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

AGREED
Dean of Aerospace Faculty

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«___»_____2021

APPROVED
Vice-Rector for Academics

_____ A. Polukhin
«___»_____2021

Quality Management System

COURSE TRAINING PROGRAM
on
«Higher Mathematics»

Educational Professional program: «Maintenance and Repair of Aircraft and Aircraft Engines »

Field of study: 27 «Transport Services»
Speciality: 272 «Aviation Transport»

Training Form	Semes-ter	Total (hours/ credits ECTS)	Lectu-res	Practi-cals	Lab. clas.	Self-study	HW/ CSP	TP/CP	Semester Grade
Full-time	1,2	420/14	70	140	–	210	HW-1s. HW-2s.	–	examination 1s.,2s.

Indexes: CB-1-272-1/21-2.1.1

Course Training Program on «Higher Mathematics» is developed on the basis of the Educational Program on "Maintenance and Repair of Aircraft and Aircraft Engines", Bachelor Curriculum and Extended Curriculum №СВ-1-272-1/21, №ЕСВ-1-272-1/21 for Speciality 272 «Aviation Transport» and corresponding normative documents.

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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 aviation.

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:**

– ability to solve complex specialized problems and practical problems in professional activity in the field of aviation transport or in the process of further training with the use of provisions, theories and methods of natural, technical, informational and socio-economic sciences, which is characterized by;

– apply modern information technologies, technical literature, databases, other resources and modern software to solve specialized complex problems of air transport;

– use the principles of formation of labor resources, identify reserves and ensure the efficiency of employees of air transport;

– to analyze the construction and operation of air transport facilities, their systems, elements, factors that affect their characteristics and parameters;

– determine the parameters of air transport facilities, their systems and elements by conducting a measurement experiment to assess its results;

– perform the calculation of the main characteristics and parameters of technological processes of production and repair of air transport facilities.

1.3. Competences the subject makes it possible to acquire

As a result of studying this discipline, the student must acquire the following competencies:

– ability to solve complex specialized problems and practical problems in professional activities in the field of air transport or in the process of further training using the provisions, theories and methods of natural, technical, informational and socio-economic sciences, characterized by complexity and uncertainty of conditions;

– skills of using information and communication technologies;

– ability to conduct research at the appropriate level;

– ability to analyze the objects of air transport and their components, to determine the requirements for their design, parameters and characteristics;

– ability to carry out experimental researches and measurements of parameters and characteristics of objects of air transport, their units, systems and elements;

– ability to analyze technological processes of production and repair of air transport facilities;

– ability to apply methods and means of technical measurements, technical regulations, standards and other normative documents at technical diagnostics of objects of aviation transport, their systems and elements.

1.4. Interdisciplinary Connections

The discipline "Higher Mathematics" is the basis for the study of further disciplines, namely: "Physics", "Theoretical Mechanics", "Material Resistance", "Technical Thermodynamics", "Aerodynamics and Flight Dynamics" and others.

2. COURSE TRAINING PROGRAM ON THE SUBJECT

2.1. The subject content

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

Module №1 " Elements of Linear Algebra,Vector Algebra and Analytical Geometry ",

Module №2 " Introduction to Mathematical Analysis. Differential calculus of a function of one variable. Differential calculus of a function of several variables ",

Module №3 " Integral calculus of functions of one variable. Differential equations",

Module №4 " Elements of Theory of Probability and Mathematical Statistics ",

each of which is a logically complete, relatively independent, holistic part of the discipline, the mastering of which involves a modular test and analysis of the results of its implementation.

2.2. Modular structuring and integrated requirements for each module

Module №1 " Elements of Linear Algebra,Vector Algebra and Analytical 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;
– Gauss method and matrix method for solving systems of linear algebraic equations;
– Kronecker-Capelli theorem;
– definitions 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;
– definition of second order curves and their canonical equations.

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;
– reduce the equations of the second order curves to the canonical form and build their graphs.

Topic 1. Determinants and their properies.

Content.*The determinants of the second and third order, their properties. Determinants of the nth order. Cofactors and minors. Different ways to calculate n-order determinants.*

Topic 2. Matrices. Linear operations with matrices. Inverse matrix. Rank of matrix.

