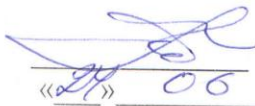


**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**  
**NATIONAL AVIATION UNIVERSITY**

Faculty of Transport, Management and Logistics  
 Air Transportation Management Department

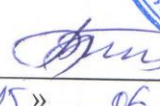
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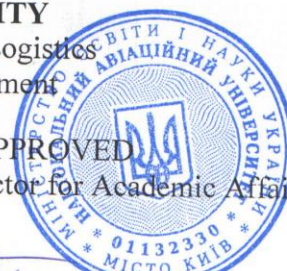
Dean of Faculty of Transport,  
 Management and Logistics

  
 «28» 06 2021 T. Mostenska

APPROVED

Vice-Rector for Academic Affairs

  
 «25» 06 2021 A. Polukhin



Quality Management System  
**COURSE TRAINING PROGRAM**

on

«Automated Systems in Designing Elements of Transport Systems»

Educational Professional Program: «Air Transportation Management»

Field of study: 27 «Transport»

Speciality: 275 «Air Transport Technologies»

Specialization: 275.04 «Air Transport Technologies»

| Training Form | Semester | Total (hours/credits ECTS) | Lectures | Practicals | Lab. classes | Self-Study | HW/CGP | TP/CP | Semester Grade |
|---------------|----------|----------------------------|----------|------------|--------------|------------|--------|-------|----------------|
| Full-time     | 4        | 120/4,0                    | 17       | —          | 34           | 69         | —      | —     | Graded Test 4s |

Index: CB-7-275-1/21-3.5

**QMS NAU CTP 19.01–01–2021**



Quality Management System.  
Course Training Program  
on  
«Automated Systems in Designing Elements  
of Transport Systems»

Document  
Code

QMS NAU CTP 19.01-01-  
2021

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Course Training Program on «Automated Systems in Designing Elements of Transport Systems» is developed on the basis of Educational Professional Program «Air Transportation Management», Bachelor Curriculum and Bachelor Extended Curriculum №CB-7-275-1/21, №ECB-7-275-1/21 for Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies» and corresponding normative documents.

Developed by:

Head of the Department of the

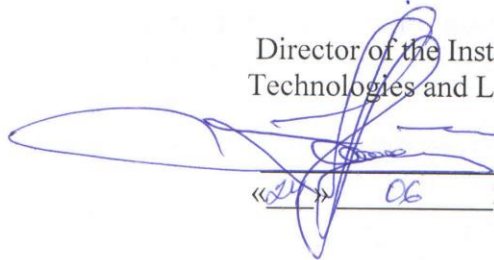
Air Transportation Management Department  D. Shevchuk

Discussed and approved by the Graduate Department for Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies» and Educational Professional Program «Air Transportation Management» - Air Transportation Management Department, Minutes № 12 « 9 » 06 2021

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« 24 » 06 2021

Document level – 3b

The Planned term between revisions – 1 year

Master copy

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## INTRODUCTION

Course Training Program on «Automated Systems in Designing Elements of Transport Systems» is developed based on the "Methodical guidance for the subject course training program", approved by the order № 249/од, of 29.04.2021 and corresponding normative documents.

### 1. EXPLANATORY NOTES

#### 1.1. Place, objectives, tasks of the subject.

The subject is an integral part of the theoretical basis of knowledge and skills in training specialists of air transportation area, studying the technological subjects.

The **objective** of the subject is to study the theoretical and practical foundations of work in software environments of computer-aided design (CAD) on the example of AutoCAD.

The **tasks** of the subject are:

- students' mastering the basics of engineering design;
- acquisition of skills of graphic display and visualization of information with the help of CAD AutoCAD;
- clarification of the principles and acquisition of basic skills of working with specialized software in the field of CAD;
- understanding of the principles of construction and architecture of CAD, drawing elements, basic requirements for creating and editing two-dimensional drawings;
- acquaintance with methods of calculation of technical and economic efficiency of technical decisions accepted in the course of designing of components of transport systems;
- application in practice of the obtained theoretical knowledge and skills in the field of CAD.

#### 1.2. Learning outcomes the subject makes it possible to achieve.

- Take responsibility, show public consciousness, social activity and participation in the life of civil society, think analytically, critically understand the world;
- Apply, use modern information and communication technologies to solve practical problems in the organization of transportation and design of transport technologies;
- Investigate transport processes, experiment, analyze and evaluate the parameters of transport systems and technologies;
- Classify and identify transport processes and systems. Evaluate the parameters of transport systems. Perform system analysis and forecasting of transport systems;
- Choose information systems for transportation.

