

	Syllabus « Soil Science with Basics of Geology»
	Educational-qualification level - Bachelor
	Specialty: 201 Agronomy
	Field of knowledge: 20 "Agriculture and Food Products "
	Year of study: 1, semester: 2, 3
	Mode of study: full
	ECTS hours: 7
	Language: English
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eLearn webpage	https://elearn.nubip.edu.ua/course/view.php?id=2700

Course Overview:

This course is an introductory designed course for the Bachelor student, which provides the basic concepts of all aspects of geology and soil science. It encompasses: Earth's origin; internal and external Earth's dynamics; minerals and rocks – formation, composition, diagnostics and properties changes; agronomic ores properties and application; anthropogenic influence on geologic environment. The course presents the soil composition and genesis; physical, chemical, and biological properties; soil water; classification and mapping; soil conservation; management practices; and soil fertility and productivity (soil testing, use of fertilizers and liming), soil quality assessment. The course gives practical experience as an aid in developing understanding of the minerals, rocks and soils as natural bodies, the use of which has an influence on environmental, human society and life in general.

The course program and structure

Topics	Hrs lec/ prac	Educational results	Tasks	Grade
2 semester				
Module 1				
Lecture topic 1. Geology. The Earth as space and physical body.	2/2	<i>Know:</i> The Earth as space and physical body. <i>Be able to:</i> describe Earth's formation and evolution. <i>Analyze:</i> Earth's physical properties. <i>Comprehend:</i> the earth as planetary body. <i>Use:</i> Earth's orbit position in a soil cartography.	Lab work №1 submitting on elearn	8
Lecture topic 2. Internal and external spheres.	2/2	<i>Know:</i> The Earth's internal and external spheres. <i>Be able to:</i> describe the Earth's internal and external structure. <i>Analyze:</i> The Earth's spheres properties. <i>Comprehend:</i> minerals' structure and physical properties. <i>Use:</i> to describe a soil mineral composition.	Lab work №2 submitting on elearn	6
Lecture topic 3. Magmatic, metamorphic and sedimentary processes.	2/2	<i>Know:</i> magmatic, metamorphic and sedimentary processes <i>Be able to:</i> provide a lab testing of minerals. <i>Analyze:</i> internal and external processes. <i>Comprehend:</i> internal and external dynamics. <i>Use:</i> to describe the Earth geological structures, rocks and minerals.	Lab work №3 submitting on elearn Self-work 1.1. submitting on elearn	6 10
Lecture topic 4. Plate tectonics and crust deformations.	2/2	<i>Know:</i> plate tectonics and crust deformations. <i>Be able to:</i> distinguish faults and folds. <i>Analyze:</i> types of stress. <i>Comprehend:</i> world system of plates <i>Use:</i> to describe brittle and plastic geological deformations	Lab work №4 submitting on elearn	6
Lecture topic 5. Volcanism.	2/2	<i>Know:</i> volcanoes and volcanism. <i>Be able to:</i> test magma and lava materials. <i>Analyze:</i> types of volcanoes. <i>Comprehend:</i> role of volcanoes in landscape formation <i>Use:</i> in soil genesis.	Lab work №5 submitting on elearn	6

