

Appx 2
to the Order of March 23, 2023 № 244


**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL
SCIENCES OF UKRAINE**
Department of Soil Science and Soil Conservation

"CONFIRMED"
Dean of Land Management Faculty
_____ T. Ievsiukov
" _____ 2023



"APPROVED"
at the meeting of the department
Soil Science & Soil Conservation
Protocol № 9 dated 10. 04. 2023
Head of Department
_____ V. Zabaluiiev

"REVIEWED"
Program Coordinator of 193 Geodesy
and Land Management
Program Coordinator
_____ I. Kovalchuk



PROGRAM OF THE COURSE

"Geology with the Basics of Geomorphology"

Specialization: **193 Geodesy and Land Management**
Educational Programm: **19 Architecture and Constructing**
Faculty: **Land Management**
Developer: **Associate Professor, PhD, Yuriy Kravchenko**

Kyiv – 2023

1. Description of the course

“Geology and Geomorphology”

Field of knowledge, specialization, educational program, educational degree	
Educational degree	Bachelor
Educational program	Geodesy and land management
Specialization	193 Geodesy and land management
Characteristics of the course	
Type	Obligatory
Total number of hours	120
Number of ECTS credits	3
Number of content modules	2
Course project (work)	-
Form of assessment	Pass-Fail Exam
Indicators of the course for full-time and part-time forms of study	
	Full time
Course (year of study)	1
Semester	1
Lecture classes	30 hours
Practical, seminar classes	-
Lab classes	15 hours
Self-study	75 hours
Individual assignments	-
Number of weekly classroom hours for the full-time form of study	3 hours

2. Purpose, objectives, and competencies of the course

Purpose : to make the acquaintance of students with the structure of Earth and also gets to know with chemical composition, receiving general information of geological processes, which take place in the earth's crust and on its surface.

Objectives:

- describe the geological phenomena which are related to the endogenous and exogenous processes;
- diagnose the physical properties of minerals, their classification and application in a national economy;
- determine ways of mineral and rock formation;
- classify of minerals and rocks;
- develop skills in observing and recording geologic features and processes;
- describe the relationship between plate tectonics and the rock cycle.
- locate and interpret scientific literature.
- give the oral presentations.
- use of computers at a level consistent with current professional practice.
- express the earth science concepts in writing.

Acquisition of competencies:

Integrated competency (IC):

- the ability to solve complex specialized problems of geodesy and land management.

General Competencies (GC):

- GC 1 - ability to study and hold of up-to-date knowledge;
- GC 2 – ability to use knowledge at practical situations;
- GC 5 - ability to use foreign language;
- GC 7 - ability to work autonomously;
- GC 8 - ability to work in a team;

- GC 9 - ability to interpersonal interaction;
- GC 10 - ability to perform safe activities;
- GC 13 - ability to predict, multiply of moral, cultural, scientific values and achievements of society based on understanding of history, patterns of development of the subject area, its place in the general system of knowledge about nature and society, as well as in the development of society, techniques and technology, using its for recreation and healthy living.

Professional Competencies (PC):

- PC 1 - the ability to apply fundamental knowledge for the analysis of of natural and technogenic phenomena underperforming professional tasks in the field of geodesy and land management.
- PC 2 - ability to apply theories, principles, methods of physical and mathematical, natural, socio-economic, and engineering sciences when performing tasks of geodesy and land management.
- PC 6 - ability to perform remote, ground, field and camera research, engineering calculations for the processing of research results, form research results, prepare reports when solving geodesy and land management tasks;
- PC 7 - ability to collect, update, process, critically evaluate, interpret, store, publish and use geospatial data and metadata about natural and technogenic objects.

Program learning outcomes (PLO):

- PLO 1 - communicate freely orally and in writing in national and foreign languages on matters of professional activity;
- PLO 4 - know and apply in professional activity regulatory and legal acts, regulatory and technical documents, reference materials in the field of geodesy and land management and related fields.
- PLO 5 - apply conceptual knowledge of natural and socio-economic sciences when performing tasks of geodesy and land management;
- PLO 7 - to carry out surveys and search, topographic-geodetic, cartographic, project and project-search works when performing professional tasks in geodesy and land management.

