

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
NATIONAL AVIATION UNIVERSITY**

Faculty of Architecture, Civil Engineering and Design  
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Quality Management System

**COURSE TRAINING PROGRAM  
on  
"Introduction to Civil Engineering"**

Educational-Professional Programs: "Industrial and Civil Engineering"  
"Highways and Airfields"


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	Home work control work	CP/ TP	Form of control
Full-time	2	150 / 5,0	34	34	-	82	HW-2c	-	Graded Test
Part-time	-	-	-	-	-	-	-	-	-

Index: CB - 5 - 192 - 1 / 21-2.1.6

**QMS NAU CTP 10.01.04-01-2022**

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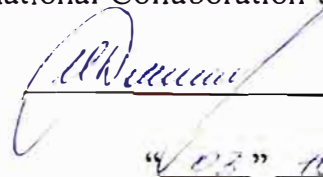
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## INTRODUCTION

The Course Training Program of the academic discipline "Introduction to Civil Engineering" 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** of the discipline in the field of science and the system of professional training.

The educational discipline "Introduction to Civil Engineering" is the theoretical and practical basis of the set of knowledge and skills that form the profile of a specialist in the field of construction and civil engineering.


The **goal** of teaching the discipline is to form a construction and engineering worldview for students, to introduce them to the circle of knowledge related to the future profession, to teach them the ability to orient themselves in the complex of tasks inherent in the modern field of construction and civil engineering, to provide a general idea of construction as an important branch of the economy, connection of future specialists with the history of the civil engineering development and the typology of buildings and structures, the basic types of construction objects and the processes of their construction.

**The objectives** of the discipline are:

- acquaintance by students of ideas about the field of activity of enterprises and organizations in the construction industry;
- mastery of knowledge about the main works and processes for the construction of buildings;
- acquisition of knowledge about the stage of development of project documentation and types of construction drawings;
- familiarization with the design and planning schemes and the main elements of buildings;
- familiarization with the regulatory documents in force in the field of construction and civil engineering;
- acquisition of knowledge on the basics of typology and classification of buildings;
- familiarization with the main types and features of the functioning of engineering structures;

#### 1.2. Educational outcomes of the academic discipline

As a result of studying the discipline, the student of higher education acquires: PLO1 – Apply basic theories, methods, and principles of mathematical, natural, social, humanistic, and economic sciences, modern models, methods, and decision-making support software to solve complex construction and civil engineering problems. PLO2 – Participate in research and development in the field of architecture and construction. PLO3 – Present the results of one's own work and argue one's position on professional issues to specialists and non-specialists, communicating freely in the state and foreign languages. PLO6 – Apply modern information technologies to solve engineering and management problems of construction and civil engineering. PLO7 – Perform data collection, interpretation and application, including through the search, processing and analysis of information from various sources. PLO8 – Demonstrate the ability to effectively use modern building materials, products and structures based on knowledge of their technical characteristics and manufacturing technology. PLO9 – Design building structures, buildings, structures and engineering networks, taking into account engineering

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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 the academic discipline

According to the content of the discipline, the applicant of higher education must be able to perform collection, analysis, substantiation of the state and conditions of various purposes buildings and structures functioning; understand the subject area and peculiarities of professional activity in the field of construction and civil engineering; use standard reference and scientific and technical literature; to get acquainted with the peculiarities of execution of architectural and construction documentation.

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 (GC): GC2 – Knowledge and understanding of the subject area and professional activity. GC6 – Ability to independently acquire knowledge by searching, processing and analyzing information from various sources. GC7 – Interpersonal skills. GC8 – Ability to communicate with members of other professional groups at different levels (with experts from other fields of knowledge/types of economic activity). GC10 – Ability to save and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, use different types and forms of physical training for active leisure and leading a healthy lifestyle.

Professional competences (PC): PC2 – Ability to critically understand and apply basic theories, methods and principles of economics and management for rational organization and management of construction production. PC3 – Ability to design building structures, buildings, structures and engineering networks (according to specialization), 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. PC4 – Ability to choose and use appropriate equipment, materials, tools and methods for designing and implementing technological processes of construction production. PC7 – Ability to take responsibility for developing and making decisions in the field of architecture and construction in unpredictable work contexts. 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. PC12 – Ability to carry out and organize the technical operation of buildings and structures, to ensure the reliability, safety and durability of the construction objects in the air transport and other industries.

