MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
Faculty of Architecture, Civil Engineering and Design
Computer Technologies of Airport Construction and Reconstruction Department

AGREED
Dean of Faculty
_____ Viktor KARPOV
«26» 10 2022

APPROVED
Vice Rector for Academics
_____ Anatolii POLUKHIN
«28» 10 2022

Quality management system

COURSE TRAINING PROGRAM
on
«Engineering geology»

Educational and Professional Program: «Industrial and Civil Engineering»

Field of study: 19 «Architecture and Construction»
Specialty: 192 «Building and Civil Engineering»

Form of education	Sem	Total (hours/ ECTS credits)	Lec.	Prac.	Lab.	Srlf-study	Homeworks control works	KW / KP	Form of control
Full-time:	6	150/5	34	-	34	82	HW 6c	-	Graded Test 6d semester
Part-time:	-	-	-	-	-	-	-	-	-

Index: ECB-5-192-1/21-2.1.13

The Course Training Program on "Engineering geology" is developed on the basis of the Educational - Professional Program "Industrial and Civil Engineering", Bachelor Curriculum and Extended Curriculum №ECB-5-192-1/21, for training higher education seekers of the Bachelor degree of speciality 192 "Building and Civil Engineering" and corresponding normative documents.

Developed by:

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Discussed and approved by the Graduat Department for the Specialty 192 "Building and Civil Engineering" (Educational Professional Program "Industrial and Civil Engineering") - Computer Technologies of Airport Construction and Reconstruction Department, Minutes № 12 of "25" 10 2022.

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«27» 10 2022

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INTRODUCTION

The Course Training Program of the academic discipline "Engineering Geology" was developed on the basis of the "Methodological recommendations for the development and execution of the syllabus of educational discipline of full-time and part-time forms of training", approved by rector's order No. 249/roz. of 29.04.2021 and relevant regulatory documents.

1. EXPLANATORY NOTE

1.1. Role, goal and objectives of the academic discipline

The place of the educational discipline is the theoretical and practical basis of a set of knowledge and skills that form the profile of a specialist in the field of design, construction, reconstruction and operation of various construction structures (buildings and structures of airports, airfields, highways and similar structures). On the basis of the acquired knowledge, the specialist performs design and technological documentation when designing specific construction objects in order to obtain the most effective results.

The purpose of the educational discipline is to reveal modern scientific concepts, concepts, methods and technologies of acquiring relevant knowledge about the Earth, its age, composition, structure, material composition and structural elements of the earth's crust, the patterns of their development; exogenous and endogenous processes, their interaction, conditioning; geological activity of surface and underground waters, atmospheric factors; minerals, rocks, soils, man-made changes in the geological environment, as well as the possibility of using them as bases for the construction, operation and reconstruction of buildings and structures.

The tasks of studying the academic discipline are:

- familiarization with the structure of the Earth's crust and its components: chemical elements, minerals, rocks;
- familiarization with the structure and properties of soils;
- the study of hydrogeology as a science of the composition, properties, regime of underground waters;
- familiarization with the main engineering and geological processes;
- to prevent the development of undesirable geological phenomena and processes that lead to changes in the engineering-geological situation, damage and destruction of engineering-technical structures;
- familiarization with the practical skills of the basics of engineering and geological mapping.

1.2. Educational outcomes of the academic discipline

As a result of studying the academic discipline, the student of higher education acquires:

PLO2 – Participate in research and development in the field of architecture and construction. PLO4 – Design and implement technological processes of construction production, using appropriate equipment, materials, tools and methods. PLO7 – Perform data collection, interpretation and application, including through the search, processing and analysis of information from various sources. PLO9 – Design building structures, buildings, structures and engineering networks, taking into account engineering and resource-saving measures, legal, social, environmental, technical and economic indicators, scientific and ethical aspects, and modern requirements of regulatory documentation in the field of architecture and construction, environmental protection and labor safety. PLO14 – Ensure reliable and safe operation of building constructions, structures and engineering networks.

1.3. Competencies obtained through academic discipline

IC - The ability to solve complex specialized tasks and practical problems in the field of construction or in the learning process, which involves the application of theories and methods of determining the strength, stability, durability, reliability and safety of buildings and structures;

application of information technologies, software complexes, automated design systems.