Lecture topic 6. Earthquakes.	2/2	<i>Know:</i> theory about earthquakes. <i>Be able to:</i> estimate causes of earthquakes. <i>Analyze:</i> physical properties of major minerals. <i>Comprehend:</i> frequency and distribution of earthquakes. <i>Use:</i> destructive effects of earthquakes in land management.	Lab work №6 submitting on elearn	6
Lecture topic 7. Weathering.	2/2	<i>Know:</i> about weathering. <i>Be able to:</i> define the factors that control rates of chemical and mechanical weathering. <i>Analyze:</i> the driving forces of weathering. <i>Comprehend:</i> mechanical, chemical and biological weathering. <i>Use:</i> weathering knowledge in a description of soil genesis.	Lab work №7 submitting on elearn Self-work 1.2. submitting on elearn	6 10
Lecture topic 8. Wind movement.	2/2	<i>Know:</i> wind activity. <i>Be able to:</i> describe a laminar and turbulent movement. <i>Analyze:</i> eolian landforms. <i>Comprehend:</i> wind erosion. <i>Use:</i> eolian deposits influence on a soil formation.	Lab work №8 submitting on elearn Mid-term exam 1 completing	6 30
Total for Module 1				100
Module 2				
Lecture topic 9. Mass wasting.	2/2	<i>Know:</i> mass wasting processes. <i>Be able to:</i> describe a movement of solid particles on slopes. <i>Analyze:</i> factors influencing mass wasting. <i>Comprehend:</i> types of mass wasting. <i>Use:</i> to recognize and minimize mass movement effects.	Lab work №9 submitting on elearn	5
Lecture topic 10. Rivers.	2/2	<i>Know:</i> rivers activity. <i>Be able to:</i> characterize floods and floodplain deposits. <i>Analyze:</i> streams. <i>Comprehend:</i> base level and stream valley development. <i>Use:</i> at floodplain soils' studying	Lab work №10 submitting on elearn	5
Lecture topic 11. Lakes and bogs.	2/2	<i>Know:</i> origin of lakes and bogs. <i>Be able to:</i> classify lakes and bogs. <i>Analyze:</i> igneous rocks. <i>Comprehend:</i> processes of sediments formation in lakes and bogs. <i>Use:</i> at bog soils' studying.	Lab work №11 submitting on elearn	9
Lecture topic 12. Oceans and seas.	2/2	<i>Know:</i> ocean and sea activity. <i>Be able to:</i> predict coastal hazards. <i>Analyze:</i> metamorphic rocks. <i>Comprehend:</i> coastal erosion and sediment transport <i>Use:</i> at soil/relief genesis studying.	Lab work №12 submitting on elearn Self-work 2.1. submitting on elearn	9 10
Lecture topic 13. Glaciers.	2/2	<i>Know:</i> glacial formation. <i>Be able to:</i> classify glaciers. <i>Analyze:</i> sedimentary rocks. <i>Comprehend:</i> glacial deposits, glacial sediments. <i>Use:</i> to recognize landscapes formed under glaciation.	Lab work №13 submitting on elearn	9
Lecture topic 14. Ground waters.	2/2	<i>Know:</i> groundwater and the hydrologic cycle. <i>Be able to:</i> detect springs, water wells and artesian systems. <i>Analyze:</i> groundwater movement. <i>Comprehend:</i> groundwater erosion and deposition. <i>Use:</i> to predict problems caused by human modifications of groundwater system.	Lab work №14 submitting on elearn Self-work 2.2. submitting on elearn	9 10
Lecture topic 15. The Quaternary period and soil parent materials.	2/2	<i>Know:</i> the quaternary environmental changes. <i>Be able to:</i> classify types of transported parent material. <i>Analyze:</i> quaternary deposits. <i>Comprehend:</i> soil parent materials formation. <i>Use:</i> quaternary deposits influence on soil profile features.	Lab work №15 submitting on elearn Mid-term exam 2 completing	4 30
Total for Module 2				100
Total for 2st semester ((100+100)/2) x 0,7				70
Exam of 2st semester				30
Total for 2st semester course				100

