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MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Higher Mathematics Department

AGREED
Dean of Faculty of Transport, Management and Logistics

_____ T. Mostenska

«___»_____2021

APPROVED
Vice-Rector for Academics

_____ A. Polukhin

«___»_____2021

Quality Management System

COURSE TRAINING PROGRAM
on
"Higher Mathematics"

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	Semesters	Total (hours/ECTS credits)	Lectures	Practicals	Self-study	HW/CGP	Semester Grade
Full-time:	1,2	270/9	68	68	134	1 hw –1s 1 hw –2s	Graded Test - 1s. Examination – 2^{d}-s

Index CB -7-275-1/21-2.1.1
Index CB -7-275-3/21-2.1.1
Index CB -7-275-4/21-2.1.1

Course Training Program on «Higher mathematics» is developed on the basis of the Educational Professional Programs on "Air Transportation Management", "Multimodal Transport and Logistics", "Onboard Support of Air Passenger Transportation", Bachelor Curriculum and Extended Curriculum №СВ-7-275-1/21, №СВ-7-275-3/21, №СВ-7-275-4/21, №ЕСВ-7-275-1/21, №ЕСВ-7-275-3/21, №ЕСВ-7-275-4/21 for Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies» and corresponding normative documents

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«___»_____2021

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Contents

INTRODUCTION

The Course Training Program of the subject "Higher mathematics" is developed on the basis of the "Methodical guidance for the development of a course training program of the subject", approved by the order № 249/од. dated 29.04.2021 p. correspondent normative documents.

1. EXPLANATORY NOTE

1.1. Place: this training course is the theoretical basis of knowledge and skills required to master the vast majority of disciplines of professional and practical training in the field of economics.

Objectives of teaching the discipline is to teach students to master the appropriate mathematical tools, which should be sufficient to develop mathematical models related to the further practical activities of specialists.

Tasks of the subject are:

- development of logical and algorithmic thinking of students;
- mastering the necessary theoretical knowledge and the main directions of their application in the system of disciplines in the specialty;
- mastering the methods of research and solving mathematical problems;
- instilling primary skills in mathematical research of applied problems;
- developing the ability to independently use the necessary methods and special literature in solving problems.

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

As a result of studying this discipline, the student must acquire the following **learning outcomes:**

- to realize the main features of the modern world and national economy of the institutional structure of the directions of social, economic and foreign economic policy of the state;
- investigate transport processes, experiment, analyze and evaluate parameters of transport systems and technologies;
- critically evaluate the scientific values and achievements of society in the development of transport technologies.

1.3. Competences the subject makes it possible to acquire

- ability to abstract thinking, analysis, synthesis;

- ability to understand and skillfully use mathematical and numerical methods that are often used in economics and management;
- ability to perform experiments independently, as well as to describe, analyze and critically evaluate experimental data;
- ability to learn and master modern knowledge;
- ability to conduct research at the appropriate level;
- ability to apply knowledge in practical situations;
- the ability to analyze the results of the organization, to compare them with the factors of external and internal environment;
- skills of using information and communication technologies.

1.4. Interdisciplinary Connections

The discipline "Higher Mathematics" is the basis for the study of further disciplines, namely: "Physics", "Computer Engineering", "Fundamentals of the theory of transport processes and systems", “Operations research on Transport”, "Logistics operations on transport”, “Technical and Economic Research of Transport Development”.

2. COURSE TRAINING PROGRAM ON THE SUBJECT

2.1. The subject content

Training material is structured according to a module principle and consists of four educational modules:

– **module №1 „Linear, vector algebra, analytic geometry"**

– **module №2 „Introduction to mathematical analysis. Differential calculus of the function of one variable"**

– **module №3 "Differential calculus of the function of several variable. Integral calculus"**

– **module №4 "Improper and double integrals. Differential equations. Some numerical methods"** each of which is a logically complete, relatively independent, holistic part of the academic discipline, which involves the assimilation of module test and analysis of the results of its implementation.