Content. *Types of matrices. Operations on matrices and their properties. Inverse matrix. Rank of the matrix. Finding the rank of the matrix by means of elementary transformations.*

Topic 3. Systems of linear algebraic equations. Kronecker-Capeli theorem usage in SLAE investigation. Methods of SLAE solution.

Content *System of linear algebraic equations. Kronecker-Capelli theorem. Investigation of systems of linear algebraic equations for compatibility. Solving systems according to Cramer's formulas, matrix method, Gauss method.*

Topic 4. Vectors. Dot, cross and mixed vector product.

Content. *Vectors, linear operations on them. Decomposition of the vector by basis. Projection of the vector on the axis. Linear dependence and independence of vectors. Vectors in the rectangular Cartesian coordinate system (coordinates, length, guide cosines). Dot product of two vectors, its properties. Expression of the dot product through coordinates. Angle between the vectors. Cross product of two vectors, its properties. Cross 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 5. Straight line on the plane.

Content. *General equation of the straight line, incomplete equations. Symmetric and parametric equations of the straight line. Straight line passing through two given points. Equation of the straight line in segments on axes, slope-intercept form of the straight line. Angle between two lines, the conditions of parallelism and perpendicularity of two straight line lines. Distance from point to the straight line.*

Topic 6. Plane in the space.

Content. *General plane equation, incomplete plane equations. Equation of the plane passing through three points. Equation of the plane in the segments on the axes. Distance from the point to the plane. Angle between two planes, the conditions of parallelism and perpendicularity of two planes.*

Topic 7. Straight line in the space.

Content. *General equation of the straight line in space, symmetric and parametric equations. Equation of the straight line passing through two given points. Angle between two lines, the conditions of parallelism and perpendicularity of two lines. Point of intersection of the straight line and plane, the angle between the straight line and the plane, the conditions of parallelism and perpendicularity of the straight line line and the plane, the conditions of belonging to the plane.*

Topic 8. Curves and surfaces of the second order.

Content. *Circle, ellipse, hyperbola, parabola. Their properties, symmetric equations. Concept of the second order surface. Cylindrical, conical surfaces, surfaces of rotation. Symmetric equations of second-order surfaces.*

Module№2 " Introduction to Mathematical Analysis. Differential calculus of a function of one variable. Differential calculus of a function of several variables ",

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

Know:

– methods of assignment and classification of functions;
– defining the limit of a numerical sequence and the limit of a function at a point;
– formulas of important limits and basic theorems about limits;
– definition of continuity of functions and classification of the points of discontinuity.
– definition of the derivative, table of derivatives and rules of differentiation
– definition and properties of the differential
– basic theorems of differential calculus;
– application of differential calculus to investigation of functions;
– definition of function of several variables, domains, limits and continuity;
– definition of partial derivatives, total differential of the function of several variables;
– application of partial derivatives.

Be able to:

–find the limit of the function and investigate the function for continuity.
– find derivative and differential of different orders of elementary functions;
– find derivative of composite functions, implicitly and parametrically given functions, perform logarithmic differentiation;

– investigate the behavior of the function and sketch its graph;
– find partial derivatives of functions and total differential of functions of several variables;
– write the equation of the tangent plane and the normal to the surface;
– find the derivative by direction and gradient of the function;
– find local extrema, the smallest and largest values of the function of two variables;
– find the conditional extremum of the function of two variables.

Topic 1. Sequences and functions. Limit of the sequence.

Content . Function. Methods of assignment and classification of functions. Function characteristics. Numerical sequence. Limit of the numerical sequence.

Topic 2. Limit of the function. Honorable limits. Indeterminate forms.

Content. *Definition of limit of the function at the point. Basic theorems. One-side limits. Limit of the function at infinity. Honorable limits. Indeterminate forms. Comparison of the infinitesimals. Equivalents infinitesimals.*

Topic 3. Continuity of the function, basic theorems.

Content. *Continuity of the function at the point. Breakpoints of the function and their classification. Properties of functions which are continuous at the point and on the segment.*

Topic 4. Derivative of the function at the point. Some problems leading to understanding of the derivative definition. Geometric and mechanical concept of the derivative.