3. Program and structure of the course for full time students

3.1. Course program

Module 1. The earth as space and physical body. Endogenic geological processes.

1.1. The Earth as space and physical body. Universe and galaxies. Planetary system, its structure, planets and satellites, belt of asteroids, comets, meteorites. The Earth in Universe, its structure, composition, age, development. The planets of terrestrial group and their comparative analysis. Forms and sizes of the Earth. Figure of the Earth, mass, density. Gravitation, magnetic, thermal and other geophysical fields.

1.2. Internal and external spheres of the Earth. The Earth layers, its properties. The Earth and the Earth crust elemental composition. Internal geosphere subdivisions. Layers of the upper Earth: lithosphere, asthenosphere, oceanic and continental crust, subduction zones, lithospheric plates (thickness), "Continental drift", isostasy. Gravitation, magnetic, thermal and other geophysical fields.

1.3. Magmatic, metamorphic and sedimentary processes. A concept about a magma. Origin of Magma. Intrusive magmatism. Effusive magmatism is volcanic magmatism. Basic types of metamorphism. Chemical and mineralogical changes during metamorphism. General life history of sediment: Weathering, Transport, Deposition, Cementation (diagenesis, katagenesis, lithification). Depositional environments: Continental (fluvial, eolian, lacustrine, glacial), Marine (continental shelf and reef, abyssal plain), Transitional (deltaic, beaches). Sediments in the rock cycle.

1.4. Plate tectonics and crust deformations. Theory of plate tectonics. Lithosphere plate, transformation break, Bhenof zones. Development and evolution of lithosphere plates. Processes in the continental. Tectonic deformations. Types of fold formations. Types of brittle deformations. Continental and oceanic types of the Earth's crust. Basic structural elements of the Earth's crust and their development. Tectonic sphere and its structure. Lithosphere and asthenosphere. Dismemberment of the earth's crust. Continents and oceans. Passive and active boundaries their structure. Structural elements and development of continental belts. Geosynclinals conception – as a reflection of empirical regularities of development of mobile belts.

1.5. Volcanism. Effusive magmatism is volcanic magmatism. Volcanoes and their activi- ty. Products of volcanic eruption: gaseous, liquid, solid. Structure of lava streams. Volcanoes of central type. Categories of eruptions. Monogenic volcanoes. Maari, diatremas. Polygenic volcano. Hawaiian type of volcanoes.

Structure of volcanic vehicle. Peleyian type. Etno-Vezuvianskiy type of volcanoes. Old volcanoes. Bandayskiy type. Calderas and their origin. Geological pre-conditions of origin of volcanoes. Under and after volcanic phenomena. Practical application of hydrothermal and steam. Geographical and geological distribution of active volcanoes

1.6. Earthquakes (seismic). Earthquakes – as an echo of intensive tectonic deformations in the earth's crust and discharging of tension. Resilient (seismic) waves, their types and speed of distribution. Seismic stations and seismographs. Classification and types of earthquakes. Frequency of earthquakes. Intensity, energy and frequency of earthquakes and their seismic districting.

1.5. Weathering. Weathering types and factors, that cause its. Agents of physical weathering. Oxidation, reduction, hydration, dehydration, hydrolysis, kaolinitization, montmorilonitization. Weathering influence on relief. Core of weathering as a natural complex of mountains, relief, climate which was made historically.

1.6. Wind movement. Geological activity of wind. Wind as an agent of denudation in dry lands (eolian processes). A specific of eolian activity. Deserted landscapes in different climatic areas. Types of the deserts. Eolian deposits. Eolian forms of relief, their geography. Wind erosion.

Module 2. Exogenic geological processes. Geological ages.

2.1. Mass wasting. Geological and relief work of water streams. A cycle of water is in nature. Fluvial processes and their factors (streams of the melted snow, temporal and permanent river-bed rain-waters). Forms of water streams. Regularity, areas and cycles of denudation. Unstreamflow, flat-bed out-wash and its development. Delluvium and other slope gravitation deposits. Temporal river-bed streams, cones of bearing-out and prolluvium. Forms of water erosion. Forms of eroded relief.

