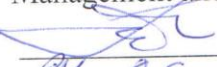


(Ф 03.02 – 110)

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**  
**NATIONAL AVIATION UNIVERSITY**  
Faculty of Transport, Management and Logistics  
Air Transportation Management Department

AGREED  
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Management and Logistics  
  
«24» 06 2021 p. T. Mostenska

APPROVED  
Vice-Rector for Academic Affairs

  
«25» 06 2021 p. A. Polukhin



Quality Management System

**COURSE TRAINING PROGRAM**

on

**«Technical and Economic Research of Transport Development»**

Educational Professional Programs: «Air Transportation Management»  
«Multimodal transport and logistics»  
«Onboard Support of Air Passenger Transportation»

Field of Study: 27 «Transport»  
Speciality: 275 «Air Transport Technologies»  
Specialization: 275.04 «Air Transport Technologies»

Training Form	Semester	Total (hours/credits ECTS)	Lectures	Laboratory Classes	Self-Study	HW/CGP	TP/CP	Semester Grade
Full-time:	6	105/3,5	17	34	54	HW-6s	-	Exam. 6s

Index: CB-7-275-1/21-2.1.17  
CB-7-275-3/21-2.1.17  
CB-7-275-4/21-2.1.17

**QMS NAU CTP 19.01-01-2021**



Quality Management System  
COURSE TRAINING PROGRAM  
on  
«Technical and Economic Research of Transport  
Development»

Document  
Code

QMS NAU  
CTP 19.01 – 01-2021

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Course Training Program on «Technical and Economic Research of Transport Development» is developed on the basis of the Educational Professional Programs «Air Transportation Management», «Multimodal transport and logistics», «Onboard Support of Air Passenger Transportation», Bachelor Curriculums and Extended Curriculums CB-7-275-1/21, CB-7-275-3/21, CB-7-275-4/21, ECB-7-275-1/21, ECB-7-275-3/21, ECB-7-275-4/21 for Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies» and corresponding normative documents.

Developed by  
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Discussed and approved by the Graduate Department for the Educational Professional Program «Air Transportation Management», Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies» – Air Transportation Management Department, Minutes № 12 of 09.06 2021.

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«06» 06 2021

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**Master copy**



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## INTRODUCTION

Course Training Program of subject «Technical and Economic Research of Transport Development» is developed on the basis of the "Methodical guidance for the subject course training program of full-time and part-time forms of education", approved by the order №249/poz dated 29.04.2021 and corresponding normative documents.

### 1. EXPLANATORY NOTES

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

This subject is theoretical basis of a set of knowledge and skills that form specialist profile in the field of air transportation management and transport technologies.

The **aim** of the subject is to obtain the necessary knowledge and skills on the basics of technical and economic research for civil aviation development as a branch of economy and civil aviation enterprises of all forms of ownership.

**Objectives** of the subject are:


- obtaining of the necessary knowledge about forecasting of airport departures;
- obtaining of the necessary knowledge on methods of calculating the operational and economic indicators of aircraft specific types on international and national airlines;
- obtaining of the necessary knowledge on analysis of transport situation in a given segment of the market.

#### 1.2. Results of mastering the training course.

- Take responsibility, show public consciousness, social activity and participation in the life of civil society, think analytically, critically understand the world;
- Formulate, modify, develop new ideas for improving transport technologies;
- Develop, design, manage projects in the field 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 effective technologies for transport modes interaction. Analyze the possibilities of using different options for transport modes interaction. Be able to automate the process of managing material and related flows in aviation supply chains (transportation operations, cargo processing, storage, sorting, labeling, consolidation, customs clearance, information support, etc.);
- Choose information systems for transportation. Operate automated control systems and navigation systems in the transportation process. Use electronic cards;
- Critically evaluate the scientific values and achievements of society in the transport technologies development;
- Investigate transport processes, experiment, analyze and evaluate the parameters of transport systems and technologies;
- Evaluate the parameters of traffic flows. Design schemes and networks of transport systems. Develop technologies for operational management of traffic flows;
- Investigate the types of transport systems. Find solutions for optimizing the transport systems parameters. Assess the efficiency of infrastructure and technology of transport systems.

