

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

Department of Agriculture and Herbology



at the meeting of the Department of
Agriculture and Herbology
Protocol № 07 dated 06.04.2023
Head of Department
[Signature] S. Tanchyk

«**REVIEWED**»

Guarantor of the educational program
Program Coordinator

[Signature] I. Kovalchuk

PROGRAM OF THE COURSE

FUNDAMENTALS OF AGRICULTURE AND CROP SCIENCE

Specialization 193 «Geodesy and Land Management»
Educational program «Geodesy and Land Management»
Faculty of Land Management

Developers:

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1. Description of the course «Fundamentals of agriculture and crop science»

Field of knowledge, specialization, educational program, educational degree		
Educational degree	Bachelor's	
Specialization	193 «Geodesy and land management»	
Educational program	Geodesy and Land Management	
Characteristics of the course		
Type	Elective	
Total number of hours	90	
Number of ECTS credits	3	
Number of content modules	2	
Form of assessment	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)	2	
Semester	4	
Lecture classes	30 hr.	
Practical, seminar classes	15 hr.	
Self-study	45 hr.	
Number of weekly classroom hours for the full-time form of study	3 hr.	

2. Purpose, objectives, and competencies of the course

Purpose. Formation of future specialists' knowledge and skills theoretical and practical problems most rational use of arable land, agricultural landscapes, how to develop physical, chemical, biological and mechanical methods and techniques to improve soil fertility, crop yields and stability of agroecosystems. Crop science deals with the study of new varieties and hybrids of cultivated crops and wild plant species to the action of biotic, abiotic and anthropogenic factors of the environment, develops cultivation technology for yields with consistently high quality based on intensification, energy saving and environmental safety.

Objectives:

1. To study the importance in plant life of the main factors of the ecological environment and the laws of agriculture and their use in agricultural production.
2. To study the concept of soil fertility and its main indicators. Master the practical measures of regulation of water, air, heat, light, and nutrient regimes of soil.
3. To study the scientific bases of crop rotations and to master the methods of their design, implementation, and development.
4. To study the scientific bases of tillage, methods of developing a system of tillage and quality control of major field work.
5. To study modern machines and tools that are used for basic field work.
6. To study the elements of technologies for growing major crops (sowing, fertilizers, crop care)
7. To study the scientific bases and agronomic measures to protect soils from erosion.

Acquisition of competencies:

Integrated competency (IC):

The ability to solve complex specialized problems of geodesy and land management

General competencies (GC):

- The ability to learn and acquire modern knowledge.
- The ability to apply knowledge in practical situations.
- The ability to work independently.
- The ability to work as a team.

Professional (special) competencies (SC):

1. The Ability to use basic knowledge of agriculture as a fundamental discipline of agricultural science.
2. Knowledge and understanding of basic biological and agrotechnological concepts, rules and theories related to the cultivation of agricultural plants.
3. The Ability to solve a wide range of problems and problems in agriculture using both theoretical and practical methods.

Program learning outcomes (PLO):

- The ability to apply fundamental knowledge to analyze phenomena of natural and man-made origin when performing professional tasks in the field of geodesy and land management.

- The Ability to apply theories, principles, methods of physical and mathematical, natural, socio-economic, and engineering sciences when performing tasks of geodesy and land management.

- The ability to choose and use effective methods, technologies, and equipment for carrying out professional activities in the field of geodesy and land management.

- Convey information, ideas, problems, solutions, own experience and arguments to specialists and non-specialists.

- Apply conceptual knowledge of natural and socio-economic sciences when performing tasks of geodesy and land management.

3. Program and structure of the course for

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

Topic	Number of hours				
	weeks	Total	including		
			l	p	self
Module one. Scientific bases of agriculture. Weeds and their control in crops					
Topic 1. Agriculture – food, energy, and environmental safety of Ukraine	1	6	2	-	4
Topic 2. Scientific bases of agriculture. Plant life factors and laws of agriculture	2	6	2	-	4
Topic 3. Living conditions of agricultural plants and methods of their regulation	3–5	10	6	-	4
Topic 4. The concept of weeds and their classification. Weed control measures in modern agriculture.	6–7	10	2	4	4
Total for content module 1	7	32	12	4	16
Module two. Crop rotation, soil tillage, and crop protection					
Topic 5. Scientific bases of crop rotations	8	6	2	-	4
Topic 6. Placement of major field crops and fallow field in crop rotation	9–10	13	4	4	5
Topic 7. Design, introduction, and development of crop rotations. Classification of crop rotations	11	10	2	3	5
Topic 8. Theoretical foundations of tillage. Technological operations (processes) in tillage	12	7	2	-	5
Topic 9. Measures (techniques) of tillage. Tillage systems.	13–14	13	4	4	5
Topic 10. Sowing of crops, fertilizers and crop protection	15	9	4	-	5
Total for content module 2	8	58	18	11	29
Total hours	15	90	30	15	45