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

Topic 5. Differentiability of the functions. Rules of differentiation. Derivative of the functions. Table of derivatives.

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

Topic 6. Differential of the function. Higher order derivatives and differentials.

Content. Differential of the function. Geometric and mechanical content of the differential. Properties of the differential. Application of differentials in approximate calculations. Higher order derivatives and differentials.

Topic 7. Investigation of the functions and constructing the graphs of functions.

Content. *Monotonicity of the function. Extremum of function. Greatest and leastt values of the function. Intervals of convexity and concavity, inflection points of curves. Asymptotes of the curve. General scheme of investigation of function and constructing the graphs of functions.*

Topic 8. Derivatives and differentials of functions of several variables.

Content. *Concept of functions of many variables, basic definitions, geometric interpretation, lines and surface levels. Limit of the function of many variables. Continuity of function of many variables. Partial and total change of the function of two variables. Partial derivatives of functions of many variables. Complete differential of the function of many variables and its application to approximate calculations.*

Topic 9. Some applications of partial derivatives. Directional derivatives. Gradient. Extrema for functions of two variables.

Content. *Tangent plane and normal to the surface. Directional derivatives. Scalar field gradient. Local extrema of the function of two variables. Necessary and sufficient conditions for the existence of extremum. Extrema on the polygon. Relative extrema.*

Module№3 " Integral calculus of functions of one variable. Differential equations ",

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 indefinite integral and its properties;
– integrals of basic elementary functions and methods of integration of functions;
– definition, conditions of existence and properties of the definite integral;
– Newton-Leibniz formula;
– application of a definite integral;
– application of an improper integral;
– forms of writing of ordinary differential equation;
– the concept of order, solution, integral curve of the differential equation;
– statement of the Cauchy problem;
– the theorem of existence and uniqueness of the solution of the differential equation of the first order;
– types of first-order differential equations: differential equations with separated and separable variables, homogeneous, linear differential equations, Bernoulli equations, equations in complete differentials;
– definition of partial, general, special solution of the differential equation of the n-th order;
– definition of linear homogeneous and inhomogeneous differential equation of the n-th order;
–definition of the fundamental system of solutions of a linear homogeneous differential equation;
– the structure of the general solution of the non-homogeneous linear differential equation of the n-th order;
– the concept of a system of differential equations, solutions of the system: partial, general.

Be able to:

– apply methods of integration by parts and substitution;
– integrate rational, some irrational and trigonometric functions;
– calculate the area of flat figure, the length of the arc of the curve, the volume of the body, the surface area of rotation by using a definite integral;
– calculate or investigate the convergence of improper integrals;
–solve differential equations with separated and separable variables, homogeneous, linear differential equations, Bernoulli equations, equations in complete differentials;
– solve linear differential equations of the n-th order with constant coefficients;
– solve linear systems of second-order differential equations with constant coefficients.

Topic 1. Complex Numbers.

Content. *Concept of the complex number. Operations with complex numbers in algebraic form. Geometric form of the complex number. Module and argument of a complex number. Trigonometric and exponential forms of a complex number. Operations with complex numbers in trigonometric form.*

Topic 2. Indefinite integral.

Content. *Primitive function and indefinite integral. Properties. Table of basic integrals. Methods of integration: direct integration, method of substitution, method of integration by parts.*

Topic 3. Integration of rational functions.

Content. *Fractional-rational functions. Correct and incorrect rational fractions. Elementary fractions. Decomposition of the correct rational fraction into elementary fractions. Decomposition of the incorrect fraction into the sum of the polynomial and the correct rational fraction. Integration of rational fractions with the square trinomial in the denominator. Integration of elementary rational fractions. Integration of rational functions.*

Topic 4. Integration of trigonometric functions and irrational functions.

Content. *Methods of integration of trigonometric functions. Universal trigonometric substitution. Partial cases of rationalization of integrals from trigonometric functions. Integration of expressions containing quadratic irrationalities. Integration of some irrational expressions. Integration of differential binomials*

Topic 5. Definite integral. Improper 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: method of substitution, integration by parts. Improper integrals with infinite limits of integration. Criterion of convergence. Evaluation. Improper integrals: integrand unbounded. Criterion of convergence. Evaluation.*

Topic 6. Application of the definite integral.