General competences, which the educational discipline makes it possible to acquire:

GC2 – Knowledge and understanding of the subject area and professional activity.

Professional competences, which the educational discipline makes it possible to acquire:

PC4 – Ability to choose and use appropriate equipment, materials, tools and methods for designing and implementing technological processes of construction production.

1.4. Interdisciplinary links.

The study discipline "Engineering geology" complements the study of the following disciplines: "Engineering geodesy (general course)", "Construction technology" and is the basis for studying the disciplines : "Production base of civil engineering", "Erection and assembling of structures".

2. PROGRAM OF THE ACADEMIC DISCIPLINE.

2.1. Content of the academic discipline

The educational material of the discipline is structured according to the modular principle and consists of two educational modules, namely: module No. 1 "Structure of the earth, minerals and rocks"; module No. 2 "Fundamentals of hydrogeology, geological processes and engineering-geological prospecting", which are logically complete, relatively independent, integral parts of the educational discipline, the mastery of which involves conducting modular control works and analyzing the results of their implementation.

2.2. Module structuring and integrated requirements for each module

Module № 1. "Earth structure, minerals and rocks"

Integrated module requirements №1:

Know: hypotheses of the origin of the Earth, stages of its development, structure, origin of the planet in outer space; the structure, composition and age of the earth's crust and the main stages of its formation, geochronological scale; basic information about minerals, rocks, their classifications and properties; diagnostic properties and methods of determining basic minerals; diagnostic properties and basic methods of determining the main types of rocks; the main types of movements of the earth's crust and its impact on engineering and technical structures; basic engineering-geological and physical characteristics of soils.

Be able to: use the geochronological scale and determine the relative age of rocks; determine the main rock-forming minerals; determine the main types of rocks; determine the granulometric composition and mechanical characteristics of soils; determine the intensity of earthquakes in points (magnitudes); use engineering and geological materials, maps.

Topic 1.1. Requirements for knowledge and skills in the academic discipline. Introduction. The place of the discipline in the system of training a specialist in construction production. The purpose and tasks of the discipline. Integrated requirements for knowledge and skills in the discipline. Object of engineering geology research. Relationship of engineering geology with other sciences. Main sections of engineering geology. Engineering and geological conditions.

Topic 1.2. Basic information about the Earth. Planet Earth in the solar system. Structure of the Solar System. The origin of the solar system and the formation of the planet Earth. Modern cosmological ideas about the origin of the Earth and its age. The shape, mass, density and structure of the Earth. Earth's thermal regime. Atmosphere. Hydrosphere. Lithosphere. Biosphere. Features of temperature distribution in the earth's crust.

Topic 1.3. Basic information about minerals. The concept of minerals. Separation of minerals according to the conditions of formation. Crystalline and amorphous structure of minerals. Classification of minerals by chemical composition. Properties of minerals: color, luster, transparency, fracture, cleavage, hardness, density. The use of minerals in various spheres of social life. Double refraction, magnetism, smell, taste, solubility, flammability**.**

Topic 1.4. Basic information about rocks. The concept of rocks. Igneous, sedimentary and metamorphic rocks. The structure and texture of rocks. Fully crystalline, semi-crystalline and amorphous structure of rocks. Rock texture. Intrusive (deep) and effusive (poured out) igneous rocks. Forms of igneous rocks: batholiths, shafts, dykes, laccoliths, veins, flows, covers. Physical, chemical and organic weathering of rocks. Application of igneous rocks.

The concept of sedimentary rocks. The main sedimentary rocks. Fragmental, chemogenic and organogenic sedimentary rocks. Formations of sedimentary rocks. Sandy, dusty and clay soils. The structure and texture of sedimentary rocks. Use of sedimentary rocks.

The concept of metamorphic rocks. Regional metamorphism. Contact metamorphism. Dislocation metamorphism. Zones of metamorphism. Main metamorphic rocks. Marble. The use of metamorphic rocks in construction.