3 semester				
Module 1				
Topic 1. Introduction to Soil Science.	1/1	<i>Know:</i> course: overview, syllabus, schedule, objectives, grading policy, teaching methods, etc. <i>Be able to:</i> follow the course schedule. <i>Analyze:</i> the course grading system. <i>Comprehend:</i> about soil science as a fundamental science. <i>Use:</i> the course while studying.	Lab work №1 submitting on elearn	5
Topic 2. What is soil?	1/1	<i>Know:</i> soil key concepts. <i>Be able to:</i> determine functions of soil. <i>Analyze:</i> soil phases. <i>Comprehend:</i> importance of soil. <i>Use:</i> knowledge about soil components in soil testing.		
Topic 3. Soil formation and soil processes.	1/1	<i>Know:</i> Soil formation and soil genesis. <i>Be able to:</i> describe passive and active soil forming factors. <i>Analyze:</i> soil forming processes. <i>Comprehend:</i> fundamental soil forming processes. <i>Use:</i> knowledge about soil forming factors and processes to fill out the form of a soil profile description	Lab work №2 submitting on elearn	6
Topic 4. Soil classification.	1/1	<i>Know:</i> different approaches in soil classifications. <i>Be able to:</i> name the soil on the principles of Ukrainian classification. <i>Analyze:</i> FAO nomenclature of soils. <i>Comprehend:</i> principles of soil classifications. <i>Use:</i> soil classifications to name a soil.	Lab work №3 submitting on elearn	6
Topic 5. Soil taxonomy and morphology.	1/1	<i>Know:</i> soil taxonomy. <i>Be able to:</i> classify soils based on soil taxonomy principles. <i>Analyze:</i> FAO, WRB, Ukrainian taxonomy systems. <i>Comprehend:</i> genetic principles of Ukrainian taxonomy system. <i>Use:</i> Morphological features in a soil profile description.		
Topic 6. Soil physical properties 1. Texture and structure.	1/1	<i>Know:</i> the soil solid components. <i>Be able to:</i> provide a lab experiment for soil particles analysis. <i>Analyze:</i> particle sizes and soil texture. <i>Comprehend:</i> soil properties based on its particle composition. <i>Use:</i> a soil texture data in agronomy and land management.	Lab work №4 submitting on elearn Self-work 1.1. submitting on elearn	6 10
Topic 7. Soil organic matter.	2/2	<i>Know:</i> soil organic matter composition. <i>Be able to:</i> estimate the quantity of a soil organic matter. <i>Analyze:</i> a soil organic matter in a lab. <i>Comprehend:</i> a soil organic matter quality. <i>Use:</i> agricultural practices to maintain of humus quantity and quality	Lab work №5 submitting on elearn	6
Topic 8. Soil colloids.	1/1	<i>Know:</i> origin and compositing of soil colloids. <i>Be able to:</i> outline types of soil colloids. <i>Analyze:</i> properties of soil colloids. <i>Comprehend:</i> role of soil colloids in soil genesis and soil productivity. <i>Use:</i> colloidal matter to increase a soil adsorbing capacity.	Lab work №6 submitting on elearn	6
Topic 9. Sorption, cation and anion exchange.	1/1	<i>Know:</i> types and practical significance of soil absorbing capacity. <i>Be able to:</i> estimate CEC & composition of exchangeable cations. <i>Analyze:</i> cation exchange capacity. <i>Comprehend:</i> cation and anion composition influence on soil colloids. <i>Use:</i> agricultural practices to manage soil cation and anion composition.	Lab work №7 submitting on elearn	5
Topic 10. Soil acidity and alkalinity.	2/2	<i>Know:</i> about soil acidity and alkalinity. <i>Be able to:</i> manage soil acidity and alkalinity. <i>Analyze:</i> soil acidity and alkalinity in a lab.	Lab work №8 submitting on elearn	5 10

		<i>Comprehend:</i> the reasons of soil acidity and alkalinity. <i>Use:</i> lime and gypsum application to manage soil acidity and alkalinity.	Self-work 1.2. submitting on elearn	
Topic 11. Soil salinity.	2/2	<i>Know:</i> about soil salinity. <i>Be able to:</i> manage soil salinity. <i>Analyze:</i> soil soluble salts by a water extract analysis. <i>Comprehend:</i> the genesis of soil salinity. <i>Use:</i> leaching rates to maintain soil salinity.	Lab work №9 submitting on elearn Mid-term exam 1 completing	5 30
Total for Module 1				100
Module 2				
Topic 12. Soil physical properties 2. Soil structure, soil density, pore space, impacts of tillage.	2/2	<i>Know:</i> soil structure and its types. <i>Be able to:</i> evaluate in the field: soil structure, soil particle and bulk density, soil porosity. <i>Analyze:</i> soil particle and bulk density, soil porosity. <i>Comprehend:</i> soil physical properties. <i>Use:</i> soil mechanical properties knowledge for soil tillage management.	Lab work №10 submitting on elearn	10
Topic 13. Soil water.	1/1	<i>Know:</i> water origin, properties and structure. <i>Be able to:</i> define forms (categories) of soil water. <i>Analyze:</i> plant and soil water relations (soil moisture constants). <i>Comprehend:</i> energy concepts of soil water. <i>Use:</i> different methods of soil water potential expression		
Topic 14. Soil and the hydrologic cycle.	1/1	<i>Know:</i> hydrologic cycle and water balance <i>Be able to:</i> manage with a soil water balance. <i>Analyze:</i> water balance and water regimes <i>Comprehend:</i> natural drainage classes <i>Use:</i> agricultural practices to manage soil water balance.	Lab work №11 submitting on elearn Self-work 2.1. submitting on elearn	8 10
Topic 15. Soil climate. Soil air and temperature	1/1	<i>Know:</i> soil air and temperature. <i>Be able to:</i> regulate soil air and temperature conditions. <i>Analyze:</i> soil air/temperature & modes of energy transfer. <i>Comprehend:</i> plant requirements to soil air and temperature conditions. <i>Use:</i> agricultural practices to manage soil air and temperature regimes.		
Topic 16. Soil ecology.	1/1	<i>Know:</i> soil ecology. <i>Be able to:</i> estimate structurally and chemically diverse of organic resources. <i>Analyze:</i> soil living organisms. <i>Comprehend:</i> the role of organic matter in soil function <i>Use:</i> different technologies to accumulate soil organic resources.	Lab work №12 submitting on elearn	8
Topic 17. Soil productivity and its evaluation.	2/2	<i>Know:</i> soil productivity and its evaluation. <i>Be able to:</i> to evaluate soil productivity by a A.I.Siry method. <i>Analyze:</i> soil properties by 0 to 100-point scale. <i>Comprehend:</i> role of a soil productivity in crop yields. <i>Use:</i> a land suitability class to land management.		
Topic 18. Soils of the Forest Zone of Ukraine.	2/2	<i>Know:</i> natural conditions of the Forest Zone of Ukraine. <i>Be able to:</i> describe a profile of the Forest soils of Ukraine. <i>Analyze:</i> properties of the Forest Zone soils of Ukraine. <i>Comprehend:</i> the fertility management of the Forest Zone soils of Ukraine. <i>Use:</i> in agriculture the Forest Zone soils of Ukraine.	Lab work №13 submitting on elearn	8
Topic 19. Soils of the Forest-Steppe zone of Ukraine.	2/2	<i>Know:</i> natural conditions of the Forest-Steppe Zone of Ukraine. <i>Be able to:</i> describe a profile of the Forest-Steppe soils of Ukraine. <i>Analyze:</i> properties of the Forest-Steppe soils of Ukraine. <i>Comprehend:</i> the fertility management of the Forest-Steppe Zone soils of Ukraine. <i>Use:</i> in agriculture the Forest-Steppe Zone soils of Ukraine.	Lab work №14 submitting on elearn Self-work 2.2. submitting on elearn	8 10