#### 1.3. Competences the subject makes it possible to acquire.

- Ability to analyze and predict the parameters and performance of transport systems and technologies, taking into account the impact of the external environment;
- Ability to organize international transportation;
- Ability to use modern information technologies, automated control systems and geographic information systems in the organization of the transportation process;
- Ability to identify insurance cases on air transport, to develop a system of measures to prevent and eliminate them;
- Ability to use professionally profiled knowledge and practical skills of technology, organization and management of air passenger transportation to solve engineering problems in production;
- Ability to design transport (transport-production, transport-warehousing) systems and their individual elements. Ability to develop and use appropriate software to automate transport systems and processes.

#### 1.4. Interdisciplinary connections.

The subject is based on following subjects, as: «Computer Engineering», «Higher Mathematics», «Informational Systems and Technologies on Transport», «Fundamentals of Transport Processes and Systems Theory», «Stochastic Processes in Transport Systems» and is basic for studying subjects, as: «Mathematical Modeling of Air Transportation», «Transport Vehicles Operation», «Transportation of Special Goods by Air Transport», «Microcontrollers and Programming of Automation Means of Transport Processes and Systems», «Transport Infrastructure», «Fundamentals of Transport Process Designing».

|                                                                                   |                                                                                                                                  |                  |                               |
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## 2. COURSE TRAINING PROGRAM ON THE SUBJECT

### 2.1. The subject content.

Training material is structured according to module principle and consists of **one educational module, Module № 1 « Automated Systems in Designing Elements of Transport Systems »**, that is logically complete, relatively independent, holistic part of the subject, learning of which provides module test and analysis of its performance.

### 2.2. Modular structuring and integrated requirements for each module.

#### Module №1 «Automated Systems in Designing Elements of Transport Systems»

##### Integrated requirements to module №1:

##### know:

- principles and tasks of design, stages of design, design procedures;
- criteria and conditions for limiting the design process;
- mathematical, linguistic, software, information, technical and organizational support of design tasks;
- methods of building mathematical models and their application in computer-aided design systems;
- methods of analysis and synthesis of design objects, their application in CAD;
- procedures of parametric optimization of design objects.

##### be able:

- use the achievements of scientific and technical research;
- develop design and engineering documentation of design systems and its elements;
- to solve design and engineering problems of construction of the designed object and its elements;
- evaluate the technical and economic efficiency of the design process;
- to build mathematical models of systems, subsystems of the designed object;
- use basic CAD software packages.

#### Topic 1. General information about computer-aided design.

Tasks and basic definitions of the discipline. The role of computer-aided design systems in the process of creating elements of transport systems. Principles and tasks of design. Hierarchical levels of descriptions of projected objects. Features of descriptions of objects. Varieties of descriptions of projected objects and classification of their parameters. Design stages.

#### Topic 2. Typical design procedures.

Typical design procedures, their classification. A typical sequence of design procedures. Routes of designing technical objects. Design modes in computer-aided design systems. Mathematical support of automated design. General characteristics, current state of mathematical software, prospects and development forecast. Classification of mathematical models of transport systems. Block-hierarchical approach.

#### Topic 3. Typical automated design system.

Construction of computer-aided design systems. The structure of computer-aided design systems, a set of design automation tools. Technical support of computer-aided design systems. Mathematical support of computer-aided design systems.

#### Topic 4. Information and CAD software.

Software for computer-aided design systems. Information support of computer-aided design systems. Methodical and organizational support of computer-aided design systems. Subsystems and levels of computer-aided design systems.

#### Topic 5. Technical support of CAD.

|                                                                                   |                                                                                                                                  |                  |                               |
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Databases and data banks in computer-aided design and database management systems. Linguistic support of computer-aided design systems. Programming languages, design languages. Management languages.

#### **Topic 6. General information about AutoCAD.**

Design applications. General overview, characteristics, development trends. Automation of design and technological documentation. Review of graphic editors. ACAD graphical editor, interface, environment settings. ACAD primitives. ACAD coordinate systems. Screen structure in the ACAD graphics editor, toolbar, drop-down menu, context menu, command line.

#### **Topic 7. Teams for drawing, drawings. Editing drawings.**

Object binding, step binding. Image management. Obtaining information on the drawing. Text, choice of fonts, size, placement methods, input of special characters. Blocks. Block creation, block insertion, block entry, block properties. Hatching. Hatching styles. Requirements for the contour of the hatched area.

