrate knowledge and understanding of the principles of plant physiological processes to the extent necessary for mastering fundamental and professional disciplines.

ELO9. To possess operational-level proficiency in methods of observation, description, identification, classification, as well as cultivation of objects, and maintaining the stability of agroecosystems while preserving natural biodiversity.

ELO10. To analyze and integrate knowledge from general and specialized professional training to the extent required for specialized professional work in the field of agronomy.

ELO11. To initiate timely and appropriate solutions to production problems in accordance with zonal conditions.

ELO13. To design and organize measures for the cultivation of high-quality agricultural produce in accordance with current requirements.

ELO14. To integrate and improve production processes for cultivating agricultural produce in accordance with current requirements.

ELO15. To plan economically viable agricultural production.

ELO16. To organize productive and safe working conditions.

2. Programme and structure of the discipline for:

- full-time (part-time) form of study;
- reduced full-time (part-time) form of study

Modules and topics	Number of hours													
	Full-time form							Part-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 – TEORETICAL BASIS OF CROP PRODUCTION														
1. Crop production as a branch of agricultural production.		2	2					4						4
2. Ecological and biological foundations of crop production.		2	2					4						4
3. Agrobiological foundations of intensive cultivation technologies for agricultural crops.		4	2				2	10	2					8
4. Agrotechnological foundations of crop production.		4	2				2	10	2					8
5. Fundamentals of crop yield programming.		8	2	6				6		2				4
6. Fundamentals of seed science.		8	2	6				6		2				4
Total for module 1		28	12	12			4	40	4	4				32
CONTENT MODULE 2 – CEREALS AND LEGUMES														
1. Winter cereals		38	12	16			10	40	6	8				26
2. Spring cereals and flake crops		38	14	16			8	36	6	6				24
3. Legumes		32	12	10			10	30	4	4				22
Total for module 2		108	38	42			28	108	18	18				72
CONTENT MODULE 3 – ROOT CROPS, TUBER CROPS, WATERMELONS														
1. Tuber crops		10	2	4			4	12	2	2				8
2. Root crops		9	2	3			4	12	2	2				8
3. Watermelons		6	2	2			2	8		2				6
Total for module 3		25	6	9			10	32	4	6				22
CONTENT MODULE 4 – SUGAR BEETS														
1. Sugar crops		8	2	2			4	12	2	2				8
2. Sugar beets		16	6	6			4	16	2	2				12
Total for module 4		24	8	8			8	28	4	4				20
CONTENT MODULE 5 – OILSEEDS AND ESSENTIAL OIL CROPS														
1. Oilseeds		32	10	10			12	14	2	2				10
2. Essential oil crops		15	4	8			3	24	2	2				20
Total for module 5		47	14	18			15	38	4	4				30
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
CONTENT MODULE 6 – FIBER, AROMATIC, MEDICINAL AND ENERGY CROPS														
1. Fiber crops		12	6	4			2	10	2	2				6
2. Aromatic crops		8	2	4			2	4						4
3. Medicinal crops		9	2	4			3	4						4

4. Energy crops		9	2	4			3	6		2			4
Total for module 6		38	12	16			10	24	2	4			18
Coursework on Crop Production: "Development and Scientific Justification of a Technology for Cultivating a Programmed Yield of Agricultural Crops under Specific Soil and Climatic Conditions»			-	-	-		-		-	-	-		-
Total hours		270	90	105			75	270	36	40			194

