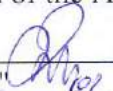


MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
 Aerospace Faculty
 Aircraft Continuing Airworthiness Department

AGREED

Dean of the Aerospace Faculty


 Mykola KULYK
 "22" 07 2023

APPROVED
 Vice Rector for Academics


 Anatoliy POCHUKHIN
 "22" 07 2023



Quality Management System

COURSE TRAINING PROGRAM

On

"Information Technologies for Providing Maintenance Processes for Aviation Equipment"

Educational and Professional Program: Maintenance and Repair of Aircraft and Aircraft Engines
 Educational and Professional Program: Airport Technologies and Technical Equipment

Field of study: 27 Transport
 Specialty: 272 Aviation Transport

Form of training	Semester	Total (hours/ECTS credits)	Lectures	Practicals	Laboratory classes	Self-study	Home works, control work	Term papers Course projects	Form of control
Full-time	2	105/3,0	18	-	18	69	-	-	Graded Test 2s

Index: CM-1-272-1/21-2.1.4

Index: CM-1-272-2/21-2.1.4



Course Training Program on "Information Technologies for Providing Maintenance Processes for Aviation Equipment" was developed on the basis of the Educational Professional Program «Maintenance and Repair of Aircraft and Aircraft Engines», "Airport Technologies and Technical Equipment" curriculum № CM-1-272-1/21 amended, № ECM-1-272-1/21, CM-1-272-2/21 amended, № ECM-1-272-2/21 for training of applicants for higher education of the educational degree "Master" in the specialty 272 "Aviation Transport" and relevant regulatory documents.

Developed by:


Associate professor
of Aircraft Continuing Airworthiness Department  Rynat SALIMOV

The course training program was discussed and approved at a meeting of the Graduating Department of the Educational and Professional Program "Maintenance and Repair of Aircraft and Aircraft Engines", specialty 272 "Aviation Transport" - Aircraft Continuing Airworthiness Department, Minutes № 1 " 01 " 02 " 2023

Guarantor of the Educational Professional Program  Oleksandr DUKHOTA

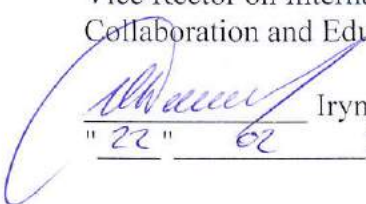
Head of the Department  Oleksandr POPOV

The course training program was discussed and approved at a meeting of the Graduating Department of the Educational and Professional Program "Airport Technologies and Technical Equipment", specialty 272 "Aviation Transport" - Department of Airport Technologies, Minutes № 2 " 22 " 02 " 2023

Guarantor of the Educational Professional Program  Oleksandr TAMARGAZIN

Head of the Department  Oleksandr TAMARGAZIN

Vice Rector on International
Collaboration and Education

 Iryna ZARUBINSKA
" 22 " 02 " 2023

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Master copy



CONTENTS

	page
Introduction	4
1. Explanatory Notes	4
1.1. Place, objectives, tasks of the subject.....	4
1.2. Learning outcomes the subject makes it possible to achieve.....	4
1.3. Competences the subject makes it possible to acquire.....	5
1.4 Interdisciplinary connections	6
2. Course training program on the subject	7
2.1. The subject content.....	7
2.2. Modular structuring and integrated requirements for each module.....	7
2.3. Training schedule of the subject.....	8
2.4. The list of questions to prepare for the exam.....	8
3. Basic Concepts of Guidance on the Subject	9
3.1. Teaching Methods	9
3.2. List of References (Basic and Additional)	9
3.3. Internet Resources	9
4. Rating System of Knowledge and Skills Assessment	10



INTRODUCTION

The Course Training Program of the discipline " Information technologies for ensuring processes of maintenance of aviation equipment " was developed on the basis of "Methodical recommendations for the development and design of a working program of the discipline of full-time and part-time forms of education", approved by the rector's order of 29.04.2021 No 249 / unit, and relevant regulatory documents.

1. EXPLANATORY NOTES

1.1. Place, objectives, tasks of the subject

The place of this discipline in the system of professional training of a specialist is in the composition of profiling disciplines that form the aviation profile of a specialist - a researcher in the field of information technologies for the provision of maintenance processes of aircraft and relevant computer systems.