4. Practical class topics

№	Name of theme	Number of hours
1	Biological features of weeds	4
2	The main crops in Ukraine	4
3	Methods of crop rotation design. Drawing up a crop rotation scheme	3
4	Development of tillage systems in crop rotation	4

5. Self-Study topics

№	Topics	Number of hours
1	The Origins of Agriculture	4
2	Use of agricultural laws in modern agriculture	4
3	Methods of determining air and thermal properties of soil	4
4	Contribution of Ukrainian and foreign scientists to the development of crop rotation	4
5	Characteristics of soil and climatic zones of Ukraine	4
6	Special soil-protecting crop rotations and crop rotations on irrigated and drained lands	5
7	Quality control of the primary tillage	5
8	Quality control of the pre-sowing tillage	5
9	Quality control of the post-sowing tillage	5
10	Soil erosion accounting methods. Conservation tillage	5

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

Questions list:

1. Soil fertility, types of fertility and its indicators.
2. The concept of crop rotation and its significance.
3. Air properties of soil and methods of their regulation.
4. Thermal properties of soil and methods of their regulation.
5. Placement of spring cereals in crop rotation.
6. Water properties of soil and methods of their regulation.
7. The ratio of agricultural crops before re-sowing. The phenomenon of soil fatigue and the causes of its occurrence
8. Fallow field and its varieties. The task of fallow field and its disadvantages.
9. Factors affecting plant growth.
10. Classification of crop rotations.
11. Types of crop rotations.
12. Light regime and methods of its regulation.
13. Nutritional regime of soil and methods of its regulation.
14. Preceding crops of winter wheat, their characteristics.
15. Laws of agriculture and their meaning.
16. Chemical causes of crop rotations.
17. Physical causes of crop rotations.
18. Biological causes of crop rotations.

Tests:

Question 1

Indicate the agronomic measures to regulate the light regime
1. The direction of the lines of culture in the field
2. Irrigation and drainage
3. Protect crops from weeds
4. Application of organic and mineral fertilizers
5. Optimal plant density per unit area

Question 2

Select the dimensions of soil aggregates that belong to the microstructure, mm
1. 1,00–3,00
2. 0,5–1,00
3. <0,25
4. 0,25–0,50
5. >10,00

Question 3

What is the process of air exchange between soil and atmosphere and what factors affect it?	
1. Diffusion	A. Temperature
2. Convection	C. Precipitation
3. Air permeability	S. Crops
4. Aeration	D. Wind
5. Air capacity	E. The duration of the growing season

Question 4

Select agrophysical soil fertility indicators
1. The structure of the arable layer, the total porosity of the soil
2. Soil bulk density
3. The content of physical sand and physical clay
4. Stocks of productive moisture
5. The content of organic matter in the soil

Question 5

Give a brief definition of the law of autotrophic
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Question 6

Determine the reserve of productive moisture (P) (in mm) in the soil layer (h) 0.5 m, if it is known that the soil moisture (W) is 17 %, the average bulk density in this layer (d) is 1.24 g/cm³, maximum soil hygroscopicity (Mg) – 3.5 %.

Question 7

Choose the chemical causes of crop rotation
1. Reduction of weed infestation
2. Improving the nutrient regime of the soil
3. Increasing the reserves of productive moisture in the soil
4. Plants make better use of nutrients in crop rotation
5. Crop rotation plants make better use of nutrients from hard-to-reach compounds

Question 8

What determines the structure of sown areas?

1. The presence of land
2. Market conditions
3. Specializations of the enterprise
4. Introduction of proper soil tillage
5. Soil and climatic conditions

Question 9

Select crop rotation links in which winter wheat will have the maximum yield with the same cultivation technologies and for which zones they are typical	
1. Corn for grain, peas, winter wheat	A. Polissya
2. Sunflower, Fallow field, winter wheat	B. Forest-steppe
3. Soybeans, sunflowers, winter wheat	
4. Winter rye, late potatoes, winter wheat	S. Step
5. Sugar beets, corn for silage, winter wheat	

Question 10

The place of culture in crop rotation depends on:
1. Economic importance
2. Phytosanitary condition
3. The presence of machine-tractor units
4. Biology of culture
5. Technologies for growing crops

7. Teaching methods

Methods of organization and implementation of educational and cognitive activities of students used in the study of the discipline "Fundamentals of agriculture and crop science":

- in terms of transmission and perception of educational information: verbal (lectures); visual (illustration, demonstration).
- in terms of logic and thinking explanatory-illustrative (presentation), reproductive (short tests).
- in terms of learning management: educational work under the guidance of a teacher, independent work of students.
- in terms of teamwork: methods of stimulation (additional points for essays and presentations).
- in the aspect of independent activity: educational module, structural-logical schemes, sample tests.