3. Topics of laboratory (practical, seminar) classes

№	Topic title	Hours
1	Forecasting crop yield. Calculation of assimilation coefficients of fertilizers by crops and potential yield based on solar radiation input.	2
2	Calculation of phytometric indicators for targeted crop yield.	2
3	Compilation of the agronomic section of the technological map for programmed cultivation of field crops.	2
4	Determination of seed quality characteristics. Sampling.	2
5	Determination of seed quality characteristics: purity and impurities, germination rate, viability, moisture content, 1000-seed weight, disease infestation, pest infestation. Determination of seed authenticity (varietal laboratory control).	2
6	Determination of seed viability and preparation of seed quality documents.	2
7	General characteristics of cereal crops. Morphological and biological differences in grains of the first and second groups. Genus differences in grains of the first and second groups in terms of kernel anatomy. Genus differences in grains of the first and second groups in terms of sprouts, shoots, ears, and awns. Growth stages and phases of organogenesis in cereal crops.	4
8	Wheat. Systematics and morphological characteristics. Types of wheat. Determination of varieties of soft and hard wheat. Economic and biological characteristics of the most common and promising wheat varieties.	2
9	Rye. Systematics and morphological characteristics of plants. Species and varieties. Economic and biological characteristics of the most common varieties.	2
10	Triticale. Systematics and morphology of plants.	2
11	Barley. Systematics and morphological characteristics. Subspecies and groups. Determination of barley varieties. Economic and biological characteristics of varieties.	2
12	Oats. Systematics and morphology of plants. Species of oats. Determination of oat grain type, color, and huskiness. Varieties and their economic and biological characteristics.	2
13	Millet. Systematics and morphological characteristics. Species, subspecies, and varieties of millet. Economic and biological characteristics of common millet varieties.	2

14	Maize. Botanical characteristics. Systematics and morphological characteristics of plants. Features of ear and tassel structure. Determination of productivity based on tassels. Determination of maize subspecies and varieties. Economic and biological characteristics of maize hybrids and varieties.	2
15	Sorghum. Botanical characteristics. Systematics and morphology. Economic and biological characteristics of groups, varieties, and hybrids.	2
16	Rice. Systematics and morphological characteristics. Features of root system structure. Subspecies, groups, varieties. Varieties.	2
17	Buckwheat. Systematics and morphology of plants. Determination of species and varieties. Economic and biological characteristics of varieties.	2
18	Development of agronomic sections of technological maps for the cultivation of grain crops: winter wheat, spring barley, maize, buckwheat, and others using specific farms in Ukraine as examples.	2
19	General characteristics of cereal legume crops. Morphological features. Identification of cereal legume crops based on seeds, seedlings, leaves, and fruits.	2
20	Peas. Systematics and morphological characteristics. Identification of species and varieties. Economic and biological characteristics of cultivars.	2
21	Soybeans. Systematics and plant morphology. Subspecies, varieties, and testing groups. Economic and biological characteristics of cultivars.	2
22	Kidney beans. Systematics and morphological characteristics. Species and varieties. Economic and biological characteristics of cultivars.	2
23	Lupin. Systematics and morphology. Species and varieties. Determination of seed alkaloid content. Cultivars and their economic and biological characteristics.	2
24	Forage legumes, lentils. Systematics and morphological characteristics. Species, subspecies, varieties, and their characteristics.	2
25	Chickpeas, cowpeas. Systematics and morphological features. Species, subspecies, varieties, and their characteristics.	2
26	Development of agrotechnical sections of cultivation technology cards for peas, soybeans using a specific farm as an example.	2
27	Fodder beets, fodder carrots, rutabagas, turnips. Systematics and morphological characteristics. Anatomical structure of root crops. Identification of root crops based on seedlings, fruits, and seeds. Determination of stand density, biological yield, and its structure.	3
28	Potato. Systematics and morphological characteristics of organs. Structure of tubers. Economic and biological characteristics of potato varieties. Determination of dry matter and starch content in tubers.	2
29	Jerusalem artichoke. Morphological characteristics. Development of the agronomic section of the technological map for potato cultivation using a specific farm as an example.	2
30	General characteristics. Determination of pumpkins, watermelons, and melons based on seeds, sprouts, and fruits.	2
31	General characteristics of root crops. Sugar beets. Morphological and anatomical features of first-year sugar beet plants.	2
32	Sugar beets. Morphological and anatomical features of second-year sugar beet plants.	2
33	Sugar beets. Technological map for growing sugar beets. Biological yield and its structure, determination of plant density, sowing rate, seeding unit, juice purity, and sugar yield.	4
34	General characteristics of oil crops. Determination of oil crops based on fruits, seeds, sprouts, stems, leaves.	2
35	Botanical-morphological characteristics of sunflower. Features of sunflower plant structure, determination of sunflower groups, seed hulling and shelling. Technological map for sunflower cultivation.	2