The purpose of the educational discipline is: disclosure of modern scientific concepts, methods and technologies of using modern information technologies to ensure the processes of aircraft maintenance.

The tasks of studying the academic discipline are:

- form students' ideas about modern information and communication technologies, their features, the concept and structure of the information space of aircraft maintenance processes;
- to form students' basic ideas about the types, purpose, methods and possibilities of using modern information technologies, relevant computer tools and software, which are used in the process of ensuring maintenance of aircraft;
- orient students to the use of information technologies and appropriate computer tools as the main tool for setting and solving various operational tasks of aircraft maintenance;
- to form a basis for the student's understanding of scientific methods of research and implementation of operations related to the use of modern information technologies to ensure the processes of aircraft maintenance;
- prepare the student to choose a field of scientific interests;
- activate and motivate the learning process, organize students' activities in the aspect of independent scientific and practical research using modern information technologies.

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

For the EPP: «Aircraft Maintenance and Repair of Aircraft and Aircraft engines»:

- specialized conceptual knowledge that includes modern scientific achievements in the field of air transport and is the basis for original thinking and conducting research. Apply modern methods of scientific research, organization and planning of experiments, digital technologies, methods of data analysis to solve complex problems of air transport (PLO 01);
- solve complex problems of creation, operation, maintenance, repair and disposal of aviation transport facilities, including at the border with related branches, engineering sciences, physics, ecology and economy (PLO 02);
- freely present and discuss the results of research and innovation, other issues of professional activity in the state language and in English or one of the languages of the European Union countries in oral and written forms (PLO 03);
- develop and implement new technical solutions and apply new technologies (PLO 04);
- apply universal and specialized life cycle management (PLM), automated design (CAD), production (CAM) and engineering research (CAE) systems in professional activity (PLO 05);
- develop and implement energy-saving technologies of air transport (PLO 06);
- organize and manage the work of the primary production, design or research unit in the field of aviation transport, evaluate the efficiency and effectiveness of the staff and unit (PLO 07);
- develop and analyze physical, mathematical and computer models related to the creation, operation, maintenance and repair of aviation transport facilities (PLO 08);
- to convey one's knowledge, conclusions, decisions and the grounds for their adoption to specialists and non-specialists, including students, in a clear and unambiguous form (PLO 09);



- develop technical regulations, participate in their development and organize technological processes in the field of air transport, ensure production safety (PLO 10);
- perform technical and economic calculations, comparisons and substantiation of production, repair, renovation, operation, and maintenance projects of aviation transport facilities in accordance with specialization (PLO 11);
- make effective decisions on air transport issues, including in difficult and unpredictable conditions; predict its development; determine the factors affecting the achievement of the set goals; analyze and compare alternatives; assess risks and likely consequences of decisions (PLO 12);
- to ensure the quality of production and operation in the field of aviation transport (PLO 13);
- search for necessary data in scientific literature, databases and other sources, analyze, evaluate and use these data (PLO 14);
- determine the properties and characteristics, calculate the parameters of aviation transport objects (PLO 15);
- develop and optimize the parameters of objects and systems of air transport and technological processes, including using automated computer design of the production of nodes, aggregates and systems of objects of air transport (PLO 16);
- provide maintenance and repair of aircraft and their components (PLO 17);
- develop organizational and technical, normative and technical documentation for maintenance and repair of aircraft and aircraft engines (PLO 18);
- develop models that allow forecasting the change in the technical condition of aircraft and their components, monitor the parameters of the efficiency of its technical operation based on modern analytical methods and complex models (PLO 19).

For EPP «Airport technologies and technical equipment»

- solve complex problems of creation, operation, maintenance, repair and disposal of aviation transport facilities, including at the border with related branches, engineering sciences, physics, ecology and economy (PLO 02);
- to convey one's knowledge, conclusions, decisions and the grounds for their adoption to specialists and non-specialists, including students, in a clear and unambiguous form (PLO 09);
- determine the properties and characteristics, calculate the parameters of aviation transport objects (PLO 15).

