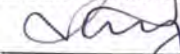


MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY

Faculty of Architecture, Civil Engineering and Design
Computer Technologies of Airport Construction and Reconstruction Department

AGREED,

Dean of the Faculty


Viktor KARPOV

« 11 » 01 2023

APPROVED

Vice Rector for Academics


Anatoli POLEKHIN

« 24 » 01

2023



Quality Management System

COURSE TRAINING PROGRAM

on

"ENGINEERING GEODESY (GENERAL COURSE)"

Educational and Professional Program: «Industrial and Civil Engineering»


Field of study: 19 «Architecture and Construction»

Specialty: 192 «Building and Civil Engineering»

Form of training	Sem.	Total (hours/ ECTS credits)	Lec.	Prac.	Lab.	Self-study	Homeworks control works	CP/ TP	Form of control
Full-time	4	105/3,5	17	-	34	54	-	-	Graded Test 4 st semester
Part-time	-	-	-	-	-	-	-	-	-

Index: ECB-5-192-1/21-2.1.11

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The Course Training Program on “Engineering geodesy (general course)” is developed on the basis of the Educational-Professional Program “Industrial and Civil Engineering”, Bachelor Curriculum and Extended Curriculum № CB-5-192-1/21, № ECB-5-192-1/21 for training higher education seekers of the Bachelor degree of specialty 192 "Building and Civil Engineering" and corresponding normative documents.

Developed by:

Senior Lecturer of the Computer
Technologies of Airport Construction
and Reconstruction Department

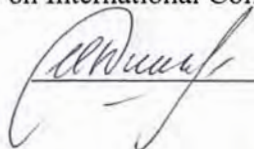
 Olena BOIKO

Discussed and approved by the Graduate 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.

Guarantor of the Educational and Professional Program  Nataliia KOSTYRA

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Vice Rector on International Collaboration and Education


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«23» 01 2023

Level of document – 3b
Planned term between revisions – 1 year
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INTRODUCTION

The Course Training Program of the academic discipline "Engineering geodesy (general course)" 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 role: the academic discipline is a theoretical and practical basis aimed at developing professional skills for performing engineering and geodetic surveys among specialists in the field of construction, reconstruction and operation of industrial, civil construction and infrastructure facilities.

The goal is to study the theoretical foundations and practical methods for performing engineering and geodetic work on the design, construction and operation of engineering structures.

The objectives of the study of the discipline is the study of topographic plans and maps and solutions using various engineering problems; study of structures and methods of using various geodetic instruments to perform measurements on the ground of angles, distances and elevations; mastering the methods of compiling topographic plans and maps of certain areas of the area; obtaining the skills of geodetic support directly for the construction of engineering structures.

1.2. Educational outcomes of the academic discipline.

Collect, interpret and apply data, including through the search, processing and analysis of information from various sources.

Demonstrate the ability to work with geodetic instruments and use topographic materials to design and create objects of industrial and civil construction.

1.3. Competencies obtained through the academic discipline.


Integral competence: 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 competencies:

GC11. Ability to develop and manage projects, ensuring the safe activities of workers and the quality of work performed

GC14. Ability to improve professional level through continuing education and self-education

Professional competences:

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

PC5 – Ability to use computer-aided design soft-ware and its specialized application for solving engineering problems of construction and civil engineering.

PC10 – Ability to ensure the organization of the construction of buildings and structures of industrial and civil purposes using modern construction materials and energy-efficient technologies.

1.4. Interdisciplinary links.

This discipline is based on the knowledge of such disciplines as "Introduction to Civil Engineering)", "Urban Planning and Transport" and is the basis for the study of further disciplines, namely: "Organization of Construction", "Erection and Assembling of structures", "Geodesic Practice for Industrial and Civil Engineering”.

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 training modules, namely:

- training module 1 **"General information for engineering and geodetic work and methods for performing geodetic measurements on the ground"**;
- training module 2 **"Performance of engineering and geodetic surveys in construction"**,

each of which is logically completed, a relatively independent, integral part of the academic discipline, the assimilation of which involves the conduct of modular control work and analysis of the results of its implementation.