Content. *Calculation of areas of flat figures. Length of curve arc. Body volume by area of parallel sections. Rotation surface area.*

Topic 7. Differential equations of the first order.

Content. *Basic concepts and definitions. Cauchy's problem. The theorem of existence and uniquness of the solution of the Cauchy problem. Geometric interpretation of the first order differential equation. Types of DR solutions. DR with separated and separable variables. Homogeneous DR (with a homogeneous right part). Linear DR. Bernoulli's equation. DR in complete differentials.*

Topic 8. Linear differential equations with constant coefficients.

Content. *Linear homogeneous and non-homogeneous DR. The structure of the general solution. Theory of linear homogeneous. DR of the second and higher orders with constant coefficients. Linear non-homogeneous DR with constant coefficients and the right part of the special form. Lagrange method (variations of arbitrary constants) for linear DR of the second order.*

Topic 9. Systems of differential equations.

Content. *Method of elimination and integrated combinations for solving systems of differential equations in normal form. Algebraic method (Euler method) for solving systems of differential equations with constant coefficients.*

Module№4 " Elements of Theory of Probability and Mathematical Statistics ",

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

Know:

– basic formulas of combinatorics;

– basic concepts of probability theory and methods for calculating the probabilities of random events;

– laws of probability distribution of discrete and continuous random variables;

–the main characteristics of the system of two random variables;

– basic concepts of mathematical statistics.

Be able to:

– calculate the probabilities of random events;

– find the numerical characteristics of discrete and continuous random variables;

– to make the laws of distribution of two-dimensional random variable;

– find the characteristics of sample distributions;

– perform statistical analysis of the sample.

Topic 1. Random events. Definition of probability.

Content. *Subject and methods of probability theory. Basic principles and formulas of combinatorics. The main types of random events. Classical and geometric definition of probabilities. Relative frequency and statistical probability of the event.*

Topic 2. Additive and multiplicative law of probability. Formula of total probability. Bayes' formula.

Content. *Probability addition theorem for incompatible events. Dependent and independent random events. Conditional probability. Probability multiplication theorems. Addition theorems for compatible events. Probabilities of hypotheses. Formula of total probability, Bayes' formula.*

Topic 3. Repeated independent trials. Bernoulli's formula.

Content. *Repeated independent trials. Bernoulli's scheme. Bernoulli's formula. The most probable number of occurrences of the event. Boundary theorems of the Bernoulli scheme: Poisson's theorem, local and integral Muavra-Laplace theorems. Probability of deviation of relative frequency from probability.*

Topic 4. Discrete random variables and their basic numerical characteristics. Distribution laws.

Content. *Random variables. Discrete random variables (DRV). Distribution laws, methods of assignment, distribution function. Numerical characteristics of DRV: mathematical expectation, variance, standard deviation, their properties. Poisson distribution, binomial, geometric, hypergeometric laws of DRV distribution.*

Topic 5. Continuous random variables and their basic numerical characteristics. Distribution function and distribution density. Distribution laws.

Content. *Continuous random variables (CRV). Function and density of distribution, their properties. Numerical characteristics: mathematical expectation, variance, standard deviation. Laws of distribution of CRV: uniform, exponential, normal. The probability of a random variable falling into the interval. The rule of three sigma.*

Topic 6. Systems of discrete random variables. Dependence of the random variables.

Content. *Two-dimensional random variables. Laws of distribution of two-dimensional quantities. Integral function and distribution density. Mathematical expectation and variance. Conditional distribution laws. Covariance and correlation coefficient of two random variables.*

Topic 7. Statistical distributions of sample.

Content. *General population and sample. Variation series. Statistical distribution of the sample. Polygon and histogram, empirical distribution function. Numerical characteristics of the statistical distribution of the sample.*

Topic 8. Estimates of unknown parameters.

Content. *Point and interval statistical estimates of distribution parameters.*

Topic 9. Statistical testing of hypotheses.