2.2. Rivers. Geological activity of river streams. Bottom and lateral erosion. The alluvium origin, its lithologic description. River valleys, their types, asymmetry, origin, evolution. Meanders, oxbow of the rivers, reasons of their origin and role in expansion of valley and forming an alluvium. Types of terraces. Alluvial deposits of minerals. Types of the alluvium. Deltas, estuary, liman.

2.3. Lakes and bogs. Lakes and bogs, as geological and geomorphological factor. Lakes, their origins, types, geography, geological activity, short life, hydrological mode, dynamics. Chemistry of lacustrines. Sediments of lakes (terrigenous, chemical, biogenic). Bogs, their origins, types (up-river, low-laying area, transitional), spreading, geological activity, connection with relief, biosphere functions, evolution.

2.4. Oceans and seas. Geological activity of seas and oceans. Marine geology. Sea relief. Morphological, physical and chemical features of the World Ocean. Organic life of oceans and seas: nekton, plankton, benthos. Abrasion. An accumulation of deposits is in the different areas of sea: littoral shelf, bathyal zone, abyssal zone. Types of sediments: terrigene, organic, chemical, volcanic. Katangese, epigenesis, hypergenesis.

2.5. Glaciers. Glacial and cryogenic processes, its geological and relief functions. Glaciers today and in geological past, their geography, paleogeography. Snow line, seasonal and long-term snows, avalanche, glacier ice. Formations of glacial deposits, their structure, glacier-accumulative forms of relief. Transfer by the glaciers of fragmental material, mobile moraines, their types. Fluvioglacial outwashes, moraines, ozy, kames, lacustrine-glacial deposits. Glacial epoch, glacial cycle.

2.6. Ground waters. Geological activity of groundwater. Origin, composition, classification, geographical spreading of groundwater. Waterproof rocks. Geological work of underwater ((suffusion, karst (carbonate, gypsum, salts), corrosion, displacement, pseudo karst)), its influence on relief. Geysers, thermal sources. Upper-water, ground, without and with pressure (artesian) between layer water. The origin of groundwater and their water supply. The groundwater movement.

2.7. The Quaternary period and soil parent materials. Description of methods of determination of absolute age of rocks. Basic stages of the Earth history. Description of quaternary period, glacial and between epochs. Geological maps, principles of their drafting. Map of quaternary deposits of Ukraine.

3.2. Course structure.

Names of content modules and topics	Number of hours				
	Full time				
	Week	Total	Including		
			Lec	Prac	Self

Module1. The Earth as space and physical body.					
The Earth as space and physical body.	1.	5	2		5
Internal and external spheres of the Earth.	2.	5	2		5
Magmatic, metamorphic and sedimentary processes.	3.	5	2		5
Plate tectonics and crust deformations.	4.	5	2		5
Volcanism	5.	5	2		5
Earthquakes	6.	5	2		5
Weathering.	7.	5	2		5
Wind movement.	8.	5	2		5
<i>Mid-term exam 1</i>					
Total for Module 1	8	48	16	8	40
Module 2. Exogenic geological processes. Geological ages.					
Mass wasting.	9.	5	2		5
Rivers.	10.	5	2		5
Lakes and bogs	11.	5	2		5
Oceans and seas	12.	5	2		5
Glaciers	13.	5	2		5
Ground waters.	14.	5	2		5
The Quaternary period and soil parent materials.	15.	5	2		5
<i>Mid-term exam 2</i>					
Total for Module 2	7	42	14	7	35
Total	15	90	30	15	75