#### **Topic 8. Graphic primitives and AutoCAD commands.**

Placing the dimensions of the drawing. Linear dimensions, marking the dimensions of circles, arcs, angles. Setting the sizing mode according to ESKD. Editing a drawing. Commands SELECT, ERASE, MIRROR, CHANGE, COPY, SCALE, ARRAY, TRIM, MOVE, ROTATE, BREAK, EXPLODE, FILLET, CHAMFER, EXTEND. Design of electrical equipment. Application overview. Brief description of common applications.

### **2.3. Training schedule of the subject.**

| №                                           | Theme<br>(thematic section)                      | Total, hours      |           |           |            |
|---------------------------------------------|--------------------------------------------------|-------------------|-----------|-----------|------------|
|                                             |                                                  | Total             | Lectures  | Labs      | Self-study |
| 1                                           | 2                                                | 3                 | 4         | 5         | 6          |
| <b>Module № 1 «Introduction into Major»</b> |                                                  |                   |           |           |            |
| 1.1                                         | General information about computer-aided design. | <b>1 semester</b> |           |           |            |
|                                             |                                                  | 14                | 2         | 2<br>2    | 8          |
| 1.2                                         | Typical design procedures.                       | 14                | 2         | 2<br>2    | 8          |
| 1.3                                         | Typical automated design system.                 | 14                | 2         | 2<br>2    | 8          |
| 1.4                                         | Information and CAD software.                    | 14                | 2         | 2<br>2    | 8          |
| 1.5                                         | Technical support of CAD.                        | 13                | 2         | 2<br>2    | 7          |
| 1.6                                         | General information about AutoCAD.               | 13                | 2         | 2<br>2    | 7          |
| 1.7                                         | Teams for drawing, drawings. Editing drawings.   | 13                | 2         | 2<br>2    | 7          |
| 1.8                                         | Graphic primitives and AutoCAD commands.         | 15                | 2<br>1    | 2<br>2    | 8          |
| 1.9                                         | Module Test №1                                   | 10                | -         | 2         | 8          |
| <b>Total by the module №1</b>               |                                                  | <b>120</b>        | <b>17</b> | <b>34</b> | <b>69</b>  |
| <b>Total by the subject</b>                 |                                                  | <b>120</b>        | <b>17</b> | <b>34</b> | <b>69</b>  |

|  |                                                                                                                                  |                  |                               |
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### 3. BASIC CONCEPTS OF GUIDANCE ON THE SUBJECT

#### 3.1. Teaching methods.

The following teaching methods of subject guidance are

- explanatory and illustrative method;
- method of problem presentation;
- reproductive method;
- research method.

The implementation of these methods are carried out during lectures, demonstrations, self-study, work with the educational material, analysis of transport technologies issues.

#### 3.2. List of references (basic and additional).

##### Basic literature.

3.2.1. Mastering AutoCAD 2020 and AutoCAD LT 2020. By authors: George Omura Brian C. Benton, New York, United States. - 1045P.

3.2.2. AutoCAD 2018 For Beginners. Cadfolks R., Createspace Independent Publishing Platform - 450 P.

3.2.3. AutoCAD For Dummies. By author: Goodread T., John Wiley & Sons Inc. – 546 P.

3.2.4. Проектування систем автоматизації. Навчальний посібник / М.С. Пушкар, С.М. Проценко // – Д.: Національний гірничий університет, 2018. – 268 с.

##### Additional Literature.

3.2.5. AutoCad. Basic Tutorial. By author: Dootred T., John Wiley & Sons Inc. – 456 P.

3.2.6. ДСТУ 2226-93 Автоматизовані системи проектування. Терміни і визначення.

3.2.7. САПР. Кн.1. И.П. Норенков. Принципы построения и структура. Минск «Высшая школа», 2014. 300с.

3.2.8. САПР. Кн.2. И.П. Норенков. Принципы построения и структура. Минск «Высшая школа», 2015. 258 с.

3.2.9. Автоматизоване проектування електромеханічних пристроїв, компонентів цифрових систем керування та діагностичних комплексів : навч. посібник / О. Ф. Бабічева, С. М. Єсаулов ; Харків. нац. ун-т міськ. госп-ва ім. О. М. Бекетова. – Харків : ХНУМГ ім. О. М. Бекетова, 2018. – 355 с

#### 3.3. Internet Information resource.

3.3.1. <https://learnmech.com/autocad-tutorial-for-beginners-pdf-free-download/>

3.3.2. <https://civilread.com/download-best-autocad-book-of-civil-engineering/>

3.3.3. <https://easyengineering.net/autocad-books/>

3.3.4. <https://www.yumpu.com/en/document/view/64123080/pdf-download-introduction-to-autocad-2020-2d-and-3d-design-full-pdf>