2.2. Modular structuring and integrated requirements for each module

Module №1 "Linear, vector algebra, analytic geometry"

Integrated requirements for module №. 1 As a result of mastering the educational material of the educational module №1 the student must:

Know:

- definition and notation of determinants, matrices, systems of linear algebraic equations;
- Cramer's formulas;
- Gaussian method and matrix method for solving systems of linear algebraic equations;
- Kronecker-Capelli theorem;
– definition and properties of scalar, vector, mixed products of vectors;
– different types of equations of a line in a plane, a plane in space and a line in space.

Be able to:

- investigate and solve systems of linear algebraic equations;
–perform linear operations with vectors;
-find the products of vectors and apply them to solving problems of geometry and physics;
–write different equations of the line;
–determine the angles between two lines, planes, between a line and a plane;
–write the conditions of parallelism and perpendicularity of lines and planes.

Topic 1. Determinants and their properties.

Content.*Determinants of the 2nd and 3rd order. Properties of determinants. Minors and cofactors. General definition of a determinant of order n. Calculation of determinants.*

Topic 2. Matrices, operations with them. Inverse matrix. Rank of a matrix.

Content *Concepts of matrix, operations on matrices. Inverse matrix. Matrix equations. Rank of a matrix.*

Topic 3. Systems of linear algebraic equations. Kronecker - Cappelli theorem. Cramer's rule.

Content *Systems of linear algebraic equations, consistence, investigation of consistence by matrix rank. Kronecker - Cappelli theorem.*

Topic 4. Gauss' and matrix methods for solving systems of linear algebraic equations.

Content.*Solviing the systems by Cramer's rule, matrix method, Gauss' method.*

Topic 5. Vectors, linear actions and operations on them. Vectors in the coordinate system.

Content. *Vectors, linear operations on them. Schedule of the vector by basis. Projection of the vector on the axis. Linear dependence and independence of vectors. Vectors in a rectangular*

Cartesian coordinate system (coordinates, length, guide cosines).

Topic 6. Scalar, vector and mixed products of vectors.

Content. *Scalar product of two vectors, its properties. Expression of a scalar product through coordinates. The angle between the vectors. Vector product of two vectors, its properties. Vector product of two vectors given by coordinates. Mixed product of three vectors, its properties. Mixed product of three vectors given by coordinates. Coplanar condition of three vectors.*

Topic 7. Equation of a straight line on a plane.

Content. *General equation of the straight line, incomplete equations. Symmetric and parametric equations of the straight line. A line that passes through two given points. Equation of a line in segments on axes, a line with an angular coefficient. The angle between two lines, the conditions of parallelism and perpendicularity of two lines. Distance from point to line.*

Topic 8. The equation of a plane and a straight line in space. Mutual placement of a straight line and a plane.

Content. *General plane equation, incomplete plane equations. Equation of a plane passing through three points. The equation of the plane in the segments on the axes. The distance from the point to the plane. The angle between two planes, the conditions of parallelism and perpendicularity of two planes. General equation of a line in space, canonical and parametric equations. Equation of a straight line passing through two given points. The angle between two lines, the conditions of parallelism and perpendicularity of two lines. The point of intersection of a line and a plane, the angle between a line and a plane, the conditions of parallelism and perpendicularity of a line and a plane.*

Module №2 "Introduction to mathematical analysis. Differential calculus of functions of one variable »

Integrated requirements for module №2. As a result of mastering the study material of the training module №2 the student must:

Know:

- methods of task and classification of functions;

–determination of the boundary of the numerical sequence and the boundary of the function at the point;

–formulas of important boundaries and basic theorems about boundaries;

–determination of function continuity and classification of breakpoints;

–definition definition, table of derivatives and rules of differentiation;

–definition and properties of the differential;

–basic theorems of differential calculus;

–application of differential calculus to the study of functions.