6. Laboratory class topics

Lab Topic	Wk	Lab
<i>Module1. The Earth as space and physical body.</i>		
Lab 1. Diagnostics of Physical Properties of Minerals.	1	2
Lab. 2. Mineral Properties.	3	2
Lab. 3. Silicates Properties.	5	2
<i>Mid-term exam of Module 1</i>	7	2
Total for Module 1		8
<i>Module 2. Exogenic geological processes. Geological ages.</i>		
Lab. 4. Igneous Rocks Properties.	9	1
Lab. 5. Metamorphic Rocks Properties.	11	1
Lab. 6. Sedimentary Rocks Properties.	13	2
Lab. 7. Quaternary Deposits and Agronomic Ores.	15	1
<i>Mid-term exam of Module 2</i>		2
Total for Module 2		7
Total for course	15	15

7. Independent work topics

№	Topic title	Number of hours
1.	Earth as space and physical body.	3
2.	Internal and external spheres.	3
3.	Magmatic, metamorphic and sedimentary processes.	3
4.	Plate tectonics and crust deformations.	3
5.	Volcanism.	3
6.	Earthquakes.	3
7.	Weathering.	3
8.	Wind movement.	3
9.	Mass wasting.	3
10.	Rivers.	3
11.	Lakes and bogs.	3
12.	Oceans and seas.	3

13.	Glaciers.	3
14.	Ground waters.	3
15.	The Quaternary period and soil parent materials.	3
Total for self-work		75

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

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE			
ECL «Bachelor» Specialties: Ecology, Land management, Agrobiology	Soil Science and Soil Conservation department 201__–201__ yr.	Exam paper № 1	Approved Head of department _____ 20__ p.
MID TERM EXAM 1			
<p>1. Common information about the Earth and its structure. The Earth in Universe, its structure, composition, age, development. Forms and sizes of the Earth. Figure of the Earth, mass, density. Internal and external the Earth layers, its properties (lithosphere, mantle, core, atmosphere, hydrosphere, biosphere). Gravitation, magnetic, thermal and other geophysical fields. Continental and oceanic types of the Earth's crust. Asthenosphere. Continents and oceans, its relief and structure. Old and young platforms. Geosynclinals.</p> <p>2. Weathering. Weathering types and factors, that cause its. Agents of physical weathering. Oxidation, reduction, hydration, dehydration, hydrolysis, kaolinitization, montmorillonitization. Weathering influence on relief. Core of weathering as a natural complex of mountains, relief, climate which was made historically. Formation of weathering core, its types, structure and depth in different climatic areas. Geographical distribution of the cores of weathering in Ukraine. Young and old layers of weathering. Eluvium as a mother of sedimentary rocks, including parent materials of soils.</p>			

Test block

1. Distribute the minerals according the groups:			
1	Native elements	A	Quartz
2	Sulphides	B	Graphite
3	Silicon oxides	C	Pyrite
4	Iron oxides	D	Magnetite

2. Find the chemical formula of augite:	
1	$(\text{CaNa})_m (\text{Mg}, \text{Fe}^{2+}, \text{Al}, \text{Fe}^{3+})_n (\text{OH}) [\text{Si}_4\text{O}_{11}]$
2	$(\text{CaNa}) (\text{Mg}, \text{Fe}^{2+}, \text{Al}, \text{Fe}^{3+}) [\text{Si}_2\text{O}_6]$
3	$(\text{Mg}, \text{Ca}, \text{K}, \text{Na})_3 \text{Al}_2 (\text{OH})_4 [\text{Si}_4\text{O}_8 (\text{OH})_2] \cdot n\text{H}_2\text{O}$
4	$(\text{Mg}, \text{Fe}^{2+}, \text{Fe}^{3+})_3 [\text{AlSi}_3\text{O}_{10}] (\text{OH})_2 \cdot 4\text{H}_2\text{O}$

3. Match the igneous rocks with the corresponding groups:			
1	Granite	A	Medium
2	Peridotite	B	Acid
3	Sienite	C	Ultra basic
4	Bazalt	D	Basic