3.3.5. <https://www.autodesk.com/>

### 4. RATING SYSTEM OF KNOWLEDGE AND SKILLS ASSESSMENT

4.1. Assessment of certain kinds of student academic work is carried out in accordance with table 4.1.

Table 4.1

| Kind of Academic Work                                                                 | Maximum Grade Values |
|---------------------------------------------------------------------------------------|----------------------|
| <b>1 semester</b>                                                                     |                      |
| <b>Module № 1 «Introduction into Major»</b>                                           |                      |
| carrying out practicals and theoretical material (106 x 8)                            | 80 (total)           |
| <i>For admission to complete module test №1, a student must receive not less than</i> | <i>48 points</i>     |
| Module test №1                                                                        | 20                   |
| <b>Total by the module №1</b>                                                         | <b>100</b>           |
| <b>Total by the subject</b>                                                           | <b>100</b>           |

|                                                                                   |                                                                                                                                  |                  |                               |
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**The credit rating** is determined (in points and in a National Scale) based on the results of all types of academic work during the semester.

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 rating assessments received by the student for certain types of completed academic work is the current modular rating assessment, which is recorded in the module control.

4.4. The final modular rating obtained by the student based on the results of the course defense and defense in points, on the national scale and ECTS scale is entered in the module control, as well as in the study card, individual student curriculum and Diploma Supplement, for example, as follows: **92 / Excellent / A, 87 / Good / B, 79 / Good / C, 68 / Sat./D, 65 / Sat./E, etc.**

4.5. The final semester rating is converted into a grade on the national scale and the ECTS scale.

4.6. The final semester rating in points, on the national scale and the ECTS scale is entered in the test report, study card and individual curriculum of the student (record book), for example, as follows: **92 / Excellent / A, 87 / Good / B, 79 / Good / C, 68 / Sat./D, 65 / Sat./E, etc.**

4.7. The Total Grade for the subject is equal to the average grade from Total Semester Grades with its further transformation into national scale and ECTS system.

The Total Grade is recorded to the Diploma Appendix

|                                                                                   |                                                                                                                                  |                  |                               |
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(Ф 03.02 – 01)

#### АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

| №<br>прим. | Куди<br>передано<br>(підрозділ) | Дата<br>видачі | П.І.Б. отримувача | Підпис<br>отримувача | Примітки |
|------------|---------------------------------|----------------|-------------------|----------------------|----------|
|            |                                 |                |                   |                      |          |
|            |                                 |                |                   |                      |          |
|            |                                 |                |                   |                      |          |

(Ф 03.02 – 02)

#### АРКУШ ОЗНАЙОМЛЕННЯ З ДОКУМЕНТОМ

| №<br>пор. | Прізвище, ім'я, по батькові | Підпис<br>ознайомленої<br>особи | Дата<br>ознайо-<br>млення | Примітки |
|-----------|-----------------------------|---------------------------------|---------------------------|----------|
|           |                             |                                 |                           |          |
|           |                             |                                 |                           |          |
|           |                             |                                 |                           |          |

(Ф 03.02 – 04)

#### АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

| №<br>пор. | Прізвище, ім'я, по батькові | Дата ревізії | Підпис | Висновок щодо<br>адекватності |
|-----------|-----------------------------|--------------|--------|-------------------------------|
|           |                             |              |        |                               |
|           |                             |              |        |                               |
|           |                             |              |        |                               |

(Ф 03.02 – 03)

#### АРКУШ ОБЛІКУ ЗМІН

| №<br>зміни | № листа (сторінки) |            |        |                   | Підпис<br>особи, яка<br>внесла зміну | Дата<br>внесення<br>зміни | Дата<br>введен-<br>ня<br>зміни |
|------------|--------------------|------------|--------|-------------------|--------------------------------------|---------------------------|--------------------------------|
|            | Зміненого          | Заміненого | Нового | Анульо-<br>ваного |                                      |                           |                                |
|            |                    |            |        |                   |                                      |                           |                                |
|            |                    |            |        |                   |                                      |                           |                                |
|            |                    |            |        |                   |                                      |                           |                                |

(Ф 03.02 – 32)

#### УЗГОДЖЕННЯ ЗМІН

|           | Підпис | Ініціали, прізвище | Посада | Дата |
|-----------|--------|--------------------|--------|------|
| Розробник |        |                    |        |      |
| Узгоджено |        |                    |        |      |
| Узгоджено |        |                    |        |      |
| Узгоджено |        |                    |        |      |