#### 1.3. Competencies of mastering the training course.

- Ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine;
- Skills in the use of information and communication technologies;
- Ability to analyze and predict the parameters and performance indicators of transport systems and technologies, taking into account the impact of external environment;
- Ability to assess operational, technical and economic, technological, legal, social, and environmental components of transportation management;
- Ability to evaluate and ensure ergonomic efficiency of transport technologies;

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- Ability to evaluate plans and proposals for transportation management and technology, drawn up by other entities, and make the necessary changes based on technical and operational parameters and principles of operation of facilities and devices of transport infrastructure, vehicles (vessels);
- Ability to use modern information technologies, automated control systems and geographic information systems in the transportation process organization;
- Ability: to describe the key components of air transport system, to explain their essential characteristics, goals, functions, tasks and problems; recognize and interpret technical, technological, legal, economic and environmental aspects of aviation transport technologies development;
- Ability to manage the quality of air transport enterprises, identify and prevent possible risks;
- Ability to identify insured events in air transport, to develop a system of measures to prevent and eliminate them;
- Ability to solve complex specialized problems and solve practical problems in the field of transport using theories and methods of modern transport science on the basis of systematic approach and taking into account the complexity and uncertainty of transport systems conditions;
- Ability to conduct research at the appropriate level;
- Ability to generate new ideas (creativity);
- Ability to develop and manage projects;
- The desire to preserve the environment;
- Ability to work independently and in a team;
- Knowledge and understanding of the subject area and understanding of professional activity;
- Ability to abstract thinking, analysis, synthesis.

#### **1.4. Interdisciplinary connections.**

Academic subject "Technical and Economic Research of Transport Development" is based on knowledge of such subjects as «Transport Vehicles Operation», «Fundamentals of Transport Processes and Systems Theory» and is the basis for studying such disciplines, as: «Efficiency of Air Transportation», «Aircraft Handling at Airports».

## **2. ACADEMIC CURRICULUM OF THE SUBJECT**

### **2.1. Content of the subject**

Educational material of the subject is structured modularly and consists of one training module:

- training **module №1 «System organization of technical and economic research»**, which is logically completed, relatively independent holistic part of the subject, learning of which provides module test and analyses of its performance.

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

#### **Module №1 «System organization of technical and economic research»**

##### **Integrated requirements of Module №1:**

As a result of mastering the training module №1 «System organization of technical and economic research» the student must:

##### **Know:**

- the purpose of the technical and economic research, the TER's composition, and the structure;
- the principles of TER's organization;
- the concept of the forecasting, types and classification of the forecasting;
- classification of the methods for passenger turnover and cargo transportation forecasting;
- the area of attraction as the general objects of study the transport services market, methods of determining the boundaries of gravity areas;
- tasks of the technical and economic research to substantiate the structure of the park and its operation;
- stages and contents of developments on the formation of the aircraft fleet and its rational use;
- the identification of the system assessment of the aircraft operation, hourly and annual flight performance, the fuel consumption, the cost of the transportation;



- the change of the commercial loading depending on the flight range, specific flight and the fuel expense, the fuel consumption on the different flight range;
- profitability (losses) of the flight, the profitability dependence on the different flight range.

**Be able:**

- to perform the forecasting of the cargo and passenger turnover;
- to calculate the necessary investment costs for the transport development;
- to calculate the necessary investment costs, for the airports development;
- to give the definition of the commercial loading, profitability, operational losses;
- to solve the tasks when finding the fuel expenses, the cost of the transportation, the commercial loading of the flight and the cost of the flight.

**Topic 1. The purpose, classification and stages of technical and economic research.**

Determination of the technical and economic research. The purpose of the technical and economic research. The TER's composition, and the structure. Classification by problems types to be solved in the structural chains of CA. The principles of TER's organization. Stages of the technical and economic research.

