

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

Department Soil Science and Soil Conservation

**"APPROVED"**

Plant Protection, Biotechnology and  
Ecology

“18” \_\_06\_\_2026

**CURRICULUM OF ACADEMIC DISCIPLINE  
Soil Science and Soil Conservation**

Area of knowledge E “Natural Sciences, Mathematics and Statistics”

Specialty E2 “Ecology”

Educational programme “Ecology”

Faculty Plant Protection, Biotechnology and Ecology

Developed by: Yuriy Kravchenko Professor, Doc Hab.

(First and LAST NAME, scientific degree, academic rank)

Kyiv – 2026

## **Description of the discipline Soil Science with the Fundamentals of Geology**

(name)

this course is an introductory designed for the Bachelor students and provides the basic concepts of all aspects of geology, soil science and soil conservation. It encompasses: Earth's composition and dynamics, pedosphere, anthropogenic influence on pedosphere. The course also presents the soil composition and genesis; physical, chemical, and biological properties; soil water; soil productivity, soil quality assessment, soil degradation and erosion, soil conservation; management practices. The course gives practical experience for sustainable use of soils, the use of which has an influence on environmental, human society and life in general.

<b>Area of knowledge, specialty, academic programme, academic degree</b>		
Area of knowledge	<i>E "Natural Sciences, Mathematics and Statistics"</i>	
Academic degree	<i>Bachelor</i>	
Specialty	<i>101 "Ecology"</i>	
Academic programme	<i>"Ecology"</i>	
<b>Characteristics of the discipline</b>		
Type	<i>Compulsory</i>	
Total number of hours	<i>120</i>	
Number of ECTS credits	<i>4</i>	
Number of modules	<i>2</i>	
Course project (work) (if any)	<i>-</i>	
Form of assessment	<i>Exam</i>	
<b>Indicators of the discipline for full-time and part-time forms of university study</b>		
	<b>University study</b>	
	<b>Full-time</b>	<b>Part-time</b>
Year of study	<i>2</i>	<i>-</i>
Term	<i>3</i>	<i>-</i>
Lectures	<i>30 hours</i>	<i>-</i>
Practical classes and seminars	<i>30 hours</i>	<i>-</i>
Laboratory classes	<i>-</i>	<i>-</i>
Self-study	<i>60</i>	<i>-</i>
Number of hours per week for full-time students	<i>4 hours</i>	<i>-</i>

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

Aim – to demonstrate an understanding of geological theory and related concepts; to identify mineral and rock properties; and to analyze fundamental soil physical, chemical, and biological properties and processes, including their interactions in soil formation. This includes assessing soil suitability and capacity for production and ecological functions, employing laboratory techniques to evaluate soil properties, and applying this knowledge to inform land-use decisions, management practices, and soil sustainability - addressing risks of degradation while preserving critical soil functions.

Prerequisites of the discipline (if any):

1. Mathematics and Physics; 2. Chemistry (Inorganic and Analytical); 3. Chemistry (Organic, Physical, and Colloidal); 4. Biology (Botany, Zoology); 5. Computer Science and Systemology; 6. History of Ukrainian Statehood; 7. Ethnocultural Studies; 8. Philosophy; 9. Ukrainian Language for Professional Purposes; 10. Foreign Language for Professional Purposes; 11. Physical Education; 12. Occupational Safety and Life Safety; 13. Environmental Legislation and Ecological Law; 14. Basic General Military Training.

## Acquisition of competences:

### Competences acquired:

**Integral competence (IC):** - the ability to solve complex specialized tasks and solve practical problems in the field of ecology, environmental conservation and sustainable nature use or the application of basic theories and methods of environmental sciences under complex and uncertain conditions during the learning process.

### General competence (GC):

- GC 1 - knowledge and understanding of the subject area and understanding of the professional activity.

### Special (professional) competence (SC):

- SC 16 – Ability to critically reflect on the core theories, methods, and principles of natural sciences;

### Expected learning outcomes (ELO):

- ELO 3 – understand the basic concepts, theoretical and practical problems in the field of natural sciences that are necessary for analysis and decision-making in the field of ecology, environmental protection and optimal environmental management;
- ELO 8 - be able to search for information using appropriate sources to make informed decisions.

## 2. Programme and structure of the discipline

Names of content modules and topics	Number of hours				
	Week	Total	Including		
			Lec	Lab	Self
<i>Module1. Soil Science.</i>					
1. The Earth and geological processes.	1	8	2	2	4
2. Soil formation and soil processes.	2	8	2	2	4
3. Soil classification, taxonomy and morphology.	3	8	2	2	4
4. Soil physics.	4	8	2	2	4
5. Soil chemistry.	5	8	2	2	4
6. Zonal soils of Ukraine.	6	8	2	2	4
7. Azonal and intrazonal soils of Ukraine.	7	8	2	2	4
Total for Module 1		56	14	14	28
<i>Module2. Soil Conservation.</i>					
8. Theoretical basics of soil conservation.	8	8	2	2	4
9. Mechanical degradation.	9	8	2	2	4
10. Physical degradation.	10	8	2	2	4
11. Chemical degradation.	11	8	2	2	4
12. Physico - chemical degradation.	12	8	2	2	4
13. Biological degradation.	13	8	2	2	4
14. Reclamation of technogenic degraded soils.	14	8	2	2	4
15. Soil conservational management.	15	8	2	2	4
Total for Module 2		64	16	16	32
Total		120	30	30	60