Topic 1.5. The age of rocks and the scale of the geological process. Stratigraphic and paleontological method of determining the age of rocks. Relative age of rocks. Absolute age of rocks. Methods of determining the absolute age of rocks. Geochronological and stratigraphic scales of the Earth's geological history. Eras and periods. Denoting the age of rocks on geological maps and sections.

Topic 1.6. Construction of an engineering geological section. Concept of engineering geological map and section. Scales of geological maps and sections. Classification of wells. The mouth, the trunk and the bottom of the well. The order of construction of an engineering-geological section. Stratigraphic limits. The use of engineering and geological sections in the construction and reconstruction of highways and airfields and industrial and civil buildings.

Module № 2. "Fundamentals of hydrogeology, geological processes and engineering-geological investigations"

Integrated module requirements №2:

To know: the origin, classification, mineralization and patterns of occurrence and movement of underground waters, their influence on rocks; the main geological processes, their orientation, consequences and features of construction in the area of their influence; the basics of engineering and geological surveys (surveying, documentation and mapping), for the construction of airfields, buildings and airport structures.

Be able to: determine the type, properties, and composition of groundwater; build hydroisogypsum maps. Forecast, classify and evaluate the impact of geological structure and geological processes on engineering and technical structures; to select and apply in engineering practice the results of engineering-geological investigations, taking into account metrological and regulatory requirements, as well as labor and environmental protection, use of engineering-geological materials, maps.

Topic 2.1. Hydrogeology as a science of underground water. The subject and problems of hydrogeology. The origin of underground waters, their classification and characteristics according to the conditions of occurrence. Types of water in the pores of rocks. Free gravity water. Free capillary water. Physical bound water. Hygroscopic water. Physical properties, chemical and bacterial composition of groundwater. Determination of the degree of aggressiveness of groundwater on concrete and reinforced concrete. Inflow of water to construction pits and water intakes. Geological activity of underground waters. Groundwater reserves and their protection.

Topic 2.2. Construction of hydroisogypsum map. Construction on the hydroisogypsum map. Application of the hydroisogypsum map in the construction and reconstruction of highways and airfields and industrial and civil facilities. The location of the wells on the hydroisogypsum map. Designation of the direction of groundwater movement on hydroisogypsum maps.

Topic 2.3. Determination of the soil filtration coefficient. Classification of layers according to water permeability. Laminar and turbulent movement of groundwater. Darcy's Law. Scheme of the Darcy device. Shezy's law. Calculation scheme of water inflow to a perfect well in a non-pressurized aquifer. A device for determining the filtration coefficient of sands.

Topic 2.4. Geological processes on the surface of the earth's crust. General concepts of geological and engineering-geological processes. Internal and external geological processes. Connection between geological and engineering-geological processes. Movements of the Earth's crust and dislocations. Tectonic, oscillatory, folding and tearing movements of the earth's crust. Volcanoes. Magmatism. Earthquakes Epicenter and hypocenter of an earthquake. Magnitude of an earthquake depending on the energy of the earthquake in the hypocenter. Characteristics of damage to buildings depending on the magnitude of earthquakes. Weathering and eluvial deposits. Geological work of surface flowing waters and the formation of deluvial, alluvial and proluvial deposits. Geological work of glaciers and glacial deposits. Geological work of wind and glacial deposits. Geological work of the sea and marine sediments. Deposits of lakes and swamps. Quaternary and indigenous sediments. Swimming pools and features of building and construction on them. Sufosis. Karst. landslides

Topic 2.5. Basics of soil science. The concept of soils. Chemical composition of soils. The structure of the mineral skeleton and pore space. Mechanical composition of soils. Classification of soils by granulometric composition. Physical and water-physical characteristics of soils (porosity, density, moisture, water resistance, moisture capacity, water yield, capillary properties, consistency, plasticity, shrinkage, subsidence, swelling, swelling). Mechanical characteristics of large-clastic soils. Engineering and geological characteristics of clay soils. Types of clay soils according to plasticity number and granulometric composition.

Topic 2.6. Determination of the type and state of clay soils. Consistency and plasticity of clay soils. Plasticity index and flow rate of clayey soils. Classification of clayey soils by plasticity number and fluidity index. Determination of yield strength and yield strength. Balancing cone. Methods of soil moisture determination. Design resistance of soils.