**Topic 2. Forecasting of air transport development: methods of passenger transportation forecasting.**

Gravitational models to forecast passenger flows. Elasticity of air transportations volumes. Mathematical modeling based on regression and correlation analysis; statistical forecasting of time series (extrapolation); heuristic forecasting (expert assessments). Determination of passenger turnover and population mobility in air transport. Essence of time series extrapolation method.

**Topic 3. Fundamentals of freight transportation volume forecasting.**

Determination of basic methods and models of freight transportation volume forecasting. Calculation of possible cargo shipments from airport. Calculation of volume of primary cargo shipments, volume of transfer shipments. Model of forecasting cargo shipments by clientele. Scheme of economic research and forecasting of cargo flows.

**Topic 4. Determination of air traffic gravity areas. Technical and economic study for airports development.**

Gravity area of airport. Peculiarities of passenger flows formation in gravity areas. Establishment of airport gravity area: graphical methods of bisectors and perpendiculars. Main patterns of passenger flows formation in transport gravity areas. Main stages preceding the design and construction (expansion, reconstruction) of airports.

**Topic 5. Aircraft choice justification for forecasted transportation volumes.**

Criteria of optimality in aircraft choice justification for airlines network and their distribution by directions. Flight indicators of optimality.

**Topic 6. Methods for determining hourly and annual aircraft productivity.**

Hourly and annual aircraft productivity calculation. Ultimate flight range with maximum commercial load. Flight speed. Dependence of aircraft productivity on the flight distance. Indicators of aircraft potential carrying capacity use. Hourly productivity of aircraft operated on airline with intermediate landings.

**Topic 7. Determination of specific fuel consumption, operating costs and transportation costs.**


Basic determination methods of fuel amount consumed during flight, specific fuel. Dependence of specific fuel consumption on flight range. Specific fuel consumption in presence of intermediate landing. Operating costs and transportation costs determination. Cost of flight hour. Flight costs.

**Topic 8. Factors determining aircraft choice for operation on airlines.**

Factors influencing the typical and quantitative fleet composition, its base by airlines groups. Flight-technical and economic data of aircraft. Length of route. Territorial location of airports. Capacity of airport complexes. Ensuring aircraft flights safety.

**Topic 9. Stages and content of technical and economic research on aircraft fleet structure formation and its rational use.**

Main stages of technical and economic research on aircraft fleet structure formation and its rational use.

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### 2.3. Structure of the subject.

№	Theme	Academic hours			
		Full-time			
		Total	Lectures	Lab. Classes	Self-study
1	2	3	4	5	6
<b>Module №1 «System organization of technical and economic research»</b>					
		<b>6 semester</b>			
1.1	The purpose, classification and stages of technical and economic research	11	2	2 2	5
1.2	Forecasting of air transport development: methods of passenger transportation forecasting	11	2	2 2	5
1.3	Fundamentals of freight transportation volume forecasting	11	2	2 2	5
1.4	Determination of air traffic gravity areas. Technical and economic study for airports development	11	2	2 2	5
1.5	Aircraft choice justification for forecasted transportation volumes	11	2	2 2	5
1.6	Methods for determining hourly and annual aircraft productivity	11	2	2 2	5
1.7	Determination of specific fuel consumption, operating costs and transportation costs	10	2	2 2	4
1.8	Factors determining aircraft choice for operation on airlines	8	2	2	4
1.9	Stages and content of technical and economic research on aircraft fleet structure formation and its rational use	7	1	2	4
1.10	Homework	8	-	-	8
1.11	Module test №1	6	-	2	4
<b>Total by the module №1</b>		<b>105</b>	<b>17</b>	<b>34</b>	<b>54</b>
<b>Total by the subject</b>		<b>105</b>	<b>17</b>	<b>34</b>	<b>54</b>

### 2.4. Homework.

Homework (HW) is performed according to the agreed methodological recommendations, in order to consolidate and improve theoretical and practical knowledge and skills, obtained in the process of mastering the educational material of the discipline in the area of comparative assessment of efficiency of aircraft, which are used in the future during the study of a lot of the following disciplines and professional trainings with basic and complete higher education.