Be able to:

–find the limit of the function and investigate the function for continuity;

–find derivatives and differentials of different orders of basic elementary functions;

–find derivatives of composite functions, implicitly and parametrically given functions, perform logarithmic differentiation;

- investigate the function and sketch the graph.

Topic 1. Sets. Function definition. Classification of functions and their characteristics.

Content. *Function. Classification of functions. Function characteristics.*

Topic 2. Numerical sequences. Limit of the numerical sequence.

Content. *Numerical sequence. Limit of the numerical sequence.*

Topic 3. The limit of the function. The first and second important limits. Undetermined expressions.

Content. *Definition of the limit of a function at a point. Basic theorems on limits. The limit of the function is at infinity. The first and second important limits. Comparison of infinitesimals. The equivalents of infinitesimals.*

Topic 4. Continuity, basic theorems.

Content. *Continuity of a function at a point. Points of discontinuity of the function and their classification. Properties of functions that are continuous at a point and on a segment.*

Topic 5. Derivative of a function at a point. Some problems that lead to the concept of derivative. Geometric and mechanical content.

Content. *Derivative, its geometric, mechanical and physical meaning. Tangent and normal to the curve. Differentiation and continuity.*

Topic 6. Differentiability of functions. Rules of differentiation. Derivatives of functions. Table of derivatives.

Content. *Rules of differentiation. Derivatives of elementary functions. Derivative of a compound function. Derivative of the inverse function. Derivative of functions given implicitly and parametrically. Logarithmic differentiation.*

Topic 7. Differential of the function. Higher order derivatives and higher order differentials.

Content. *Differential of the function differential. Geometric and mechanical content of the differential. Properties of the differential. Application of differentials in approximate calculations. Derivatives and differentials of the higher order.*

Topic 8. Investigation of the functions and sketching the graphs.

Content. *Monotonicity of the function. Extreme of the function. The largest and smallest values of the function. Intervals of convexity and concavity, inflection points of curves. Asymptotes of the curve. The general scheme of research of function and sketching the graph.*

Module №3 "Differential calculus of functions of several variables. Integral calculus of functions of one variable".

Integrated requirements for module №3. As a result of mastering the study material of the training module №3 the student must:

Know:

–definition of the functions of several variables, the domain of the function, limits and continuity;

–definition of partial derivatives, total differential of the function of several variables;

–application of partial derivatives;

–definition of the indefinite integral and its properties;

–integrals of basic elementary functions and methods of integration of various functions;

–definition, conditions of existence and properties of the definite integral;

–Newton-Leibniz formula;

–application of a definite integral.

Be able to:

–find partial derivative functions and total differential function of several variables;

–write the equation of the tangent plane and the normal to the surface;

–find the direction derivative and gradient;

–find local extrema, the smallest and largest value of the function of two variables;

–find the conditional extremum of the function of two variables;

–apply methods of integration by parts and replacement of variable;

–integrate rational, fractional-rational, some irrational and trigonometric functions;

-calculate the areas of flat figures, the length of the curve arc, the volume of the body, the surface area of rotation by using a definite integral

Topic 1. Definition of the function of several variables and basic concepts. Limits and continuity. Partial derivatives and differential.

Content. *The concept of functions of several variables, basic definitions, geometric interpretation. Limit of the function of several variables. Continuity of function of several variables. Partial and total increments of the function of two variables. Partial derivatives of functions of several variables. The total differential of the function of several variables and its application to approximate calculation.*

Topic 2. Tangent plane and normal to the surface. Direction derivative. Gradient of the function.

Content. *Tangent plane and normal to the surface. Direction derivative. Gradient of the scalar field.*

Topic 3. Local extrema of the function. The largest and smallest values.

Content. *Local extrema of the function of two variables. Necessary and sufficient conditions for the existence of the extremum. The largest and smallest values of the function. Conditional extreme.*

Topic 4. Primitive function. Indefinite integral. Direct integration.