Topic 2.7. Engineering and geological research. Composition and volume of engineering and geological research. Engineering and geological reconnaissance. Engineering and geological surveying and exploration. Mining and drilling works. Field research works. Laboratory work. Engineering and geological examination. Chamber works. Peculiarities of engineering-geological research in the areas of development of dangerous engineering-geological processes**.**

2.3. Thematic plan.

№	Topic	Academic hours							
		Full-time education				Part-time study			
		Total	Lecture	Lab. classe	Self-study	Total	Lecture	Lab. classe	Self-study
1	2	3	4	5	6	7	8	9	10
Module №. 1 "Structure of the Earth, Minerals and Rocks"									
1.1	Requirements for knowledge and skills in the academic discipline.	6 semester				6 semester			
		6	2	-	4	4	2	-	2
1.2	Basic information about the Earth.	6	2	-	4	2	-	-	2
1.3	Basic information about minerals.	8	2	2	4	4	-	-	4
1.4	General information about rocks.	8	2	2	4	2	-	-	2
1.5	Igneous rocks: general information, structure, texture, forms of occurrence, distribution in nature and applications.	8	2	2	4	4	-	-	4
1.6	Sedimentary and metamorphic rocks: general information, structure, texture,	8	2	2	4	4	-	-	4

1	2	3	4	5	6	7	8	9	10
	forms of occurrence, distribution in nature and applications.								
1.7	The age of rocks and the scale of the geological process.	6	2	2	2	2	-	-	2
1.8	Construction of an engineering geological section.	4	-	2	2	2	-	-	2
1.9	The use of engineering and geological sections in the construction and reconstruction of highways and airfields and industrial and civil buildings	4	-	2	2	2	-	-	2
1.10	Module Test №1	6	2	-	4	4	2	-	2
	Total for module №1	**64**	**16**	**14**	**34**	**30**	**4**	**-**	**26**
Module №. 2 "Fundamentals of hydrogeology, geological processes and engineering-geological investigations"									
2.1	Hydrogeology as a science of underground water.	8	2	2	4	**7 semester**			
						12	2	-	10
2.2	Calculation of groundwater flow to construction pits.	6	-	2	4	8	-	-	8
2.3	Construction of hydroisogypsum map.	4	-	2	2	12	-	2	10
2.4	Determination of the soil filtration coefficient.	8	2	2	4	12	-	2	10
2.5	General concepts of geological and engineering-geological processes. Internal and external geological processes.	8	2	2	4	8	-	-	8
2.6	Volcanism, magmatism and earthquakes.	4	2	-	2	12	2	-	10
2.7	Weathering and eluvial deposits, geological work of surface flowing waters and the formation of deluvial, alluvial and proluvial deposits	8	2	2	4	8	-	-	8
2.8	Geological work is the work of wind, sea, lakes and swamps	6	2	2	2	8	-	-	8
2.9	Determination of the type and state of clay soils	6	2	2	2	8	-	-	8
2.10	Engineering and geological research	6	2	2	2	8	-	-	8
2.11	Determination of the height of capillary rise of sand	6	-	2	4	12	-	2	10
2.12	Calculation and graphic work	10	-	-	10	-	-	-	-
2.13	Performance of control (homework)	-	-	-	-	8	-	-	8
2.13	Module test №2	6	2	-	4	12	-	2	10
	Total for Module №2	**86**	**18**	**20**	**48**	**120**	**4**	**8**	**108**

1	2	3	4	5	6	7	8	9	10
Total For Academic Discipline		**150**	**34**	**34**	**82**	**150**	**8**	**8**	**134**

2.4. Tasks for homework and control (home) work

Computational and graphic work (CGW) in the discipline is carried out in the sixth semester and is a component of module №2 "Fundamentals of hydrogeology, geological processes and engineering-geological investigations".

Completion of the CGW is an important stage in preparation for coursework and the diploma project of the future bachelor in construction and civil engineering.

The specific purpose of the work is, depending on the variant of the task, in: studying and mastering the theoretical foundations of calculating the costs of groundwater flow and water inflow to water intake facilities; construction of: calculation schemes of soil flow with horizontal and inclined placement of the aquifer, calculation scheme of water inflow to a perfect well in a non-pressurized aquifer, calculation scheme of water inflow to an imperfect well in a non-pressure aquifer; determining the radius of the depression; construction of the calculation scheme of water lowering.