HW is performed based on the self-study educational material and is part of the module №1 "System organization of technical and economic research".


Main goal of HW is contained in the rationale for the development of transport in ways typical of a given range aircraft and distance calculation system based on operational and economic indicators and performance calculation and graphics performance building flying aircraft, the unit cost of fuel, transportation costs, profitability, share of net worth.

Performance, execution and defense of the HW should be made by the student individually, in accordance with the methodological recommendations.

Appropriate time to perform the HW – is up to 8 hours.

### 2.5. List of questions to prepare for examination.

List of questions and the content of tasks to prepare for examination are developed by the leading teacher of department in accordance with course training program, approved at the department's meeting and communicated to the students.

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

#### 3.1. Teaching methods

The following teaching methods in subject guidance are:

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

Implementation of these methods are carried out during lectures, demonstrations, self-study, work with the educational material, analysis and solving problems.

#### 3.2. List of references

##### Basic literature

3.2.1. Техніко-економічні вишукування та прогнозування розвитку галузі: навч. посібник для студентів напрямку 1004 «Транспортні технології» / Ященко Л.А., Шаповал Н.С., Мерзвінська А.Н./ -К.: Центр навчальної літератури, 2016. – 240 с.

3.2.2. Єріна А.М. Статистичне моделювання та прогнозування: Навч. посібник. –К.: КНЕУ, 2016. – 170 с.

##### Additional literature

3.2.3. Лашчених О. А. Імовірнісні і статистико-експериментальні методи аналізу транспортних систем: навчальний посібник / О. А. Лашчених, О. Ф. Кузькін, С. В. Грицай. – Запоріжжя: ЗНТУ, 2016. – 420 с.

3.2.4. Dieter Schmitt, Volker Gollnik. Air Transport System – Springer Nature Switzerland AG, 2016. – 377 pages

3.2.5. John F. O'Connell, George Williams. Air Transport in the 21st Century: Key Strategic Developments – Routledge, 2015. – 512 pages

#### 3.3. Internet resources

3.3.1. <https://er.nau.edu.ua/handle/NAU/40773>

3.3.2. <https://er.nau.edu.ua/handle/NAU/25974>

3.3.3. <https://er.nau.edu.ua/handle/NAU/25829>


### 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
	Full-time
<b>6 semester</b>	
<b>Module №1 «System organization of technical and economic research»</b>	
Kinds of Academic Work	Grades
Execution of laboratory works (5p. x 9)	45 (total)
Performance, execution and defense of the Homework	15
<i>For admission to complete module test №1, student must receive not less then</i>	<i>36 grades</i>
Module test №1	20
<b>Total by the module №1</b>	<b>80</b>
<b>Semester Examination</b>	<b>20</b>
<b>Total by the subject</b>	<b>100</b>



	<p style="text-align: center;">Quality Management System  <b>COURSE TRAINING PROGRAM</b>          on          «Technical and Economic Research of Transport          Development»</p>	Document Code	QMS NAU CTP 19.01 – 01-2021
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4.2. Completed types of classes are credited to student if he received a positive ratings.

4.3. Sum of grades received by student for certain types of completed educational work is Current module grade, which is entered into Module Register.

4.4. Sum of Semester Grade and Examination Grade together is Total Semester Grade and corresponds to the National Scale and the ECTS Scale.

4.5. Total Semester Grade is entered into Examination Register and individual student curriculum, for example: **92/Ex/A**, **87/Good/B**, **79/Good/C**, **68/Sat/D**, **65/Sat/E**, etc.

4.6. Total Grade for the subject is equal to Total Semester Grades. Total Grade is recorded to Diploma Appendix.



(Ф 03.02 – 01)

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки
	УНТ/І	03.11.21	Шевченко С.І.		

(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				