### 1.4. Interdisciplinary links

This discipline is based on the knowledge of such disciplines as "Engineering graphics", "Physics", "Chemistry" and is the basis for studying further disciplines, namely: "Production Base of Civil Engineering", "Engineering Geodesy (General Course)", "Architecture of Buildings and Structures", "Construction Economics", "Organization of Construction", "Water supply and Drain", "Construction Technology", "Heat-Gas Supply and Ventilation".





## 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 basis and consists of two educational modules, namely:

- **educational module 1** "Fundamentals of Civil Engineering";
- **educational module 2** "Buildings and Structures", each of which is a logically completed, relatively independent, integral part of the educational discipline, mastering which involves a modular test and results analysis.

### 2.2. Module structure and integrated requirements for each module

#### Module №1 “Fundamentals of Civil Engineering”

**Integrated requirements for module 1:** *to know the main historical stages of development of the civil engineering; peculiarities of construction production; basic requirements for obtaining a construction permit and providing control; fundamentals and basic requirements for designing buildings and structures; the structure of the construction regulatory base; basic requirements for the preparation of the construction site; classification of construction loads and types of transport; main types of construction works; be able to conduct an analysis of the buildings and structures condition; to characterize the construction industry; organize technical supervision of construction; apply theoretical knowledge to develop and carry out analysis and examination of project documentation; work with normative literature; prepare the construction site; organize transportation of construction loads; characterize the main construction works.*

#### Topic 1. History and peculiarities of development of the civil engineering

Introduction. Historical sketch of the construction industry. Development of construction crafts. The appearance of architecture. Architecture of Early civilizations (Neolithic architecture). Architecture of the Ancient World (Egypt and Mesopotamia). The architecture of Ancient Greece and Rome. Medieval Europe architecture (Gothic style). Architecture of the Renaissance and its successors. The Baroque style, Classicism and Neoclassicism. Eclectic style. Modern style. Constructivism style. The history of the development of construction styles in Ukraine. Contemporary architecture. Unique world construction objects.

#### Topic 2. General information about construction production

Basic principles of construction production. Production of the construction industry. Building production. Residential, public, cultural and household construction. Industrial construction. Transport construction. Rural construction. Hydro-technical construction. Energy construction. Special construction. Construction participants. Construction machinery. Building materials.

#### Topic 3. Permissive and regulatory documentation, functions of construction participants

Obtaining a construction permit. Duties of the developer. Responsibility and functions of the contractor. Responsibilities of the project organization. Designation and organization of technical supervision of construction. Building control. Appointment of technical supervision in construction.

#### Topic 4. Fundamentals of building design

Design of buildings and structures. Goals and tasks of construction design. Composition of project documentation. Types of design. Construction drawings. Scales in the construction drawing. Architectural part. Plan of the building. Facade. Cross section. Nodes. Structural part. Projects of engineering plumbing systems and equipment. The project of the construction organization. The project of execution of works. Estimated documentation.

#### Topic 5. General concepts of the regulatory base of construction in Ukraine

The structure of the construction regulatory base of Ukraine. Technical regulations. Building regulations. Standards and codes of established practice. Other documents in the field of construction.



Designation of documents in construction. Implementation of the regulatory base of Ukraine with international standards and the regulatory base of the European Union.

#### **Topic 6. Engineering preparation of the construction site**

Requirements for the construction site preparation. Removal of surface water. Drainage of groundwater. Geodetic works. Arrangement of the construction site. Temporary buildings and structures.

#### **Topic 7. Cargo and loading - unloading works in construction**

Classification of construction loads, types of transport. Transportation of construction cargo. Technical-economic calculation of the vehicle choice. Basic material-handling equipment. Loading and unloading of building materials and structural elements.

#### **Topic 8. Building processes and types of construction works**

Building processes and work operation. Types of construction works. Earthworks. Arrangement of piles. Masonry works. Concrete and reinforced concrete works. Assembly processes. Construction and installation work. Furnishing works. Installation of engineering equipment. Technology of constructions.