### 3. Topics of lectures

No.	Topic	Hours
1.	The Earth and geological processes.	2
2.	Soil formation and soil processes.	2
3.	Soil classification, taxonomy and morphology.	2
4.	Soil physics.	2
5.	Soil chemistry.	2
6.	Zonal soils of Ukraine.	2
7.	Azonal and intrazonal soils of Ukraine.	2
8.	Theoretical basics of soil conservation.	2
9.	Mechanical degradation.	2
10.	Physical degradation.	2
11.	Chemical degradation.	2
12.	Physico - chemical degradation.	2
13.	Biological degradation.	2
14.	Reclamation of technogenic degraded soils.	2
15.	Soil conservational management.	2

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

No.	Topic	Hours
1.	Diagnostics of Physical Properties of Minerals.	3
2.	Forms (categories) of soil water. Soil hygroscopic moisture determination.	1
3.	International pipette method of soil texture determination.	3
4.	Soil organic matter determination.	3
5.	Soil acidity and cations determination.	2
6.	Soils of Ukraine.	3
7.	Land degradation and its evaluation.	3
8.	Water erosion evaluation.	3
9.	Wind erosion evaluation.	3
10.	Contour – ameliorative land management.	3
11.	Calculations of CO <sub>2</sub> emission and humus balance.	3

### 5. Topics of self-study

No.	Topic	Hours
1	Working with soil genesis, morphology, properties, geography	28
2	Soil conservation, degradation and amendment	32

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

- oral or written survey;
- interview;
- test;
- defending practical, design/graphical works, projects;
- self-assessment;
- other types.

## 7. Teaching methods:

- problem-based method;
- practice oriented studying method;
- case method;
- project education method;
- research based method;
- learning discussions and debates method;
- team work, brainstorm method;
- other types.

## 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
<b>Module 1. Soil Science.</b>		
Lecture 1. The Earth and geological processes.	ELO 3, 8, SC 16. Understand Earth's landforms, develop the ability to identify endogenous and exogenous processes and their resulting landforms, recognize minerals and rocks, and characterize Quaternary deposits. Understand soil forming factors and processes; master the classification of water categories in soil; assess plant-available water content; determine hygroscopic moisture, soil texture, and organic matter. Know laboratory and field safety protocols; learn proper soil sampling techniques; comprehend the role of living organisms in soil organic matter accumulation; and predict soil organic carbon content using balance calculations.	-
Laboratory work 1. Diagnostics of Physical Properties of Minerals.		7
Lecture 2. Soil formation and soil processes.		-
Laboratory work 2. Forms (categories) of soil water. Soil hygroscopic moisture determination.		7
Lecture 3. Soil classification, taxonomy and morphology.		-
Laboratory work 3. International pipette method of soil texture determination.		10
Lecture 4. Soil physics.		-
Laboratory work 4. Soil organic matter determination.		10
Lecture 5. Soil chemistry.		-
Laboratory work 5. Soil acidity and cations determination.		7
Lecture 6. Zonal soils of Ukraine.		-
Laboratory work 6. Soils of Ukraine.		4
Lecture 7. Azonal and intrazonal soils of Ukraine.		-
Laboratory work 7. Soils of Ukraine.		5
Self-study 1. Working with soil genesis, morphology, properties, geography.		10
Module control work 1.		40
<b>Total for module 1</b>		
<b>Module 2. Soil Conservation.</b>		
Lecture 8. Theoretical basics of soil conservation.	ELO 3, 8, SC 16. Be able to assessing soil suitability and capacity for production and	-
Laboratory work 8. Land degradation and its evaluation.		5

Lecture 9. Mechanical degradation.	ecological functions, employing laboratory techniques to evaluate soil properties, and applying this knowledge to inform land-use decisions, management practices, and soil sustainability - addressing risks of degradation while preserving critical soil functions.	-
Laboratory work 9. Land degradation and its evaluation.		5
Lecture 10. Physical degradation.		-
Laboratory work 10. Water erosion evaluation.		5
Lecture 11. Chemical degradation.		-
Laboratory work 11. Water erosion evaluation.		5
Lecture 12. Physico - chemical degradation.		-
Laboratory work 12. Wind erosion evaluation.		10
Lecture 13. Biological degradation		-
Laboratory work 13. Contour – ameliorative land management.		10
Lecture 14. Reclamation of technogenic degraded soils.		-
Laboratory work 14. Calculations of CO <sub>2</sub> emission and humus balance.		5
Lecture 15. Soil conservational management.		-
Laboratory work 15. Calculations of CO <sub>2</sub> emission and humus balance.		5
Self-study 2. Soil conservation, degradation and amendment		10
Module control work 2.		40
<b>Total for module 2</b>		
<b>Class work</b>	<b><math>(M1 + M2)/2 \cdot 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		<b>100</b>

### 8.1. 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

### 8.2. Assessment policy

<b><i>Deadlines and exam retaking rules</i></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 (e.g. a sick leave)
<b><i>Academic integrity rules</i></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><i>Attendance rules</i></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=3297>;
- lecture notes and presentations (in electronic form);
- textbooks, manuals, lab notes;
- methodological materials for the study of the discipline;
- summer training programme of the discipline.

## **10. Recommended sources of information**

1. Blanco, H., & Lal, R. (2023). Soil conservation and management. Springer Cham. <https://doi.org/10.1007/978-3-031-30341-8>
2. Brady, N. C., & Weil, R. R. (2021). Elements of the nature and properties of soils (15<sup>th</sup> ed.). Pearson Prentice Hall.
3. Kravchenko, Y. S. (2019). Geology with the principles of geomorphology: Part 1. Dynamic geology. Center IT.
4. Petrenko, L., Berezniak, M., Kravchenko, Y., Kozak, V., & Berezniak, E. (2020). Soil science with elements of geology. Komprint.
5. Petrenko, L., Berezniak, M., Kravchenko, Yu., Tonkha, O., Berezniak, Ie., & Bykova, O. (2023). Soil science: Practical methods manual. NUBIPU Publishing Center.