The task for the implementation of the CGW is carried out by the student individually in accordance with the methodical recommendations developed by the leading teachers of the department.

The time required to complete the CGW is 10 hours of independent work.

2.5. Tasks for control (home) work.

Control (homework) work on the discipline is performed in the seventh semester, in accordance with the methodological recommendations approved in the established order, with the aim of consolidating and deepening the student's theoretical knowledge and skills in studying the discipline.

Tasks for the implementation of the practical part of the control work are carried out by the student individually in accordance with the methodical recommendations developed by the leading teachers of the department.

The time required to complete the test is 8 hours of independent work.

2.6. List of questions for preparing the final test.

The list of questions and the content of tasks for preparation for differentiated assessment are developed by leading teachers and approved by the protocol of the department meeting and brought to the attention of students.

3. TRAINING MATERIALS FOR THE DISCIPLINE

3.1. Teaching methods

The following teaching methods are used when studying an academic discipline:

– explanatory and illustrative method;

– the problem statement method;

– reproductive method;

- research method.

The implementation of these methods is carried out during lectures, demonstrations, independent problem solving, and work with educational literature.

3.2. Recommended literature (basic and additional literature)

Basic literature

3.2.1. DBN B.2.1-10-2018. Bases and foundations of buildings and structures. Substantive provisions. - K., 2018.

3.2.2. Zotsenko M.JI. Engineering geology. Soil mechanics. Basics and foundations. - Poltava, 2004. - 568p.

3.2.3. V.B. Shvets, I.P. Boyko, Yu.L. Vinnikov, M.L. Zotsenko, O.O. Petrakov, O.V. Solodyankin, V.G. Shapoval, O.M. Shashenko, S.V. Misfortune. Soil mechanics. Basics and foundations. Textbook. - Dnipropetrovsk: "Thresholds", 2014. - 231 p.

3.2.4. Kornienko M.V. Basics and foundations. Tutorial. - K.: KNUBA. 2003. – 110 p.

3.2.5. Shutenko L.M., Rud O.G., Kichaeva O.V., Samorodov O.V., Gavrilyuk O.V. Soil mechanics, bases and foundations. Textbook. – Kharkiv: XNUMX named after OHM. Beketova, 2017 – 563 p.

3.2.6 Vaganov I.I. Engineering geology and environmental protection: Study guide / I.I. Vaganov, I.V. Majevska, M.M. Popovich – Vinnytsia: VNTU, 2013 – 267 p.

Aditional literature

3.2.7 Kozhushko V.P. Basics and foundations. Kharkiv, 2003. - 500 p.

3.2.8 Design and construction of airfield complexes: monograph / General. ed. Karpova V.V. – Kherson: Oldi+, 2022. – 336p.

3.2.9 Architecture, construction, design in the educational space: collective monograph / According to general ed. Dr. ist. Nauk V.V. Karpova. - Riga, Latvia: "Baltija Publishing", 2021. - 604 p.

3.2.10 Engineering Geology and Soil Mechanics Starter: Training manual / M.L. Zotsenko, Yu.L. Vynnykov, I.V. Miroshnychenko. – Poltava: PoltNTU, 2019. –136 p

3.2.11. DBN B.2.1-10-2018. Bases and foundations of buildings and structures. Substantive provisions. - K., 2018.

3.2.12. DSTU-N B V.2.1-28:2013 Guidelines for carrying out earthworks, arrangement of foundations and construction of foundations. - K., 2013.

3.3. Internet information resources

3.3.1. Educational and professional program "Roads and airfields" of the first (bachelor's) level of higher education // National Aviation University: website. URL: https://nau.edu.ua/download/Quality%20Assurance_ukr/Projekti/2021/4/2021%20%D0%BF%D1%80%D0%BE%D0%B5%D0%BA%D1%2%20%D0%9E%D0%9F%D0%9F%20%D0%91%20192%20%D0%90%D0%94%D0%90%20%D0%A4%D0%90%D0%91%D0%94%20%D1%81%D1%82%D0%B0%D0%BD%D0%B4%D0%B0%D1%80%D1%82.pdf.