Content. *The concept of the primitive function and indefinite integral. Properties of the indefinite integral. Table of basic integrals. Direct integration.*

Topic 5. Replacement of a variable and integration by parts.

Content. *Methods of integration: a method of substitution, integration by parts.*

Topic 6. Complex numbers. Integration of rational functions.

Content. *The concept of a complex number. Operations on complex numbers in algebraic form and trigonometric form. Integration of rational fractions with a square trinomial in the denominator. Integration of elementary rational fractions. Integration of rational functions.*

Topic 7. Integration of irrational and trigonometric functions.

Content. *Integration of irrational expressions. Integration of differential binomials. Integration of trigonometric functions.*

Topic 8. Definite integral and its properties. Newton-Leibniz formula. Methods for calculating of definite integrals.

Content. *Definitions, conditions of existence, geometric content, properties of the definite integral. Calculation of definite integrals. Newton-Leibniz formula. Methods of integration of definite integrals.*

Topic 9. Geometric applications of the definite integral.

Content. *Calculation of areas of flat figures. The length of the arc of the curve. Body volume by area of parallel sections. The area of the surface of rotation.*

Module №4 "Improper and double integrals. Differential equations. Some numerical methods.

Integrated requirements for module №4. As a result of mastering the educational material of the educational module №4 the student must:

Know:

–definition and concept of convergence of improper integrals of the 1st and 2nd kind;

- definition, basic properties and application of the double integral;

–definition of the differential equation, the concept of general and partial solutions, general and partial integrals geometric content;

- Cauchy problem and geometric content of the differential equation;

–methods of solving the simplest types of first-order differential equations;

–methods of solving higher-order differential equations that allow lowering of the order;

–methods of solving linear homogeneous and inhomogeneous differential equations with constant coefficients;

–method of variation of an arbitrary constants;

–methods of half division, chords, tangents;

–formulas of rectangles, trapezoids, Simpson;

- method of least squares method;

–selection of parameters by the method of least squares on the example of the assumption of linear dependence;

- Euler's method, Runge-Kutta method;

Be able to:

–calculate improper integrals;

- calculate double integrals;

-solve the separable differential equations, homogeneous differential equations, linear differential equations of the first order, Bernoulli equations, Cauchy problem for equations of these types;

- solve higher-order differential equations that allow lowering of the order;

-solve linear homogeneous and inhomogeneous differential equations of higher orders;

–calculate approximately definite integrals;

- to find approximate solutions of the Cauchy problem by the methods of Euler and Runge-Kutt.

Topic 1. Improper integrals of the first and second kind.

Content. *Implicit integrals with infinite limits of integration (improper integrals of the first kind). Improper integrals from unbounded functions (improper integrals of the second kind).*

Topic 2. Double integral.

Content. Problems leading to the concept of double integral. Double integral, conditions of its existence and properties. Calculation of the double integral. Replacement of variables in the double integral. Double integral in polar coordinates. Application of double integrals.

Topic 3. Differential equations of the first order.

Content. *Physical problems leading to differential equations. Definition of a first-order differential equation. Cauchy's problem. Theorem of existence and uniqueness of the solution of the Cauchy problem. General solution. The concept of a partial solution. Separable differential equations. Homogeneous differential equations. Linear differential equations. Bernoulli's equation.*

Topic 4. Differential equations of higher order, which allow lowering the order.

Content. *Basic concepts and definitions. Differential equations of the n-th order. Basic definitions and concepts of a linear differential equation of the second order. Properties of solutions of a homogeneous linear differential equation of the second order. Theorem on the structure of the general solution of a homogeneous equation of the second order.*

Topic 5. Linear differential equations of the second order with constant coefficients.

Content. *Linear homogeneous differential equations of the second order with constant coefficients. Characteristic equation and its roots. Inhomogeneous second-order differential equations with constant coefficients. Linear inhomogeneous differential equations. Theorem on*

the structure of the general solution of an inhomogeneous second-order differential equation. Method of variation of arbitrary constants (Lagrange method).