8. Forms of assessment

- current control of knowledge through surveys, writing tests of individual works during classes.
- modular control of knowledge by oral delivery of the passed material of the corresponding module.
- final control of knowledge by performing exam.

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 "Regulations and Examinations and Credits at NULES of Ukraine" (order of implementation dated 26.04.2023, protocol № 10)

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

Scientific and methodological support of the educational process includes state standards, curricula, textbooks, and manuals; electronic presentations, videos, instructional materials of laboratory classes; individual educational and research tasks; control works; text and electronic versions of tests for current and final control, methodical materials for the organization of independent work of students.

11. Recommended sources of information

Basic:

1. Землеробство. Навчальний посібник / Танчик С. П. та ін. Київ. : ЦП «Компринт», 2022. 350 с.
2. Центилю Л. В., Танчик С. П., Цюк О. А. Управління родючістю ґрунту за зберігаючого землеробства. Вінниця «Твори», 2021. 361 с.
3. Танчик С. П., Рожко В. М., Карпенко О. Ю. Землеробство з основами ґрунтознавства. Навчальний посібник. Київ. 2021. 442 с.
4. Танчик С. П., Примак І. Д., Літвінов Д. В., Центилю Л. В. Сівозміни: підручник. 2019. 364 с.
5. Танчик С. П., Цюк О. А., Центилю Л. В. Наукові основи систем землеробства. Монографія. Вінниця: ТОВ «Нілан ЛТД», 2015. 314 с.
6. Гудзь В. П., Примак І. Д., Танчик С. П. Землеробство. К.: Центр учбової літератури, 2014. 432 с.
7. Примак І. Д., Манько Ю. П. та ін. Екологічні проблеми землеробства. К.: Центр учбової літератури, 2010, 455 с.
8. Косолап М. П., Кротінов О. П. Система землеробства no-till. К.: Логос, 2011. 352 с.

Auxiliary:

1. Камінський В. Ф., Літвінов Д. В., Шиліна Л. І. Агробіологічні основи короткоротаційних сівозмін Лісостепу. Монографія, 2019. 228 с.
2. Шувар І. А., Роїк М. В., Іванишин В. В., Сендецький В. М., Центило Л. В. Сидерація в технологіях сучасного землеробства: монографія. Івано-Франківськ : Симфонія форте, 2016. 180 с.
3. Примак І. Д., Косолап М. П., Войтович М. В. та ін. Механічний обробіток ґрунту: історія, теорія, практика. Навчальний посібник. Вінниця. ТОВ «Твори», 2019. 425 с.
4. Циліорик О. І. Система мульчувального обробітку ґрунту в сівозмінах Північного Степу. Монографія. Дніпро: Новий Світ, 2019. 297 с.
5. Шевченко М. В. Наукові основи систем обробітку ґрунту в умовах нестійкого та недостатнього зволоження. Монографія. Харків, 2019. 209 с.
6. Танчик С. П. No-till і не тільки. Сучасні системи землеробства. Навчальний посібник. К. : Юнівест Медіа, 2009. 159 с.
7. Землеробство. Терміни та визначення понять : ДСТУ 4691:2006. – [Чинний від 2006-12-11]. К. : Держспоживстандарт України, 2008. 37 с. – (Національний стандарт України).

Information resources

1. Державна служба статистики України [Електронний ресурс] – Режим доступу до ресурсу: <http://www.ukrstat.gov.ua/>.
2. worldometers [Електронний ресурс] – Режим доступу до ресурсу: <https://www.worldometers.info/uk/>.
3. Інтернет-бібліотека Організації економічного співробітництва та розвитку (ОЕСР) [Електронний ресурс] – Режим доступу до ресурсу: <https://www.oecd-ilibrary.org/agriculture-and-food/data/oecd-agriculture-statistics agr-data-en>.
4. Продовольча та сільськогосподарська організація Об'єднаних націй (ФАО) [Електронний ресурс] – Режим доступу до ресурсу: <http://www.fao.org/countryprofiles/index/ru/?iso3=UKR>.