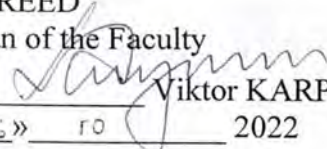


MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
 NATIONAL AVIATION UNIVERSITY  
 Faculty of Architecture, Civil Engineering and Design  
 Computer Technologies of Airport Construction and Reconstruction Department

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

APPROVED  
 Vice Rector for Academics  
  
 Anatolii POBUKHIN  
 « 22 » 10 2022

Quality Management System

**COURSE TRAINING PROGRAM**  
 on  
**"Water Supply and Drain"**

Educational-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 (home) works	CP / TP	Form of control
Full-time	7	105,0/3,5	17	-	34	54	HW-7p	-	Examination 7 <sup>th</sup> semester

Index: ECB-5 - 192 - 1/22 - 2.1.18

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



Quality Management System  
Course Training Program  
on  
"Water Supply and Drain"

Document  
code

QMS NAU  
CTP 10.01.04 – 01-2022

Page 2 of 15

The Course Training Program on "Water Supply and Drain" is developed on the basis of the Educational-Professional Program "Industrial and Civil Engineering", Bachelor Curriculum and Extended Curriculum № CB-5-192-1/22, № ECB-5-192-1/22 for training higher education seekers of the Bachelor degree of specialty 192 "Building and Civil Engineering" and corresponding normative documents.

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«27» 10 2022

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## INTRODUCTION

The Course Training Program of the academic discipline "Water Supply and Drain" 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 discipline has an independent value and is one of the leading disciplines that provides skills in understanding the technological processes of water supply and sewerage in engineering structures, the purpose of these structures and construction.

**The goal** of the discipline is to form the skills and knowledge of future specialists in the basics of design, construction and operation of water supply and drainage systems of settlements, residential and industrial facilities.

**The objectives** of the discipline are to obtain basic information on the methods and facilities for improving the quality, supply and distribution of drinking water, methods and facilities for the transportation of wastewater and sludge, the basics of design, construction and operation of external water supply and sewage systems.

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

PLO5 – Use and develop technical documentation at all stages of the life cycle of construction products. 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 the 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:

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.

Professional competences:

PC1 – Ability to use conceptual scientific and practical knowledge of mathematics, chemistry and physics to solve complex practical problems in construction and civil engineering. 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. PC6 – Ability to perform engineering activities in the field of construction, compilation and use of technical documentation. PC7 – Ability to take responsibility for developing and making decisions in the field of architecture and construction in unpredictable work contexts.

### **1.4. Interdisciplinary links**

This discipline is based on the knowledge of such disciplines as Introduction to Civil Engineering, Architecture of Buildings and Structures, Technical Mechanics of Fluids and Gas, Engineering Geology, Construction Production Technology.

## **2. PROGRAM OF THE ACADEMIC DISCIPLINE**

### **2.1. Content of the academic discipline**

The educational material of the discipline is structured on a modular principle and consists of two training modules, namely:

- **training module №1**, "Basic provisions and characteristics"
- **training module №2**, "Design and construction of networks"



each of which is a logical complete, relatively independent, integral part of the discipline, the mastering of which involves conducting modular control work and analysis of the results of its implementation.

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

### Module №1 “Basic provisions and characteristics”

#### Integrated requirements for module 1:

*to know:* regulatory framework; categories of water consumers; requirements for water supply systems; water quality criteria;

*be able:* to use regulatory documents that regulate the implementation of construction and installation works; methodically choose the right design and technological solutions for a particular construction object.

#### Topic 1: Basic provisions.

General information about the water supply system. Regulatory framework in the field of water supply and sanitation. The value of water. Categories of water consumers. Requirements for water supply systems. Water quality.

#### Topic 2. Water supply systems and schemes.

Water supply systems and schemes. Classification of water supply systems. Schemes of water supply. rubs, which are used for the construction of water supply networks. Fittings on water supply networks. Acceptance of water supply networks in operation. Graphic designations of pipelines and elements of axonometric schemes of water supply and drainage.

#### Topic 3. Types of water supply sources.

Fire water supply from reservoirs and tanks. Fire pipelines of high and low pressure. Fire-fighting water discharge. Traditional fresh water sources and water supply systems.

#### Topic 4. Fresh water sources and water supply networks.

External water supply networks. Schemes of tracing water supply networks. Basics of calculations of water supply networks. Modes of water consumption, calculated water consumption and the required pressure in the network. Alternative sources of fresh water and water supply systems.