3.3.2. Department of Computer Technologies of Airport Construction and Reconstruction // Repository of the National Aviation University: website. URL: https://er.nau.edu.ua/handle/NAU/9121

3.3.3. Scientific and technical library of NAU // Scientific and technical library of NAU: website. URL: http://www.lib.nau.edu.ua/main/

3.3.4. Repository of the National Aviation University // Repository of the National Aviation University: website. URL: https://er.nau.edu.ua/

3.3.5. V. G. Zabolotny State Scientific Architectural and Building Library // V. G. Zabolotny State Scientific Architectural and Building Library: website. URL: http://www.dnabb.org/

3.3.6. National Library of Ukraine named after V. I. Vernadskyi // National Library of Ukraine named after V. I. Vernadskyi: website. URL: http://www.nbuv.gov.ua/

4. RATING SYSTEM OF KNOWLEDGE AND SKILLS ASSESSMENT

4.1 Evaluation of certain types of work done by student of the points made in accordance with Table 4.1.

Table 4.1

Kind of Academic Activities	**Ma[imum Grade**	
	Full-time study	**Part-time study**
	Module №1	
Performance and protection of laboratory work	**6 semester**	**6 semester**
	7x3 б= 21	-
Oral response at a lecture session	-	20
In order to be admitted to the modular test №1, a student must score at least	*14 балів*	*12 балів*
Execution of modular control work №1	10	20
Total per module №1	**31**	**40**
	Module №2	
Performance and protection of laboratory work	**6 semester**	**7 semester**
	10x3 б=30	3x10 б=30
Performance of calculation and graphic work	9	-
In order to be admitted to the modular test №2, a student must score at least	*26 балів*	*18 балів*
Execution of modular control work №2	10	10
Total per module №2	**49**	**40**
Semester exam	**20**	**20**
Total for academic discipline	**100**	**100**

4.2. Completed types of educational work are credited to the student if he received a positive rating for them.

4.3. The sum of the ratings received by the student for individual types of completed educational work constitutes the current modular rating rating, which is entered in the information of modular control.

4.4. The sum of the final semester module and exam rating grades in points constitutes the final semester rating grade, which is converted into grades according to the national scale and the ECTS scale.

4.5. The final semester rating in points, according to the national scale and the ECTS scale, is entered in the credit and examination information, the study card and the student's credit book, for example: 92/Vidm./A, 87/Good/B, 79/Good/C, 68/Satisfied/D, 65/Satisfied/E, etc.

4.6 The final grade for the discipline is equal to the final semester grade. The specified final grade for the discipline is entered in the Appendix to the diploma.

(Ф 03.02 – 01)

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки

(Ф 03.02 – 02)

АРКУШ ОЗНАЙОМЛЕННЯ З ДОКУМЕНТОМ

№ пор.	Прізвище ім'я по-батькові	Підпис ознайомленої особи	Дата ознайом-лення	Примітки

(Ф 03.02 – 04)

АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

№ пор.	Прізвище ім'я по-батькові	Дата ревізії	Підпис	Висновок щодо адекватності

(Ф 03.02 – 03)

АРКУШ ОБЛІКУ ЗМІН

№ зміни	№ листа (сторінки)				Підпис особи, яка внесла зміни	Дата внесення зміни	Дата введення зміни
	Зміненого	Заміненого	Нового	Анульо-ваного			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				

Syllabus of the academic discipline
" Engineering geology "
Educational and professional program:
«Industrial and Civil Engineering»,
Field of study: 19 «Architecture and Construction»
Specialty: 192 «Building and Civil Engineering»