4. Which rocks formed paragneisses as a result of metamorphism?	
1	Granites
2	Sandstones
3	Marbles
4	Loess

5. The shape of the Earth is

6. Name the type of primary magma:	
1	Schistic
2	Basaltic
3	Sedimentary
4	Biochemic

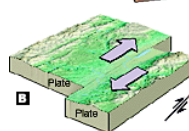
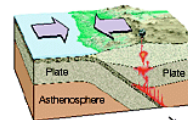
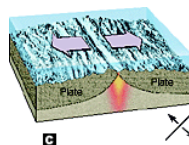
7. Name folding deformations:	
1	Fault
2	Syncline

3	Grabben
4	Covers (domes)

8. Geologic activity of swamps results in the formation of:	
1	Peat
2	Limnoabrasion
3	Clastic sediments
4	Coal

9. Rifts are a component of:	
1	Plain platform areas
2	Mountain areas
3	Zones of island bows
4	Ocean floor

10. Identify each of the indicated types of plate boundaries by selecting the correct response.



- 1 convergent boundary
- 2 transform fault boundary
- 3 divergent boundary

9. Teaching methods

Teaching methods include: - “Authority lecturing” method with the teacher-centered approach (including ppt presentations, audio & video tools); - “Demonstrator” method, is used to acquire a full understanding of the theoretical and practical knowledge of the subject (soil museum, lab equipment, tools and techniques available by which we investigate soils); - “Real learning” method is used for demonstrating real situations in agriculture and land management; - “Facilitator” method or action method is used to develop problem-solving skills, for ex., how to solve the problems related to: soil organic matter declining, soil acidity, soil salinity, soil compaction, etc.; - “Delegator” or group or the student-centered approach method is beneficial for students group work used in soil mapping and chemical lab-based experiments; - “Blended learning” is based on a strategy that encourages the use of personal preferences in studying research or practical soil science along with face-to-face instruction. This is an integrated teaching style incorporates individual extra-curricular knowledge and specific interests into students scientific or diploma work; - “Field-Trip” method entails visits to places where students studying soils in the nature as well as it has been changed under agriculture influence; - “Brainstorming” method is also beneficial for generating ideas or solving problems within a student group; - “Independent Study” method is widely used outside of the campus and combined with “Online learning” by means of usage “Moodle” platform. This method is focused on students’ self-work; - other methods. There are also other enjoyed techniques used in the course teaching: enthusiasm, pictures, and stories that bring soils alive in the classroom, along with laboratory and field experiences that allow students to grow confidence in their ability to understand and work with soils. To adopt the best teacher practices, a module from geology uses a concept of independent students’ testing with a preliminary self-work preparation at http://wps.prenhall.com/esm_tarbuck_earth_8/19/5071/1298207.cw/index.html web page.

10. Forms of assessment

Lab reports - lab reports will be submitted in the students’ lab book and teacher’s journal. Lab reports submitted after the due date will be assessed a late penalty of 10% of the total lab report point value for each 24-hour period beyond the due date.

Homework assignments will be announced in the class. The homework assignments will consist of short summary or answer questions that are related to the subject matter being covered in lecture. Homework assignments *must* be submitted as additional text in student workbook.

Mid-term Exams. All mid-term exams dates and themes are shown in the course schedule. At least one week prior to each exam students will receive requesting them to be prepared to examination. Students also will be provided with Study Guide/Learning Objectives for exam. Mid-term exam could be based on oral, writing, quizzing, project or computer-testing procedure. Students who have documented course conflicts with these exam dates and times must contact Dr. Yuriy Kravchenko at least one week prior to the exam date to arrange an alternate exam time. They should get a dean’s permission for this extra examination.

Final Exam. The final is a comprehensive examination and is a writing-quizzing based exam. Date and location for the final exam will be as indicated on the University final exam schedule. Make-up exams will only be granted to students with an excused absence, must be get a dean’s permission, and scheduled with Dr. Yuriy Kravchenko.

11. 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 1 "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): $R_{dis} = R_{aw} + R_{ex}$.