1.3. Competences the subject makes it possible to acquire

For the EPP: «Aircraft Maintenance and Repair of Aircraft and Aircraft engines»:

- the ability to solve complex tasks of a research and/or innovative nature in the field of aviation transport or in the process of further education using the provisions, theories and methods of natural, technical, information and socio-economic sciences, characterized by the complexity and uncertainty of conditions (IC);
- knowledge and understanding of the subject area and understanding of professional activity (GC 01);
- ability to communicate in a foreign language (GC 02);
- skills of using information and communication technologies (GC 03);
- ability to conduct research at the appropriate level (GC 04);
- ability to search, process and analyze information from various sources (GC 05);
- ability to identify, pose and solve problems (GC 06);
- ability to make informed decisions (GC 07);
- the ability to evaluate and ensure the quality of performed works (GC 09);
- ability to develop and implement scientific and applied projects in the field of aviation transport (PC 01);
- ability to apply a systematic approach to solving engineering interdisciplinary problems in aviation transport (PC 02);
- the ability to take into account legal, social, environmental, ethical, economic and commercial aspects affecting decision-making and implementation in air transport (PC 03);
- the ability to integrate knowledge and solve complex scientific and industrial problems in the field of aviation transport, taking into account the wider interdisciplinary engineering context (PC 04);



- the field of air transport, which are complex, unpredictable and require new strategic approaches (PC 05);
- the ability to implement modern technologies, research, analyze and improve technological processes of air transport (PC 06);
- ability to choose optimal materials, equipment and measures for the implementation of the latest technologies in air transport (PC 07);
- skills in maintenance and repair of aircraft and their components (PC 08);
- ability to organize and carry out quality control of maintenance and repair of aircraft, in compliance with national and European requirements for maintaining the airworthiness of aircraft to ensure flight safety (PC 09);
- the ability to develop models that allow predicting changes in the technical condition of aircraft and their components, monitoring the parameters of the efficiency of their operation on the basis of modern analytical methods and complex models (PC 10);
- ability to develop organizational and technical, regulatory and technical documentation for maintenance and repair of aircraft and aircraft engines (PC 11);

For EPP «Airport technologies and technical equipment»

Ability to solve complex research and/or innovation problems in the field of airport functioning, operation of aviation ground equipment and airport equipment or in the process of further training using the provisions, theories and methods of natural, technical, information and socio-economic sciences, characterised by complexity and uncertainty of conditions (IC).

- knowledge and understanding of the subject area and understanding of professional activity (GC 01);
- skills of using information and communication technologies (GC 03);
- ability to conduct research at the appropriate level (GC 04);
- ability to search, process and analyze information from various sources (GC 05);
- ability to identify, pose and solve problems (GC 06);
- ability to make informed decisions (GC 07);
- the ability to evaluate and ensure the quality of performed works (GC 09);
- ability to develop and implement scientific and applied projects in the field of aviation transport (PC 01);
- ability to apply a systematic approach to solving engineering interdisciplinary problems in aviation transport (PC 02);
- the ability to integrate knowledge and solve complex scientific and industrial problems in the field of aviation transport, taking into account the wider interdisciplinary engineering context (PC 04);
- the ability to implement modern technologies, research, analyze and improve technological processes of air transport (PC 06).

1.4. Interdisciplinary connections

This discipline is based on the knowledge obtained during preparation for the Bachelor's degree and is the basis for studying further disciplines, namely:

For the EPP: «Aircraft Maintenance and Repair of Aircraft and Aircraft engines»:

This discipline is based on the knowledge obtained during preparation for the Bachelor's degree and disciplines: «Business Foreign Language», «Philosophical Problems of Scientific Cognition», «Methodology of Applied Research in the Field of Aviation Transport», «Mathematical Methods for Modeling Systems and Processes», and is the basis for studying further disciplines, namely: «International and State Regulation of Airworthiness of Aircraft», «Maintaining Airworthiness of Aircraft (ICAO Doc. 9760)», «Course project on the discipline Maintaining Airworthiness of Aircraft (ICAO Doc. 9760)», «Research Activity in the Field of Maintenance and Repair of Aircraft and Aircraft Engines», «Pre-diploma practice» passing the certification exam and the implementation of qualification work.