### **Module №2 “Buildings and Structures”**

**Integrated requirements for module 2: to know:** *structural and planning schemes of buildings; basic requirements for buildings and structures and their classification; conditions and methods of providing the microclimate of premises; characteristics of the main elements of buildings; basic requirements for technical maintenance and repair of buildings; the main factors that affect the design of residential buildings; main types of public buildings; main characteristics and volume-planning decisions of industrial buildings; basic principles and requirements for designing agricultural buildings and structures; main characteristics and conditions of operation and construction of engineering structures; **be able** to determine the structural and planning scheme of buildings; analyze the influence of natural and climatic factors on buildings and structures; determine the technical state of wear and tear of buildings; determine the type and characterize residential buildings; determine the type and characterize public buildings; characterize the volume-planning features of industrial buildings of various types; determine the type and characterize the buildings and structures of agricultural enterprises; carry out analysis and evaluation of engineering structures. able to determine the structural and planning scheme of buildings; analyze the influence of natural and climatic factors on buildings and structures; determine the technical state of wear and tear of buildings; determine the type and characterize residential buildings; determine the type and characterize public buildings; characterize the volume-planning features of industrial buildings of various types; determine the type and characterize the buildings and structures of agricultural enterprises; carry out analysis and evaluation of engineering structures.*

#### **Topic 1. General information about Buildings and Structures**

The characteristics of Buildings and Structures. Requirements for buildings and their classification. Structural schemes of buildings. Planning schemes of buildings. Building physics. Microclimate of premises. Building and architectural climatology

#### **Topic 2. Main elements of buildings**

Basement and foundations. Walls and separate supports. The masonry walls made of bricks and small stones. Large block and panel walls. Walls made of monolithic concrete and wood. Partitions. Floors and floor covering. Roofs and roof covering. Stairs, elevators and ramps. Windows, doors and gates.

#### **Topic 3. Maintenance and repair of buildings**

Organization of repair and restoration works. Operating repair of buildings and structures. General overhaul of buildings and structures. Reconstruction of buildings. Durability of buildings and structures. Factors of wear and tear of buildings.



#### Topic 4. Residential buildings

The main factors that affect the residential building design. Classification of residential buildings. Individual residential buildings. Blocked residential buildings. Multi-apartment residential buildings. Requirements for load-bearing elements of multi-apartment residential buildings. Multifunctional residential buildings. The apartment and its elements. Temporary building.

#### Topic 5. Public buildings

Urban planning and architectural-artistic features of designing public buildings and structures. Classification of public buildings. Functional basics of public buildings designing. The main planning elements of public buildings. Horizontal communications. Vertical communications. Fire requirements for public buildings design.

#### Topic 6. Industrial buildings and structures

Volume-planning features of various types industrial buildings. One-story industrial buildings. Two-story industrial buildings. Multi-storey industrial buildings. Auxiliary buildings and premises of industrial enterprises. Basic principles of planning and development of territories of industrial enterprises.

#### Topic 7. Buildings and structures of agricultural enterprises

Classification of agricultural buildings and structures and requirements for them. Animal buildings. Buildings for keeping birds. Warehouse agricultural buildings and structures. Buildings for processing of agricultural products. Planning and selection of the territory of the production area. Placement of buildings and structures on the territory of the production zone.

#### Topic 8. Engineering structures

Main types and classification of engineering structures. Supports of overhead power lines. General characteristics of overhead power lines. Exhaust towers. Smoke pipes. Radio and television towers. Waterworks. Dams Hydropower facilities. Water transport facilities. Water engineering structures. Reservoirs. Retaining walls. Linear transport facilities. Automobile roads. The main elements of the road. Railway tracks. Bridges Purpose and characteristics of bridges. Tunnels. Pipelines. Artificial structures on roads.