12. Educational and methodological support

- Textbooks, laboratory books, additional literature, internet sources.
- Lecture and lab classrooms.
- Soil museum.
- Equipment:

Фотометр полуменевий: BWB-XP G2b, Спектрофотометр скануючий двухпроменевий Libra S-70, рН-метр :Thermo Orion STAR A SERIES, Thermo Orion STAR A SERIES, Дозатор піпетковий з регульованим об'ємом дози Термо Fisher Scientific Oy, 500-5000мкл, Finnpiptette F2, 100-1000мкл, Finnpiptette F2, 1000-10000мкл, шафа сушильна: Thermconcept KTL 400/02/A, СНОЛ 100/350, Вага лабораторна електронна: OHAUS PA513, OHAUS PA513C, Ваги аналітичні: OHAUS PA214C, Сито лабораторне: СЛ-200 (0,25мм), СЛ-200 (0,25мм), Термогірометр: TFA D-97877, TFA D-97877, Термостат: IRMECO ILW 53 STD, Млин лабораторний: MF 10 basic IKA-WORKS, Шейкер: GmbH Since 1880 SM-30 C, Дистилятор: GFL 2012, Мішалка магнітна: IKA C-MAG HS 7 з підігрівом, Електроплитка: LDH HPLP-C-P, Термія ЕП42-2,5/220.

13. Recommended sources of information

Textbooks Required:

1. Kravchenko Y.S. Geology with the principles of Geomorphology. Part 1. Dynamic Geology. Київ, ТОВ "Центр ІТ". 2009. 142 с.
2. Тихоненко Д.Г. Геологія з основами мінералогії : навч. посібник. За ред. д-ра с. -г. наук, проф. Д. Г. Тихоненка. К.: Вища освіта, 2003. 287 с.
3. Свинко Й.М., Сивий М.Я. Геологія. Підручник. К.: Либідь, 2003. 480 с.
4. Carlson D.H., Plummer C.C., Hammersley L. Physical Geology. McGraw-Hill, 2015. 672 p.
5. Lutgens F.K., Tarbuck E.J. Essentials of Geology. 13th Edition. NY, USA: Pearson, 2017. 606 p.
6. Keller E.A. Introduction to Environmental Geology. Prentice Hall, 2011-2012. 801 p. 5th ed.
7. Стецюк В.В., Ковальчук І.П. Основи геоморфології: Навч. посіб. / За ред. О.М.Маринича. К.: Вища школа, 2005. 495 с.
8. Павловська Т. С. Геоморфологія : навч. посіб. для студ. закл. вищ. освіти / Тетяна Сергіївна Павловська, Іван Платонович Ковальчук. Луцьк : Вежа-Друк, 2022. 348 с.

Laboratory books Recommended:

1. Petrenko L., Kravchenko Yu., Starodubtsev V. Elements of Geology. NUBIPU Publishing Center, Kyiv, 2006. 99 pp.
2. Tasa D., Cronin V. Laboratory Manual in Physical Geology. 11th Edition. Pearson, 2018. 471 p.
3. Klein C., Philpotts A. Earth Materials. Introduction to Mineralogy and Petrology. University Printing House, Cambridge CB2 8BS, United Kingdom, 2017. 1925 p.
4. Halдар, S. K., Tisljar Josip. Introduction to mineralogy and petrology. Waltham, Massachusetts : Elsevier, 2014. 338 p.
5. Perkins D. Mineralogy. Third Edition. Harlow, England: Pearson Education Limited, 2014. 561 p.

Additional literature:

1. Murck B., Skinner B. Visualizing Geology. Wiley, 2012. 592 p. in color. 3rd ed.
2. Пальоха. Загальна геологія. Конспект лекцій. 102 с. (Дата звернення 28.05.2023 р.).
https://elearn.nubip.edu.ua/pluginfile.php/596645/mod_page/content/8/%D0%9F%D0%B0%D0%BB%D1%8C%D0%BE%D1%85%D0%B0.%20%D0%97%D0%B0%D0%B3%D0%B0%D0%BB%D1%8C%D0%BD%D0%B0%20%D0%B3%D0%B5%D0%BE%D0%BB%D0%BE%D0%B3%D1%96%D1%8F.doc

Internet sources.

Електронний курс – <https://elearn.nubip.edu.ua/course/view.php?id=3295>