For EPP «Airport technologies and technical equipment»

This discipline is based on the knowledge obtained during preparation for the Bachelor's degree and disciplines: ««Methodology of Applied Research in the Field of Aviation Transport» and is the basis for studying further disciplines, namely: «Mathematical Modelling of Airport Technological Processes», «Operation of Aviation Ground Equipment and Airport Equipment», «Course Project on «Operation of Aviation Ground Equipment and Airport Equipment», «Research Activity in the Field of Maintenance and Repair of Aircraft and Aircraft Engines», «Pre-diploma practice» passing the attestation exam and the implementation of qualification work.



2. COURSE TRAINING PROGRAM ON THE SUBJECT

2.1. The subject content

The educational material of the discipline is structured according to the modular principle and consists of two educational modules, namely: **Module No. 1 "Information technologies for maintaining the airworthiness of aircraft equipment"** and **Module No. 2 "Modern management systems for aircraft maintenance organization"**, each of which is logically complete, a relatively independent, integral part of the educational discipline, the mastery of which involves conducting a modular control work and analyzing the results of its implementation.

2.2. Modular structuring and integrated requirements for each module

Module No. 1 "Information technologies for maintaining the airworthiness of aircraft equipment"

Integrated requirements to Module №1:

As a result of learning the educational material of educational module No. 1 "Information technologies for maintaining the airworthiness of aircraft equipment", the student must:

know:

- areas of application of information technologies used to maintain the airworthiness of aircraft;
- theory of application of information technologies;
- classification of information technologies;
- digitization of aircraft airworthiness services
- predictive maintenance of aircraft;
- big data and aircraft airworthiness maintenance;
- digital twins;
- application of the Internet of things in the maintenance of aircraft;

be able to:

- independently solve the task of choosing information technologies for aircraft maintenance;
- independently evaluate the effectiveness of the use of information technologies for aircraft maintenance;
- independently apply information technologies for aircraft maintenance.

Topic 1. Information technologies.

Basic concepts and terminology. Components of information technologies. Classification of information technologies.

Topic 2. Computer technologies in the life cycle of aviation equipment products.

Basic concepts and definitions. The main stages of the life cycle of products. CALS concept of life cycle information support. Tasks and functions of CALS technologies.

Topic 3. Aviation information technologies.

Aviation transport system (ATS). Generalized characteristics of the information support of the ATS. Contours of information support.

Topic 4. Aviation information and control systems (AICS).

Basic processes (functions) for the organization of aircraft maintenance. AICS: purpose, composition, main functions.

Module No. 2 "Modern management systems of aircraft maintenance organization"

Integrated requirements to Module №2:

As a result of learning the educational material of educational module No. 2 "Modern management systems of aircraft maintenance organization", the student must:

know:

- Modern aircraft maintenance management organization systems;
- ACARS - address-reporting system of aviation communication;
- ECTM (Engine Condition Trend Monitoring);
- ERP (Enterprise Resource Planning);
- Maintenance system (maintenance automation) AMOS;



be able to:

- work independently with aircraft maintenance computer systems;
- Independently work with computer systems for diagnosing gas turbine aircraft engines;
- Independently work with computer systems of technical marketing.

Topic 1. Maintenance organization.

Terms and definitions. EASA organization. Part M "Airworthiness Maintenance". Part 145 MRO "Maintenance and repair organization".

Topic 2. Enterprise resource planning.

Terms and definitions. Purpose and composition. Modern management concepts. Human factor. mySAP Business Suite system. Purpose and composition. SAP solutions for airlines.

Topic 3. AMOS asset management operating system.

Purpose and composition. AMOS platform. AMOS ideology. AMOS architecture. AMOS products. AMOS Business Suite. Maintenance and repair system.

Topic 4. Digitization of aircraft airworthiness services.

Basic concepts. Predictive maintenance of aircraft. Maintenance using big data. Monitoring of the state of the aircraft. Implementation of various devices with support for the Internet of Things.