2.2. Module structure and integrated requirements for each module

Module №1 «General information for engineering and geodetic work and methods for performing geodetic measurements on the ground»

Integrated requirements for module 1:

To know:

- tasks and organization of state and departmental geodetic services;
- theoretical foundations, practical techniques and organization of geodetic works for the design, operation of engineering structures;
- the main state and departmental regulatory documents regulating geodetic support for the design, construction and operation of engineering structures and buildings;
- requirements for topographic maps, the possibility of their application;
- nomenclature of topographic maps;

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- composition and requirements for the construction of the State geodetic network;
- the structure of the theodolite, its purpose.

Be able to:

- independently read topographic maps and carry out cartometric operations;
- use the geoportal of the State Geodetic Network of Ukraine and determine the characteristics of the DGM points on the territory;
- work with a theodolite, measure horizontal and vertical angles.

Topic 1. Introduction. Determination of the position of points of the physical earth's surface relative to the general figure of the Earth

Goals and objectives of the study of the subject, its content. Modern ideas about the shape and size of the Earth. Ellipsoid of Krasovsky. projection method. Astronomical and geodetic coordinates The system of heights and coordinates in Ukraine. Gauss-Kruger projection. Zonal coordinate system. World Geodetic Coordinate System WGS - 84.

Geographic, magnetic and axial meridians. Approximate angles - azimuth, rhumb and directional angle. Relationship between reference angles. Methods for determining approximate angles.

Scales, nomenclature, frame design and symbols of topographic plans and maps. Solving engineering problems using topographic plans and maps.

Topic 2. State geodetic network of Ukraine

State geodetic networks, their purpose and construction methods: triangulation, polygonometry, trilateration and leveling. Geodetic networks of local importance; special geodetic networks. Regulatory documents for the construction of geodetic networks, construction accuracy, classes and categories. Survey geodetic networks. Signs and centers for fixing the terrain of points of geodetic networks. Construction of geodetic networks using satellite technologies.

Geoportal DGM. Functions and capabilities of the geoportal, working with it.

Topic 3. Theodolite, its structure, purpose. Theodolite checks.

Theodolite, its concept. Purpose and arrangement of the main parts of the theodolite. Limbo division price. The accuracy of reading devices. Level division price. The structure of the optical system of theodolite. Designs of modern theodolites (optical, code, laser). Theodolite check.

Topic 4. Working with theodolite, measuring horizontal and vertical angles.

Working with theodolite, bringing theodolite into working condition. The order of work in the station. Measurement of horizontal and vertical angles. Measurement of angles by the method of circular techniques. Filling and decorating logs to define horizontal and vertical angles.



Module №2 "Performance of engineering and geodetic surveys in construction"

Integrated requirements for module 1:

Know:

- leveling device, its purpose;
- types of leveling and methods of its implementation;
- legal documents regulating engineering and geodetic surveys in construction;
- requirements for the performance of geodetic works in construction;
- geodetic marking works.

Be able to:

- work with the level, determine the excess;
- perform tacheometric survey;
- perform engineering and geodetic surveys in construction
- perform various geodetic measurements during the construction and operation of buildings and engineering structures.

Topic 1. Level. Its structure, purpose. Level checks.

Level, its concept. Purpose and arrangement of the main parts of the level. The structure of the optical system of the level. Designs of modern levels (optical, laser). Leveling rails. Level checks.

Topic 2. Working with a level, measuring elevations, distances.

Work with the level, bringing it into working condition. The order of work in the station. Taking readings on the rail.

Essence and methods of geometric leveling. Field work during geometric leveling, control of their implementation. Leveling classes. Geometric leveling accuracy.

The essence of trigonometric leveling. Formulas for trigonometric leveling for small and large distances between terrain points. Field and cameral work with trigonometric leveling.


Filling and registration of leveling logs.

Topic 3. Tacheometric survey.

Tacheometers, their structure. The purpose and essence of tacheometric survey, the composition of field and cameral work. Requirements of regulatory documents for tacheometric survey. Maintaining and working out the journal of tacheometric survey. Computer technologies for creating tacheometric survey plans.

Topic 4. Engineering and geodetic refinements in construction.

Normative-legal documents regulating engineering and geodetic surveys in construction. State building norms "Geodetic works in construction". Geodetic support

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for the construction of buildings and structures. Geodetic support during surveys of linear structures. Geodetic support for the vertical planning of the site.

Topic 5. Geodetic marking work.

Geodetic marking works. Breakdown works in the process of construction. Construction of a design segment, placing a point on a design mark, combining points with an alignment, building a line of a given slope, transferring marks to a pit and a mounting horizon. Executive photography.