### Module №2 “Design and construction of networks”

#### Integrated requirements for module 2:

*to know:* equipment of water supply and sewage systems; systems and schemes of water disposal; features of construction and operation of sewage networks;

*be able:* to design water supply and sewage systems and operate them.

#### Topic 5. Equipment of water supply systems.

Metering equipment. Hydrometric characteristics of high-speed wing-time water flow meter.



### Topic 6. Drainage systems and schemes.

Systems and schemes of drainage. Construction and operation of water disposal networks. External drainage networks. Tracing of external drainage networks. Basic data for network design. Estimated flow rates of wastewater and the basis of calculation of external drainage networks. Receivers of wastewater.

### Topic 7: Equipment and facilities of sewerage networks.

Equipment and facilities of sewerage networks. Pipes and collectors. Construction and operation of drainage networks.

### Topic 8: Water drainage.

Drainage of rainwater. Intersection of water supply and drainage networks with drainage obstacles. Internal drainage.

## 2.3. Thematic plan of the academic discipline

№ п/п	Topic	Academic hours							
		Full-time study				Part-time study			
		Total	Lectures	Labs	Self-study	Total	Lectures	Labs	Self-study
1	2	3	4	5	6	7	8	9	10
<b>Module №1 “ Basic provisions and characteristics ”</b>									
1.1	Topic 1: Main provisions	<b>7 semester</b>				<b>7 semester</b>			
		<b>6</b>	2	2	2	-	-	-	-
1.2	LW 1: Regulatory framework in the field of water supply	4	-	2	2	-	-	-	-
1.3	LW 2: Recommendations and regulatory framework for the installation of drainage systems	4	-	2	2	-	-	-	-
1.4	Topic 2: Water supply systems and schemes	4	2	-	2	-	-	-	-
1.5	LW 3: Deformations around a point of the body.	4	-	2	2	-	-	-	-
1.6	LW 4: Stress-strain state around a point of the body.	4	-	2	2	-	-	-	-
1.7	LW 5: Graphic designations of pipelines of water supply and drainage schemes.	2	-	-	2	-	-	-	-
1.8	Topic 3: Types of water supply sources	4	2	-	2	<b>8 semester</b>			
						-	-	-	-
1.9	LW 6: Traditional sources of fresh water.	4	-	2	2	-	-	-	-
1.10	LW 7: Water supply systems	4	-	2	2	-	-	-	-
1.11	Topic 4: Fresh water sources and water supply systems	3	1	-	2	-	-	-	-
1.12	LW 8: Alternative sources of fresh water.	4	-	2	2	-	-	-	-
1.13	LW 9: Water supply systems s.	4	-	2	2	-	-	-	-
1.14	Modular control work №1	2	1	-	1	-	-	-	-
	<b>Total for Module 1</b>	<b>53</b>	<b>8</b>	<b>18</b>	<b>27</b>	-	-	-	-



1	2	3	4	5	6	7	8	9	10
<b>Module №2 “ Design and construction of networks ”</b>									
2.1	Topic 5: Equipment of water supply systems	2	2	-	-	-	-	-	-
2.2	LW 10: Structure of high-speed impeller water flow meter	4	-	2	2	-	-	-	-
2.3	LW 11: Hydrometric characteristics of high-speed impeller water flow meter.	4	-	2	2	-	-	-	-
2.4	Topic 6: Equipment of water supply systems	4	2	-	2	-	-	-	-
2.5	LW 12: Wastewater receivers are traditional	4	-	2	2	-	-	-	-
2.6	LW 13: Alternative wastewater receivers	4	-	2	2	-	-	-	-
2.7	Topic 7: Equipment and facilities of sewerage networks	2	2	-	-	-	-	-	-
2.8	LW 14: Hydraulic valves for sewage	4	-	2	2	-	-	-	-
2.9	LW 15: Hydraulic hydraulic valves	4	-	2	2	-	-	-	-
2.10	Topic 8: Drainage	2	2	-	-	-	-	-	-
2.11	LW 16: Audits	4	-	2	2	-	-	-	-
2.12	LW 17: Purges	4	-	2	2	-	-	-	-
2.13	Home work.	8	-	-	8	-	-	-	-
2.14	Modular control work №2	2	1	-	1	-	-	-	-
<b>Total for Module 2</b>		<b>52</b>	<b>9</b>	<b>16</b>	<b>27</b>	-	-	-	-
<b>Total for Academic Discipline</b>		<b>105</b>	<b>17</b>	<b>34</b>	<b>54</b>				

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

Homework on the discipline is performed in the 7th semester, in accordance with the methodological recommendations approved in the prescribed manner, in order to consolidate and deepen the theoretical knowledge and skills of the student in the study of the discipline.