Topic 6. Approximate calculation of definite integrals.

Content. *Formulation of the problem. The formula of rectangles. Trapezoidal formula. Parabola (Simpson) formula. Absolute errors.*

Topic 7. Method of least squares.

Content. *Formulation of the problem. Principles of construction of the least squares method. Estimation of quality of approximation by the method of least squares.*

Topic 8. Numerical integration of differential equations.

Content. *Euler's method. Runge-Kutta method.*

2. SUBJECT CONTENT

2.3. Training schedule of the subject

№	Theme (thematic section)	Total, hours			
		Full-time			
		Total	Lectures	Practical classes	Self study
1	2	3	4	5	6
Module №1 "Linear, vector algebra and analytic geometry"					
1.1	Determinants and their properties	**The first semester**			
		7	2	2	3
1.2	Matrices, operations on matrices. Inverse matrix. Matrix rank .	7	2	2	3
1.3	Systems of linear algebraic equations. Kronecker-Capelli theorem.	7	2	2	3
1.4	Methods for solving systems of linear equations: Cramer, Gauss, matrix method	7	2	2	3
1.5	Vectors, linear actions and operations on them. Vectors in the coordinate system.	7	2	2	3
1.6	Scalar, vector and mixed products	7	2	2	3
1.7	Equation of a straight line on a plane	7	2	2	3
1.8	Equation of plane and straight line in space. Mutual placement of a straight line and a plane	5	2	-	3
1.9	Homework 1.1	4	-	-	4
	Module test №1	5	-	2	3
	Total for module №1	**63**	**16**	**16**	**31**
Module №2 "Introduction to mathematical analysis. Differential calculus of functions of one variable»					
2.1	Sets. Definition of the function. Classification of functions and their characteristics	7	2	2	3
2.2	Numerical sequences. Limitof the numerical sequence	7	2	2	3

№	Theme (thematic section)	Total, hours			
		Full-time			
		Total	Lectures	Practical classes	Self study
1	2	3	4	5	6
2.3	Limit of the function. The first and second important Limits.Points of discontinuity of the function	7	2	2	3
2.4	Continuity, basic theorems	7	2	2	3
2.5	Derivative of the function at a point. Some problems that lead to the concept of derivative. Geometric and mechanical content.	7	2	2	3
2.6	Differentiability of functions. Rules of differentiation. Derivative of functions. Table of derivatives	7	2	2	3
2.7	Differential of the function. Higher order derivatives and differentials.	7	2	2	3
2.8	Basic theorems of the differential calculus	7	2	2	3
2.9	Investigation of functions and sketching the graphs.	6	2	-	4
2.10	Homework 1.2	4	-	-	4
2.11	Module test №2	6	-	2	4
	Total for module №2	**72**	**18**	**18**	**36**
	Total for the first semester	**41**	**135**	**34**	**34**
Module №3 "Differential calculus of the function of several variables. Integral calculus"					
3.1	Function of several variables.Partial derivatives and differentials.	**The second semester**			
		7	2	2	3
3.2	Tangent plane and normal to the surface. Derivative by direction. Gradient of the function.	7	2	2	3
3.3	Local extremum of the function of two variables. The largest and smallest values of the function.	7	2	2	3
3.4	Antiderivative. Indefinite integral. Properties. Table of basic integrals. Principal methods of integration.	7	2	2	3
3.5	Method of substitution. Integration by parts.	7	2	2	3
3.6	Complex numbers. Integration of rational functions.	8	2	2	4
3.7	Methods of integration of trigonometric functions.	8	2	2	4
3.8	Definite integral and its properties. Newton-Leibniz' formula. Basic method for calculation of definite integrals.	7	2	2	3
3.9	Calculation of areas of plane figures. Arc length of the curve. Volume of solid of revolution.	6	2	-	4
3.10	Homework 2.1	4	-	-	4