Level of higher education	First (undergraduate)
Discipline status	Educational discipline of the selective component of OP
Course	3, 4
Semester	6, 7
Scope of discipline,	5/150
ECTS credits/hours	English
Language of training	The possibility of mastering the basic provisions for the design of various types of structures taking into account the engineering and geological situation, as well as finding the stress in the foundations of the soil from the action of external loads, the ultimate pressure and deformation of the foundations.
What will be studied (subject of study)	The purpose of the educational discipline is to reveal modern scientific concepts, concepts, methods and technologies of acquiring relevant knowledge about the Earth, its age, composition, structure, material composition and structural elements of the earth's crust, the patterns of their development; exogenous and endogenous processes, their interaction, conditioning; geological activity of surface and underground waters, atmospheric factors; minerals, rocks, soils, man-made changes in the geological environment, as well as the possibility of using them as bases for the construction, operation and reconstruction of buildings and structures.
Why it is interesting/should be studied (purpose)	The student of higher education acquires the knowledge and ability to forecast, classify and evaluate the influence of the geological structure and geological processes on engineering and technical structures; to select and apply in engineering practice the results of engineering-geological investigations, taking into account metrological and regulatory requirements, as well as labor and environmental protection, use of engineering-geological materials, maps.
How to use acquired knowledge and skills (competencies)	General competences that the educational discipline makes possible to acquire: the ability to abstract thinking, analysis and synthesis (ZK1); knowledge and understanding of the subject area and professional activity (ZK2); the ability to use information and communication technologies (ZK5); the ability to effectively apply knowledge to solve practical tasks (ZK12). Professional competences that the educational discipline provides: use conceptual scientific and practical knowledge in mathematics, chemistry and physics to solve complex practical problems in the field of construction and civil engineering (FC1); to have the theoretical foundations of construction mechanics and geotechnics, to perform on their basis calculations of the stress-deformation state of the ground, road surfaces and artificial structures in the design of highways and airfields (FK12); the ability to analyze the properties of the base soils, taking into account the interaction of building structures with each other and with a heterogeneous natural or artificial soil environment under different types of loads (FC 13).
Educational logistics	Content of the discipline: Introduction. The place of the discipline in the system of training a specialist in construction production. The purpose and tasks of the discipline. Integrated requirements for knowledge and skills in the discipline. Object of engineering geology research. Relationship of engineering geology with other sciences. Main sections of engineering geology. Engineering and geological conditions. Basic information about the Earth. Planet Earth in the solar system. Structure of the Solar System. The origin of the solar system and the formation of the planet Earth. Modern cosmological ideas about the origin of the Earth and its age. The shape, mass, density and structure of the Earth. Earth's thermal regime. Atmosphere. Hydrosphere. Lithosphere. Biosphere. Features of temperature distribution in the earth's crust. Basic information about