The specific purpose of homework is the current control of students' knowledge of the discipline. Homework is an integral part of the educational process, as well as an active form of independent work of students. Homework helps to expand, deepen and consolidate the knowledge gained in the process of studying the course; the formation of the ability to work independently with educational, methodological and normative literature with further generalization of data and conclusions. Tasks for implementation are developed by the author of the work program. Teaching materials are approved by the minutes of the meeting of the graduating department, brought to the attention of the student individually and are carried out in accordance with the methodological recommendations.

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

#### 2.5. List of questions for exam and final test

The list of questions and the tasks to prepare for the exam 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 design.

#### **3.2. Recommended literature**

##### **Basic literature**

3.2.1. Водопостачання і водовідведення: Підручник. / В.К Черненко, М.Г. Ярмоленко, Г.М. Батура та ін.; за ред. В.К. Черненка, М.Г. Ярмоленка. – К.: Вища шк., 2002. – 430 с.

3.2.2. Зеленкова Г.Ф. Водопостачання і водовідведення. / Г.Ф. Зеленкова, О.І. Пилипенко – НАУ, 2005. – 134 с.

3.2.3. Карапузов Є.К. Матеріали і технології в сучасному будівництві. / Є.К. Карапузов. – К.: Вища шк., 2005. – 480 с.

##### **Additional literature**

3.2.4 Черненко О.І. Водопостачання і водовідведення / О.І. Черненко. – К.: Вища школа, 2000. – 340 с.

3.2.5. Ярмоленко М.Г. Водопостачання і водовідведення. / М.Г. Ярмоленко, В.К. Черненко, В.І, Терновий та ін.; за ред. М.Г. Ярмоленка. – К.: Вища шк., 2003. – 406 с.

3.2.6. Осташевська Г.Г. Тексти лекцій «Водопостачання і водовідведення» / Г.Г. Осташевська. – Харків: ХНАМГ, 2009. -69 с.

3.2.7. Якименко О.В. Водопостачання і водовідведення / О.В. Якименко. – Харків: ХНУМГ, 2016. – 410 с.

#### **3.3. Internet information resources**

3.3.1. <https://www.youtube.com/channel/UCMHldi-SngrK8NrjsqI4vhg>



## 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.

Kind of Academic Activities	Maximum Grade	
	Full-time study, points	Part-time study, points
3 semester/3,4 semester		
Module №1 “ Basic provisions and characteristics ”		
Laboratory works 4x5p	20	-
<i>For admission to the modular control work work No. 1, the student must score at least</i>	10	-
Performing modular control work №1	10	-
<b>Total for module №1</b>	<b>30</b>	<b>-</b>
Module №2 “ Design and construction of networks ”		
Laboratory works 4x5p	20	-
Homework	10	-
<i>For admission to the modular control work work No. 2, the student must score at least</i>	10	-
Performing modular control work №2	10	-
Performing control (homework)	-	-
<b>Total for module №2</b>	<b>40</b>	<b>-</b>
<b>Total for module №1, №2</b>	<b>80</b>	<b>-</b>
<b>Final semester control work</b>	<b>20</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 The completed types of academic work are credited to the student if he received a positive rating for them.

4.3. The sum of the rating grades received by the student for certain types of completed academic work is the current module rating grade, which is entered in the module control record.

4.4. The final semester rating grade is converted to the national scale and ECTS scale.

4.5 The final semester rating grade in points, according to the national scale and the ECTS scale is entered in the test-examination record, study card and student's record book, for example 92/Excellent/A, 87/Good/B, 79/Good/C, 68/Failing/D, 65/Failing/E, etc.

4.6 The final rating grade in the discipline is equal to the final semester rating grade. The specified final rating grade in the discipline is entered in the Diploma Supplement.





(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				



(F 21.01 – 03)



**Syllabus of the academic discipline  
«WATER SUPPLY AND DRAIN»  
Educational and professional program:  
«Industrial and Civil Engineering»,  
Field of study: 19 «Architecture and Construction»  
Specialty: 192 «Building and Civil Engineering»**

<b>Level of higher education</b>	First (Bachelor)
<b>Discipline status</b>	Academic discipline of the selective component
<b>Course</b>	4
<b>Semester</b>	7
<b>ECTS credits / hours</b>	3,5 / 105
<b>Language of training</b>	English
<b>What will be studied (subject of study)</b>	Water supply and sewerage networks
<b>Why is it interesting / necessary to study (goal)</b>	The purpose of teaching the discipline is to provide the future specialist with knowledge in the field of calculation and design of water supply and drainage systems, taking into account the requirements of manufacturability of production of structural elements, their transportation, installation and technical operation.
<b>What can you learn (learning outcomes)</b>	PLO5 – Use and develop technical documentation at all stages of the life cycle of construction products. 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.