№	Theme (thematic section)	Total, hours			
		Full-time			
		Total	Lectures	Practical classes	Self study
1	2	3	4	5	6
3.11	Module test #3	6	–	2	4
	Total for module №3	**70**	**18**	**18**	**34**
	Total for the second semester	**41**	**135**	**34**	**34**
Module №4 “Improper and double integrals. Differential equations. Some numerical methods"					
4.1	Improper integrals of the first and second kind.	7	2	2	3
4.2	Double integrals.	8	2	2	4
4.3	Differential equations of the first order. Homogeneous and linear differential equations. Bernoulli equation.	8	2	2	4
4.4	Differential equations of higher orders that allow lowering of the order	7	2	2	3
4.5	Linear differential equations of the second order with constant coefficients.	7	2	2	3
4.6	Approximate calculation of definite integrals	8	2	2	4
4.7	Least of squares method	8	2	2	4
4.8	Numerical integration of differential equations	6	2	-	4
4.9	Homework 2.2	4	-	-	4
4.10	Module test № 4	6	-	2	4
	Total for module №4	**65**	**16**	**16**	**33**
Total for the second semester		**135**	**34**	**34**	**67**
Total for the subject		**270**	**68**	**68**	**134**

2.4. Homework

Homeworks 1.1, 1.2, 2.1, 2.2 are performed in the first and second semesters. The purpose of homework: to improve theoretical knowledge and practical skills while studying the material of training modules.

Execution, design and defense of homework is carried out by the student individually in accordance with the guidelines.

The time required to complete each homework is up to 4 hours of independent work.

2.5. Questions list for the examination

The list of questions and content of tasks for preparation for the exam are developed by the leading teacher of the department in accordance with the course training program, approved at the meeting of the department and distributed among students.

3. BASIC CONCEPTS OF GUIDANCE ON THE SUBJECT

3.1. Teaching methods

It is recommended to use the following teaching methods during mastering the subject:

- 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 and solution of problems.

3.2. List of references

Basic literature

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3.2.8. Higher Mathematics. Part 1. Calculus and Differential Equations: manual/ V.P. Denisiuk, V.G. Demydko and others. - K. NAU, 2018. – 384 p.

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3.2.10. Denisiuk V. P. Higher mathematics. Part 2: Manual / V. P. Denisiuk, V. G. Demydko, V. K. Repeta. — K. : NAU, 2009. — 248 p.

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3.2.18. James Stewart. Single Variable Calculus: Early Transcendentals/ United States of America: «Thomson Brooks/Cole», 2008. – 763 p.

3.3. Internet resources

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3.3.2. http://mathem-kstuca.ucoz.ua/Liter/VM-PriklZadac-P1.pdf

3.3.3. http://univer.nuczu.edu.ua/tmp_metod/148/Basmanov.pdf

4. RATING SYSTEM OF KNOWLEDGE AND SKILLS GRADE

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
	The first semester
Solving problems, answering theoretical questions during classroom work	**Modules №1, №2**
	30
For admission to complete a module test №1 (№2), a student must receive not less	*21points*
Carrying out and defense of homework 1.1(1.2)	*5*
Module Test №1 (№2**)**	15
Total for the Module №1(№2)	**50**
Total for the first semester	**100**
	The second semester
	Modules №3, №4
Solving problems, answering theoretical questions during classroom work	20
Carrying out and defense of homework 2.1(2.2)	5
For admission to complete a module test №3 (№4), a student must receive not less	*15 points*
Module Test №3 (№4**)**	15
Total for the Module №3(№4)	**40**
Semester Examination	**20**
Total for the second semester	**100**

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 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 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.***

4.6. 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.

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки

(Ф 03.02 – 02)

АРКУШ ОЗНАЙОМЛЕННЯ З ДОКУМЕНТОМ

№ пор.	Прізвище ім'я по-батькові	Підпис ознайомленої особи	Дата ознайом-лення	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	Анульо-ваного			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				