	minerals. The concept of minerals. Separation of minerals according to the conditions of formation. Crystalline and amorphous structure of minerals. Classification of minerals by chemical composition. Properties of minerals: color, luster, transparency, fracture, cleavage, hardness, density. The use of minerals in various spheres of social life. Double refraction, magnetism, smell, taste, solubility, flammability. Basic information about rocks. The concept of rocks. Igneous, sedimentary and metamorphic rocks. The structure and texture of rocks. Fully crystalline, semi-crystalline and amorphous structure of rocks. Rock texture. Intrusive (deep) and effusive (poured out) igneous rocks. Forms of igneous rocks: batholiths, shafts, dykes, laccoliths, veins, flows, covers. Physical, chemical and organic weathering of rocks. Application of igneous rocks. The concept of sedimentary rocks. The main sedimentary rocks. Fragmental, chemogenic and organogenic sedimentary rocks. Formations of sedimentary rocks. Sandy, dusty and clay soils. The structure and texture of sedimentary rocks. Use of sedimentary rocks. The concept of metamorphic rocks. Regional metamorphism. Contact metamorphism. Dislocation metamorphism. Zones of metamorphism. Main metamorphic rocks. Marble. The use of metamorphic rocks in construction. The age of rocks and the scale of the geological process. Stratigraphic and paleontological method of determining the age of rocks. Relative age of rocks. Absolute age of rocks. Methods of determining the absolute age of rocks. Geochronological and stratigraphic scales of the Earth's geological history. Eras and periods. Denoting the age of rocks on geological maps and sections. Construction of an engineering geological section. Concept of engineering geological map and section. Scales of geological maps and sections. Classification of wells. The mouth, the trunk and the bottom of the well. The order of construction of an engineering-geological section. Stratigraphic limits. The use of engineering and geological sections in the construction and reconstruction of highways and airfields and industrial and civil buildings. Hydrogeology as a science of underground water. The subject and problems of hydrogeology. The origin of underground waters, their classification and characteristics according to the conditions of occurrence. Types of water in the pores of rocks. Free gravity water. Free capillary water. Physical bound water. Hygroscopic water. Physical properties, chemical and bacterial composition of groundwater. Determination of the degree of aggressiveness of groundwater on concrete and reinforced concrete. Inflow of water to construction pits and water intakes. Geological activity of underground waters. Groundwater reserves and their protection. Construction of hydroisogypsum map. Construction on the hydroisogypsum map. Application of the hydroisogypsum map in the construction and reconstruction of highways and airfields and industrial and civil facilities. Geological processes on the surface of the earth's crust. General concepts of geological and engineering-geological processes. Internal and external geological processes. Connection between geological and engineering-geological processes. Movements of the Earth's crust and dislocations. Tectonic, oscillatory, folding and tearing movements of the earth's crust. Volcanoes. Magmatism. Earthquakes Epicenter and hypocenter of an earthquake. Magnitude of an earthquake depending on the energy of the earthquake in the hypocenter. Characteristics of damage to buildings depending on the magnitude of earthquakes. Weathering and eluvial deposits. Geological work of surface flowing waters and the formation of deluvial, alluvial and proluvial deposits. Geological work of glaciers and glacial deposits. Geological work of wind and glacial deposits. Geological work of the sea and marine sediments. Deposits of lakes and swamps. Quaternary and indigenous sediments. Swimming pools and features of building and construction on them. Sufosis. Karst. landslides Basics of soil science. The concept of soils. Chemical composition of soils. The structure of the mineral skeleton and pore space. Mechanical composition of soils. Classification of soils by granulometric composition. Physical and water-physical characteristics of soils (porosity, density, moisture, water resistance, moisture capacity, water yield, capillary properties, consistency, plasticity, shrinkage, subsidence, swelling, swelling). Mechanical characteristics of large-clastic soils. Engineering and geological characteristics of clay soils. Types of clay soils according to plasticity number and granulometric composition. Determination of the type and state of clay soils. Consistency and plasticity of clay soils. Plasticity index and flow rate of

	clayey soils. Classification of clayey soils by plasticity number and fluidity index. Determination of yield strength and yield strength. Balancing cone. Methods of soil moisture determination. Design resistance of soils. Engineering and geological research. Composition and volume of engineering and geological research. Engineering and geological reconnaissance. Engineering and geological surveying and exploration. Mining and drilling works. Field research works. Laboratory work. Engineering and geological expertise. Chamber works. Types of classes: lectures, laboratory classes Teaching methods: explanatory and illustrative method, problem presentation method, reproductive and research methods. Forms of education: full-time, part-time
Prerequisites	"Engineering graphics", "Resistance of materials", "Construction mechanics"
Porekvizyty	"Soil science and soil mechanics", "Artificial structures on roads and airfields"
Information support	DBN B.2.1-10-2018. Bases and foundations of buildings and structures. Substantive provisions. - K., 2018. Zotsenko M.JI. Engineering geology. Soil mechanics. Basics and foundations. - Poltava, 2004. - 568p. V.B. Shvets, I.P. Boyko, Yu.L. Vinnikov, M.L. Zotsenko, O.O. Petrakov, O.V. Solodyankin, V.G. Shapoval, O.M. Shashenko, S.V. Misfortune. Soil mechanics. Basics and foundations. Textbook. - Dnipropetrovsk: "Thresholds", 2014. - 231 p. Kornienko M.V. Basics and foundations. Tutorial. - K.: KNUBA. 2003. – 110 p. Shutenko L.M., Rud O.G., Kichaeva O.V., Samorodov O.V., Gavrilyuk O.V. Soil mechanics, bases and foundations. Textbook. – Kharkiv: XNUMX named after OHM. Beketova, 2017 – 563 p. Vaganov I.I. Engineering geology and environmental protection: Study guide / I.I. Vaganov, I.V. Majevska, M.M. Popovich – Vinnytsia: VNTU, 2013 – 267 p.
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