<p><b>How to use the acquired knowledge and skills (competencies)</b></p>	<p>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.</p> <p>General competences: 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.</p> <p>Professional competences: PC1 – Ability to use conceptual scientific and practical knowledge of mathematics, chemistry and physics to solve complex practical problems in construction and civil engineering. 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. PC6 – Ability to perform engineering activities in the field of construction, compilation and use of technical documentation. PC7 – Ability to take responsibility for developing and making decisions in the field of architecture and construction in unpredictable work contexts.</p>
<p><b>Educational logistics</b></p>	<p><b>Contents:</b> Basic provisions. Systems and schemes of water supply. Types of water supply sources. Sources of fresh water and water supply networks. Equipment of water supply systems. Systems and schemes of drainage. Equipment and facilities of sewerage networks. Drainage of water.</p> <p><b>Classroom sessions:</b> lectures, laboratory classes.</p> <p><b>Teaching methods:</b> explanatory and illustrative method, method of problem presentation, reproductive methods.</p> <p><b>Form of training:</b> full-part</p>
<p><b>Prerequisites</b></p>	<p>"Introduction to Construction Engineering", " Architecture of buildings and structures ", " Technical mechanics of liquid and gas", " Engineering geology ", " Technology of construction production "</p>
<p><b>Porekvizyty</b></p>	<p>"Organization of building", " Construction and installation of buildings and structures"</p>



<b>Information support from the repository and fund of NTB NAU</b>	<p>Водопостачання і водовідведення: Підручник / В.К Черненко, М.Г. Яр-моленко, Г.М. Батура та ін.; за ред. В.К. Черненка, М.Г. Ярмоленка. – К.: Вища шк., 2002. – 430 с.</p> <p>Зеленкова Г.Ф. Водопостачання і водовідведення. / Г.Ф. Зеленкова, О.І. Пилипенко – НАУ, 2005. – 134 с.</p> <p>Карапузов Є.К. Матеріали і технології в сучасному будівництві. / Є.К. Карапузов. – К.: Вища шк., 2005. – 480 с.</p> <p>Допоміжна література</p> <p>Черненко О.І. Водопостачання і водовідведення / О.І. Черненко. – К. : Вища школа, 2000. – 340 с.</p> <p>Ярмоленко М.Г. Водопостачання і водовідведення. / М.Г. Ярмоленко, В.К. Черненко, В.І. Терновий та ін.; за ред. М.Г. Ярмоленка. – К.: Вища шк., 2003. – 406 с.</p> <p>Осташевська Г.Г. Тексти лекцій «Водопостачання і водовідведення» / Г.Г. Осташевська. – Харків: ХНАМГ, 2009. - 69 с.</p> <p>Якименко О.В. Водопостачання і водовідведення / О.В. Якименко. – Ха-рків: ХНУМГ, 2016. – 410 с.</p>	
<b>Location and logistics</b>	<a href="http://www.lib.nau.edu.ua">http://www.lib.nau.edu.ua</a>	
<b>Semester control, examination methods</b>	tests, module test	
<b>Department</b>	Construction Computer Technologies and Airports Reconstruction	
<b>Faculty</b>	Architecture, civil engineering and design	
<b>Professor</b>		<p><b>HORB OLEKSANDR</b> <b>Position:</b> Associate Professor <b>Scientific degree:</b> Candidate of Sciences <b>Academic title:</b> - <b>Profile:</b> <a href="http://iap.nau.edu.ua/images/LAP_ACRED/npp2/Gorb.pdf">http://iap.nau.edu.ua/images/LAP_ACRED/npp2/Gorb.pdf</a> <b>tel.:</b> 044-406-74-25 <b>E-mail:</b> <a href="mailto:oleksandr.horb@npp.nau.edu.ua">oleksandr.horb@npp.nau.edu.ua</a> <b>Room:</b> 5.510</p>
<b>Originality of academic discipline</b>	Author's course	
<b>Link to discipline</b>	<a href="https://er.nau.edu.ua/handle/NAU/24905">https://er.nau.edu.ua/handle/NAU/24905</a>	