### 2.3. Thematic plan

№	Topic	Academic hours							
		Full-time study				Part-time study			
		Total	Lectures	Practicals	Self-study	Total	Lectures	Practicals	Self-study
1	2	3	4	5	6	7	8	9	10
<b>Module №1 «Fundamentals of Civil Engineering»</b>									
1.1	History and peculiarities of development of the civil engineering	<b>2 semester</b>				-			
		8	2	2	4	-	-	-	-
1.2	General information about construction production	8	2	2	4	-	-	-	-
1.3	Permissive and regulatory documentation, functions of construction participants	8	2	2	4	-	-	-	-
1.4	Fundamentals of building design	8	2	2	4	-	-	-	-
1.5	General concepts of the regulatory base of construction in Ukraine	8	2	2	4	-	-	-	-





1.6	Engineering preparation of the construction site	8	2	2	4	-	-	-	-
1.7	Cargo and loading - unloading works in construction	8	2	2	4	-	-	-	-
1.8	Building processes and types of construction works	8	2	1	5	-	-	-	-
1.9	Module test №1	4	-	1	3	-	-	-	-
<b>Total for Module №1</b>		<b>68</b>	<b>16</b>	<b>16</b>	<b>36</b>	-	-	-	-
<b>Module №2 «Buildings and Structures»</b>									
2.1	General information about buildings and structures	2				-			
		8	2	2	4	-	-	-	-
2.2	Main elements of buildings	8	2	2	4	-	-	-	-
2.3	Stairs, elevators and ramps	6	-	2	4	-	-	-	-
2.4	Maintenance and repair of buildings	8	2	2	4	-	-	-	-
2.5	Residential buildings	8	2	2	4	-	-	-	-
2.6	Public buildings	8	2	2	4	-	-	-	-
2.7	Industrial buildings and structures	8	2	2	4	-	-	-	-
2.8	Buildings and structures of agricultural enterprises	8	2	2	4	-	-	-	-
2.9	Engineering structures	9	3	2	4	-	-	-	-
2.10	Home work	8	-	-	8	-	-	-	-
2.11	Module test №2	3	1	-	2	-	-	-	-
2.12	<i>Control (home) work (part-time study)</i>	-	-	-	-	-	-	-	-
2.13	<i>Final semester test (PTS)</i>	-	-	-	-	-	-	-	-
<b>Total for Module №2</b>		<b>82</b>	<b>18</b>	<b>18</b>	<b>46</b>	-	-	-	-
<b>Total for Academic Discipline</b>		<b>150</b>	<b>34</b>	<b>34</b>	<b>82</b>	-	-	-	-

#### 2.4. Task for control (home) work

Control (homework) in the discipline is performed in the second (third) semester, in accordance with the approved methodological recommendations, in order to consolidate and deepen the theoretical knowledge and skills of the student in the study of the discipline. The task for the practical part of the control (home) task is carried out by the student individually in accordance with the guidelines.

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

#### 2.5. List of questions for Graded Test and final test (PTS)

The list of questions and the tasks to prepare for the Graded Test are developed by the teacher of the department in accordance with the work program and communicated to the students.


### 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, solving problems in civil engineering.

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### 3.2. Recommended literature

#### Basic literature

3.2.1. Вступ до будівельної справи : навчальний посібник / В. М. Першаков, А. О. Белятинський, О. В. Чемакіна, І. Л. Машков, О. Л. Бойко, К. В. Краюшкіна, К. М. Лисницька. За загальною редакцією д.т.н., проф. В. М. Першакова. - К.: НАУ. 2016. – 122 с.

3.2.2. Вступ до будівельної справи: навчальний посібник /В. Я. Савенко, В. В. Петрович, М. М. Малько, Г. М. Фещенко. – К.: НТУ, 2013. – 232 с.

3.2.3. Якименко О. В. Конспект лекцій з дисципліни «Будівельна справа» (для студентів 2 курсу денної та заочної форм навчання освітнього рівня бакалавр, спеціальностей 192 – «Будівництво та цивільна інженерія», спеціалізації (освітні програми) «Будівництво (Промислове і цивільне будівництво, Міське будівництво та господарство)», «Цивільна інженерія (Теплогазопостачання і вентиляція, Водопостачання та водовідведення)») /О. В. Якименко; Харків. нац. ун-т міськ. госп-ва ім. О. М. Бекетова. – Харків : ХНУМГ ім. О.М. Бекетова, 2018. – 113 с.

3.2.4. Матеріалознавство та основи будівельної справи - 2. Основи будівельної справи [Електронний ресурс]: навч. посіб. для здобувачів ступеня бакалавра за освітньою програмою «Геоінженерія» / В.В. Вапнічна; КПІ ім. Ігоря Сікорського. – Київ : КПІ ім. Ігоря Сікорського, 2020. – 127 с.