2.3. Training schedule of the subject

	Topic name	Full-time teaching			
		Total	Lectures	Practical	Self-study
1	2	3	4	5	6
		2 semester			
1.1	Introduction. General provisions of the discipline. Information Technology.	7	2	-	5
1.2	Computer technologies in the life cycle of aviation equipment products.	12	2	2	8
1.3	Aviation information technologies	12	2	2	8
1.4	Aviation information and control systems	12	2	2	8
1.5	Modular control work #1	6	-	2	4
In total according to module #1		49	8	8	33
2.1	Maintenance and repair organization	8	2	-	6
2.2	ERP (Enterprises Resource Planning)	14	4	4	6
2.3	AMOS asset management operating system	10	2	2	6
2.4	Digitization of aircraft airworthiness services.	10	2	2	6
2.9	Homework	8	-	-	8
2.10	Modular control work #2	6	-	2	4
In total according to module #2		56	10	10	36
In just 2 semesters		105	18	18	69
All by academic discipline		105	18	18	69

2.4. The list of questions to prepare for the exam

The list of questions and the content of tasks for preparation for the final test work are developed by the leading lecturer of the department in accordance with the work program, approved at the meeting of the department, and communicated to the students.



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 literature, analysis and problem solving.

3.2. List of References (Basic and Additional)

Basic Literature

3.2.1. В. Павлиш, Л. Гліненко, Н. Шаховська, Ф. Основи інформаційних технологій і систем: Львівська Політехніка, 2018. – 620 с.

3.2.2. Tetiana Shmelova, Nina Rizun, Yuliya Sikirda, Dmytro Kucherov Cases on Modern Computer Systems in Aviation – IGI Global, 2018. – 512 p.

3.2.3. Ursula Silling. Aviation of the Future: What Needs to Change to Get Aviation Fit for the Twenty-First Century 2019. – 170 p.

3.2.4. Johan Rignér Adapting to increased automation in the aviation industry through performance measurement and training fuzzy logic systems. – Printed by: Universitetservice US-AB, Sweden 2020.

3.2.5. Provan, D. J., Woods, D. D., Dekker, S. W. A., Rae, A. J. (2020). Safety II professionals: How resilience engineering can transform safety practice. Reliability Engineering & System Safety 195 p.

3.2.6. Piric, S., de Boer, R., Roelen, A. L. C., Karanikas, N., & Kaspers, S. (2019). How does aviation industry measure safety performance? Current practice and limitations. International Journal of Aviation Management, 4(3), 425c.

3.2.7. Provan, D. J., Woods, D. D., Dekker, S. W. A., Rae, A. J. (2020). Safety II professionals: How resilience engineering can transform safety practice. Reliability Engineering & System Safety, 230 p.

Additional Literature

3.2.8. ICAO. Додаток 8. Льотна придатність повітряних суден: Міжнародні стандарти.

3.2.9. ICAO. Технічне керівництво з льотної придатності. Doc. 9051.

3.2.10. International Standards and Recommended Practices: Airworthiness Manual. Doc. 9760. 2020. – 420 p.

3.3. Internet Resource

3.3.1 <http://avia.gov.ua>

3.3.2 www.easa.europa.eu

3.3.3 <https://www.swiss-as.com/amos-mro>



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	Max Grade Values	Kind of Academic Work	Max Grade Values
	Full-time Training Form		Full-time Training Form
1 semester			
Module No. 1 "Information technologies for maintaining the airworthiness of aircraft equipment"		Module No. 2 "Modern management systems of aircraft maintenance organization"	
Kind of Academic Work	Grade	Kind of Academic Work	Grade
Carrying out practical classes/ laboratory works (8p x 3)	24 (total)	Carrying out practical classes/ laboratory works (20p x 2)	8px4=32 (total)
		Carrying out Test (Home) work	10
<i>For admission to complete module test №1, a student must receive not less than</i>	15 points	<i>For admission to complete module test №2, a student must receive not less than</i>	25 points
		Semester final test work	–
Module test №1	17	Module test №2	17
Total by the modules №1 and №2			100
Total by the subject			100

The credit rating is determined (in points and in a National Scale) based on the results of all types of academic work accomplishing 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 the rating assessments received by the student for certain types of completed academic work is the current modular rating assessment, which is recorded to the module check.

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

4.5. The final semester rating in points, on the national scale and the ECTS scale is entered into 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.**

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



(Ф 03.02 – 01)

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки
	<i>УМС/Ю</i>		<i>Масенко</i>	<i>М</i>	

(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				