36	Botanical-morphological characteristics of mustard, rapeseed, and safflower.	2
37	Botanical-morphological characteristics of poppy, castor oil plant, and flax.	2
38	Botanical-morphological characteristics of sesame, peanuts, pearl millet, and quinoa.	2
39	Botanical-morphological characteristics of essential oil crops.	8
40	Bast fiber crops. Botanical-morphological characteristics of flax.	2
41	Botanical-morphological characteristics of hemp, cotton, and kenaf.	2
42	Botanical-morphological characteristics of tobacco, snuff, and hops.	4
43	Botanical-morphological characteristics of medicinal crops.	4
44	Botanical-morphological characteristics of phytoenergy crops.	4
	Total	105

4. Topics for self-study

№	Topic title	Hours
1	Ecological and biological foundations of crop production.	2
2	Agrobiological foundations of intensive cultivation technologies for agricultural crops.	2
3	Agrotechnological foundations of crop production.	2
4	Basics of yield programming for agricultural crops.	2
5	Fundamentals of seed science.	2
6	Winter cereals. General characteristics.	8
7	Spring cereals and cereal crops.	8
8	Grain legume crops.	8
9	Tuber crops.	4
10	Root crops.	3
11	Vegetable crops.	2
12	Sugar crops.	2
13	Sugar beets.	6
14	Oil crops.	8
15	Essential oil crops.	8
16	Fiber crops.	2
17	Aromatic crops.	2
18	Medicinal plants.	2
19	Phytoenergy crops.	2
	Total	75

5. Tools for assessing expected learning outcomes:

- exam;
- credit;
- module tests;
- presentation of laboratory and practical works;
- other types.
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6. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- practical method (laboratory, 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;
- other types.

7. Assessment methods:

- exam;
- credit;
- oral or written assessment;
- module tests;
- team projects;
- essays and reports;
- presentation of laboratory and practical works;
- presentations at academic events
- other types.

8. 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's rating, points	National grading of exams and credits	
	exams	credits
90-100	excellent	pass
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	fail

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

9. Teaching and learning aids

- e-learning course <https://elearn.nubip.edu.ua/course/view.php?id=24>
- lectures and presentations (in electronic form);
- textbooks, manuals, tutorials;
- guidelines for studying a discipline by full-time and part-time students;
- Metodical recommendation for course work PLANT SCIENCE
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10. Recommended sources of information

1. *CROP PRODUCTION GUIDE AGRICULTURE. Tamil Nadu Agricultural University. Link: <https://www.freebookcentre.net/biology-books-download/gotoweb.php?id=13855>*
2. Graham Thiele, Michael Friedmann, Hugo Campos, Vivian Polar, Jeffery W. Bentle. *Root, Tuber and Banana Food System Innovations*. Springer, 2022. DOI: <https://doi.org/10.1007/978-3-030-92022-7>
3. Kalenska S.M., Dmytryshak M.Ya., Mokriyenko V.A. *Zernovi ta zernobobovi kultury. Navchalnyi posibnyk. - Vinnytsia: TOV "TVORY". 2020. 366 p. (Title: Cereals and Legume Crops. Educational Manual)*
4. Mazur V.A., Polishchuk I.S., Tekalo N.V., et al. *Roslynnnytstvo. Navchalnyi posibnyk. – Vinnytsia: TOV "Druk". 2020. 352 p. (Title: Crop Production. Educational Manual)*
5. Petrichenko V.F., Lykhochvor V.V. *Roslynnnytstvo. Novi tekhnolohii vyrashchuvannia polevykh kultur: pidruchnyk. - 5-te vid., vyrav., dopov. Lviv: NVF "Ukrainski tekhnolohii", 2020. 806 p. (Title: Crop Production. New Technologies for Field Crop Cultivation: Textbook)*
6. *Roslynnnytstvo z osnovamy kormovyrobnytstva ta agrometeorolohii. Chastyna 1: pidruchnyk/ S.M. Kalenska, M.Ya. Dmytryshak, V.A. Mokriyenko, et al. – Kyiv: Printeko, 2023. 610 p. (Title: Crop Production with Basics of Forage Production and Agrometeorology. Part 1: Textbook)*