Topic 20. Soils of the Steppe zone of Ukraine.	2/2	<i>Know:</i> natural conditions of the Steppe Zone of Ukraine. <i>Be able to:</i> describe a profile of the Steppe soils of Ukraine. <i>Analyze:</i> properties of the Steppe soils of Ukraine. <i>Comprehend:</i> the fertility management of the Steppe Zone soils of Ukraine. <i>Use:</i> in agriculture the Steppe Zone soils of Ukraine.		
Topic 21. Alluvial and Meadow Soils.	1/1	<i>Know:</i> natural conditions of the flooding plain soils' formation. <i>Be able to:</i> describe a profile of the flooding plain soils. <i>Analyze:</i> properties of the flooding plain soils. <i>Comprehend:</i> the fertility management of the flooding plain soils. <i>Use:</i> in agriculture the flooding plain soils.	Lab work №15 submitting on elearn Mid-term exam 2 completing	8 30
Topic 22. Saline soils.	1/1	<i>Know:</i> natural conditions of the saline soils' formation. <i>Be able to:</i> describe a profile of the saline soils. <i>Analyze:</i> properties of the saline soils. <i>Comprehend:</i> the fertility level of the saline soils. <i>Use:</i> in agriculture the saline soils.		
Total for Module 2				100
Total for 3rd semester ((100+100)/2) x 0,7				70
Exam of 3rd semester				30
Total for 3rd semester course				100

THE COURSE POLICY

<i>Lab Grading Policy:</i>	Lab reports are submitted on elearn platform. Lab reports submitted after due date will be assessed at a penalty of 10% of the total lab report point value for each 24-hour period beyond the due date. Make-up lab submitting will only be provided for students with excused absences. Students are expected to submit four self-works prior a session.
<i>Examination Policy:</i>	Students are required to take all two mid-term exams and the final exam in this course. Copying of others' work, use of disallowed material on exams, plagiarism in assignments, or cheating in any other form as defined by the instructor will result in a grade of zero for that assignment. Multiple infractions will result in a grade of 'F' for the course. No electronic equipment, except calculators, will be allowed during exams. Violation of this will result in an immediate grade of '0' for the exam.
<i>Attendance Policy:</i>	Students are expected to be present at all lectures and to arrive on time. If a student must miss a lecture, her/his is responsible for all material presented during lecture and for the assigned textbook reading. Make-up quizzes, homework assignments, and examinations will only be provided for students with excused absences. Excused absences will only be granted for documented academic conflicts, international staging, documented medical reasons and force majeure. Excused absences can only be granted by Dr. Yuriy Kravchenko. Students are expected to respect the rights of others in the class. Cell phones and other electronic equipment should be turned off prior to the beginning of class.

STUDENT'S RATING SCALE

Student's rating, points	The Ukrainian National Grades	Grading Test
90-100	«Excellent»	Passed
74-89	«Good»	
60-73	«Satisfactory»	
0-59	«Unsatisfactory»	Fail