2.3. Thematic plan.

№	Topic	Academic hours							
		Full-time study				Part-time study			
		Total	Lectures	Laboratory classes	Self-study	Total	Lectures	Laboratory classes	Practicals
1	2	3	4	5	6	7	8	9	10
Module №1 «General information for engineering and geodetic work and methods for performing geodetic measurements on the ground»									
1.1	Introduction. Determination of the position of points of the physical earth's surface relative to the general figure of the Earth	4semester				-			
		3	2	-	1	-	-	-	-
1.2	Reading a map at a scale of 1:2 000	3	-	2	1	-	-	-	-
1.3	Measurement on a map scale 1:25 000	3	-	2	1	-	-	-	-
1.4	State geodetic network of Ukraine	3	2	-	1	-	-	-	-
1.5	Working with the geoportal of the State Geodetic Network	3	-	2	1	-	-	-	-
1.6	Studying the layout of topographic maps on the territory of Ukraine according to the data of the DGM geoportal	3	-	2	1	-	-	-	-
1.7	Theodolite, its structure, purpose.	4	2	-	2	-	-	-	-
1.8	The study of the structure of theodolite and its optical system	4	-	2	2	-	-	-	-
1.9	Theodolite checks	4	-	2	2	-	-	-	-
1.10	Working with theodolite, measuring horizontal and vertical angles	4	2	-	2	-	-	-	-
1.11	Measurement of horizontal and vertical angles	4	-	2	2	-	-	-	-
1.12	Module Test №1	4	-	2	2	-	-	-	-
Total for Module №1		42	8	16	18	-			



Module №2 "Performance of engineering and geodetic surveys in construction"

2.1	Level. Its structure, purpose. Level checks	4	2	-	2	-	-	-	-
2.2	Studying the structure of the level and its optical system	4	-	2	2	-	-	-	-
2.3	Level checks	3	-	2	1	-	-	-	-
2.4	Work with a level, measurement of excesses, distances	4	2	-	2	-	-	-	-
2.5	The order of work in the station. Taking readings along the rail	4	-	2	2	-	-	-	-
2.6	Registration of leveling logs and determination of elevations	4	-	2	2	-	-	-	-
2.7	Tacheometric survey	4	2	-	2	-	-	-	-
2.8	Maintenance and processing of the tacheometric survey log	4	-	2	2	-	-	-	-
2.9	Creating a topographic plan	3	-	2	1	-	-	-	-
2.10	Engineering and geodetic surveys in construction	4	2	-	2	-	-	-	-
2.11	Geodetic support for the construction of buildings and structures	4	-	2	2	-	-	-	-
2.12	Geodetic support during surveys of linear structures	4	-	2	2	-	-	-	-
2.13	Geodetic marking works	3	1	-	2	-	-	-	-
2.14	Settlement and graphic work	10	-	-	10	-	-	-	-
2.15	Module Test №2	4	-	2	2	-	-	-	-
Total for Module №2		63	9	18	36	-	-	-	-
Total For Academic Discipline		105	17	34	54	-	-	-	-


2.4. Task for settlement and graphic work

Settlement and graphic work "Fundamentals of geodetic information and methods for obtaining it" in the academic discipline is carried out in accordance with the instructions of the teacher and the recommendations of the methodological literature available at the department. The performance of computational and graphical work pursues the main goal of studying methods for obtaining geodetic information about the area using topographic plans and maps and various geodetic tools.

Its implementation helps to better assimilate the training material as a whole and master the techniques for obtaining geodetic information about the area. Settlement - graphic work has a volume of 10-15 pages of an explanatory note with calculations, drawings, diagrams and measurement logs. Approximate labor intensity of the work - 10 hours.

2.5. List of questions of preparation for the exam.

The list of questions and the content of tasks for preparing for the exam, developed in accordance with the work program, is approved at a meeting of the department and brought to the attention of students.

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3. TRAINING MATERIALS FOR THE DISCIPLINE

3.1. Teaching methods

When studying the discipline, the following teaching methods are used:

- explanatory-illustrative method;
- method of problem statement;
- reproductive method.

The implementation of these methods is carried out during lectures, demonstrations, independent work, work with educational literature about airports.