#### Additional literature

3.2.5. Технологія будівельного виробництва (курсове та дипломне проектування) : навчальний посібник / Дудар І. Н., Лівінський О. М., Прилипко Т. В. – Вінниця : ВНТУ, 2018. – 75 с.

3.2.6. Шаповал С. В. Конспект лекцій з курсу «Сучасні будівельні матеріали і технології» (для студентів 5 курсу денної форми навчання спеціальності 191 – Архітектура та містобудування) / С. В. Шаповал, А. А. Баранова ; Харків. нац. ун-т міськ. госп-ва ім. О. М. Бекетова – Харків : ХНУМГ ім. О. М. Бекетова, 2017. – 97 с.

3.2.7. Будівельне матеріалознавство. Підручник. Дворкін Л.Й., Лаповська С.Д. К.: Кондор-Видавництво, 2017. – 472 с.

3.2.8. Угненко Є. Б., Тимченко О. М., Белікова Н. В. Основи організації будівництва та будівельного виробництва: Конспект лекцій. – Харків: УкрДУЗТ, 2019. – Ч. 1. – 81 с.

3.2.9. Семко, В. О. Архітектура будівель і споруд. Архітектурні конструкції малоповерхових цивільних будівель : навч. посіб. / В. О. Семко, М. В. Пашинський ; Центральнoукраїн. нац. техн. ун-т. - 3-тє вид., перероб. і допов. - Кропивницький : ЦНТУ, 2020. - 185 с. – Режим доступу:

<http://dspace.kntu.kr.ua/jspui/bitstream/123456789/10159/3/Architecture.pdf>.

#### 3.3. Internet information resources

3.3.1. <http://iap.nau.edu.ua/index.php/kafedry/komp-yuternikh-tekhnologij-budivnitstva>

3.3.2. <http://www.lib.nau.edu.ua/main/>

3.3.3. [file:///C:/Users/%D0%9E%D0%BB%D0%B5%D0%BA%D1%81%D0%B0%D0%BD%D0%B4%D1%80/Downloads/VdBS-122%20\\_%D0%90%D0%B2%D1%82%D0%BE%D1%81%D0%BE%D1%85%D1%80%D0%B0%D0%BD%D0%B5%BD%D0%BD%D1%8B%D0%B9\\_.pdf](file:///C:/Users/%D0%9E%D0%BB%D0%B5%D0%BA%D1%81%D0%B0%D0%BD%D0%B4%D1%80/Downloads/VdBS-122%20_%D0%90%D0%B2%D1%82%D0%BE%D1%81%D0%BE%D1%85%D1%80%D0%B0%D0%BD%D0%B5%BD%D0%BD%D1%8B%D0%B9_.pdf)

3.3.4. <http://eprints.kname.edu.ua/4664/1/%D0%A2%D0%9B%2C%D0%92%D0%94%D0%91%D0%A1%2C%D0%92.%D0%90.%D0%AE%D1%88%D0%BA%D0%BE%2C%D0%BF%D0%B5%D1%87%D0%B0%D1%82%D0%BD.%2C23.04.09.pdf>

#### 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 Table. 4.1.

Table 4.1.

Kind of Academic Activities	Maximum Grade		Kind of Academic Activities	Maximum Grade	
	Full-time study	Part-time study		Full-time study	Part-time study
Semester 2			Semester 2, 3 (PTS)		
<b>Module № 1 «Fundamentals of Civil Engineering»</b>			<b>Module № 2 «Buildings and Structures»</b>		
Carrying out and defending the task of the Practical	25	-	Carrying out and defending the task of the Practical	25	-
-	-	-	Carrying out the control (home) work	15	-
<i>For carrying out a module test 1 a student must receive not less than</i>	15	-	<i>For carrying out a module test 2 a student must receive not less than</i>	24	-
-	-	-	<i>Final semester test</i>	-	-
Carrying out a module test №1	15	-	Carrying out a module test №2	15	-
<b>Total for module 1</b>	40	-	<b>Total for module 2</b>	60	-
<b>Total for modules №1, №2</b>				<b>100</b>	<b>-</b>
<b>Total for academic discipline</b>				<b>100</b>	

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 Scale 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 second 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				