3.2. Recommended literature

Basic literature

- 3.2.1. Войтенко С.П. Інженерна геодезія: підручник. К.: Знання, 2012.-574 с.
- 3.2.2. Тельнов В.Г. Геодезія: навч. посіб. [Електронне видання]. – Дніпро : НТУ «Дніпровська політехніка», 2019. – 317 с.
- 3.2.3. Martin Vermeer GEODESY The science underneath. 2019.- 612р.[Електронне видання] - <https://users.aalto.fi/~mvermeer/geodesy.pdf>
- 3.2.4. Бачишин Б.Д. Інженерна геодезія: навч. посіб. [Електронне видання]. – Рівне : НУВГП, 2020. – 196 с.

Additional literature

- 3.2.5. Інструкція з топографічного знімання у масштабах 1:5000, 1:2000, 1:1000 та 1:500 (ГКНТА -2.04-02-98) К, 1998.
- 3.2.6. ДБН В.1.3-2:2010 «Геодезичні роботи в будівництві»
- 3.2.7. Умовні знаки для топографічних планів масштабів 1:500, 1:2000, 1:1000, 1:500.- К: Міністерство екології та природних ресурсів України, 2001


3.3. Internet information resources

- 3.3.1 <https://dgm.gki.com.ua/>
- 3.3.2. <http://www.kmcgeo.com/>
- 3.3.3. https://ngc.com.ua/ua/shop/takheometry/f-18_161_teodolit/
- 3.3.4. <https://systemnet.com.ua/gnss/>
- 3.3.5. <https://www.elnav.com.ua/>
- 3.3.6. <https://www.minregion.gov.ua/wp-content/uploads/2017/12/3.1.-DBN-A.2.1-1-2008.-Vishukuvannya-proektuvannya-i-teri.pdf>
- 3.3.7. <https://kizv.gov.ua/1.php?id=3>
- 3.3.8. <https://ndibv.kiev.ua/ua/archives/1250>
- 3.3.9. https://geotop.com.ua/geodezicheskie-izyskaniya_ua.php

4. RATING SYSTEM OF KNOWLEDGE AND SKILLS ASSESSMENT

4.1. Evaluation of certain types of work done by students of the points made in accordance with Tables.4.1.

Table 4.1

	Quality Management System Course Training Program on «Engineering geodesy (general course)»		Document Code	QMS NAU CTP 10.01.04-01-2022	
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Kind of Academic Activities	Maximum Grade		Kind of Academic Activities	Maximum Grade	
	Full-time study	Part-time study		Full-time study	Part-time study
	4 semester	-		4 semester	-
Module № 1 «General information for engineering and geodetic work and methods for performing geodetic measurements on the ground»			Module № 2 « Performance of engineering and geodetic surveys in construction»		
Kind of Academic Activities	Grade	Grade	Kind of Academic Activities	Grade	Grade
Practicals	7x5g=35	-	Practicals	7x4g=28	-
			Task for settlement and graphic work	7	-
<i>For carrying out a module test a student must receive not less than</i>	20	-	<i>For carrying out a module test a student must receive not less than</i>	18	-
Carrying out a module test №1	5	-	Carrying out a module test №2	5	-
Total for module 1	40	-	Total for module 2	40	-
Total for module 1, 2				80	-
Semester exam				20	
Total for academic discipline				100	

A Semester Grade is determined (in points and in the National Scale) as a result of performing all kinds of educational work during the semester.

4.2. A student is considered to have passed the module if both his/her Current Module Grade and Module Test Grade are positive.

4.3. The Semester Module Grade is calculated as the sum of the Total Module Grades.

4.4. The Semester Module Grade and the Graded Test together make up a Total Semester Grade which is calculated according to the National Scale and the ECTS Scale.

4.5. The Total Semester Grade in points, the National Scale and the ECTS Scales is written into a student's record book, for example: **92/Ex/A**, **87/Good/B**, **79/Good/C**, **68/Sat/D**, **65/Sat./E**, etc.

4.6. The Total Semester Grade of the subject is determined as the arithmetic average grade of the total semester grades in points (for the fourth semester for this subject) with its further transfer into the National Scale and ECTS Scale. The indicated Total Semester Grade of the subject is entered in the Diploma Supplement.



(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 ознайомлення	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 зміну	Дата внесення зміни	Дата введення зміни
	Зміненого	Заміненого	Нового	Анульованого			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				