Content. *Statistical hypotheses. Statistical criterion. Construction of a critical area. Criterion power. General algorithm for testing statistical hypotheses. Parametric and non-parametric statistical hypotheses.*

2. SUBJECT CONTENT

2.3. Training schedule of the subject

Table 2.1

№	Theme (thematic section)	Total, hours			
		Full-time			
		Total	Lecture	Practice	Self-Study
1	2	3	4	5	6
The first semester					
Module №1 „ Elements of Linear Algebra,Vector Algebra and Analytical Geometry”					
1.1	Determinants and their properies.	12	2	2 2	6
1.2	Matrices. Linear operations with matrices. Inverse matrix. Rank of matrix.	12	2	2 2	6
1.3	Systems of linear algebraic equations. Kronecker-Capeli theorem usage in SLAE investigation. Methods of SLAE solution.	12	2	2 2	6

1.4	Vectors. Dot, cross and mixed vector product.	10	2	2 2	4
1.5	Straight line on the plane.	12	2	2 2	6
1.6	Plane in the space.	12	2	2 2	6
1.7	Straight line in the space.	12	2	2 2	6
1.8	Curves and surfaces of the second order.	10	2	2	6
1.9	Homework №1.1	4	–	–	4
1.10	Module test №1	6	–	2	4
Total by the module №1		**102**	**16**	**32**	**54**
Module №2 „ Introduction to Mathematical Analysis. Differential calculus of function of one variable. Differential calculus of function of several variables ”					
2.1	Sequences and functions. Limit of the sequence.	12	2	2 2	6
2.2	Limit of the function. Honorable limits. Indeterminate forms.	12	2	2 2	6
2.3	Continuity of the function, basic theorems.	10	2	2 2	4
2.4	Derivative of the function at the point. Some problems leading to understanding of the derivative definition. Geometric and mechanical concept of the derivative.	8	2	2	4
2.5	Differentiability of the functions. Rules of differentiation. Derivative of the functions. Table of derivatives.	12	2	2 2	6
2.6	Differential of the function. Higher order derivatives and differentials.	12	2	2 2	6
2.7	Investigation of the functions and constructing the graphs of functions.	10	2	2 2	4
2.8	Derivatives and differentials of functions of several variables.	12	2	2 2	6
2.9	Some applications of partial derivatives. Directional derivatives. Gradient. Extrema for functions of two variables.	10	2	2 2	4
2.10	Homework №1.2	4	–	–	4
2.11	Module test №2	6	–	2	4
Total by the module №2		**108**	**18**	**36**	**54**
In total by the first semester		**210**	**34**	**68**	**108**
The second semester					
Module №3 „ Integral calculus of functions of one variable. Differential equations ”					
3.1	Complex numbers.	10	2	2 2	4
3.2	Indefinite integral.	12	2	2 2	6
3.3	Integration of rational functions.	10	2	2 2	4

3.4	Integration of trigonometric functions and irrational functions.	11	2	2 2	5
3.5	Definite integral. Improper integrals.	11	2	2 2	5
3.6	Applications of definite integrals.	11	2	2 2	5
3.7	Differential equations of the first order.	11	2	2 2	5
3.8	Linear differential equations with constant coefficients.	11	2	2 2	5
3.9	Systems of differential equations.	8	2	2	4
3.10	Homework №2.1	4	–	–	4
3.11	Module test №3	6	–	2	4
Total by the module №3		**105**	**18**	**36**	**51**
Module №4 „Elements of Theory of Probability and Mathematical Statistics ”					
4.1	Random events. Definition of probability.	10	2	2 2	4
4.2	Additive and multiplicative law of probability. Formula of total probability. Bayes’ formula.	12	2	2 2	6
4.3	Repeated independent trials. Bernoulli’s formula.	10	2	2 2	4
4.4	Discrete random variables and their basic numerical characteristics. Distribution laws.	11	2	2 2	5
4.5	Continuous random variables and their basic numerical characteristics. Distribution function and distribution density. Distribution laws.	11	2	2 2	5
4.6	Systems of discrete random variables. Dependence of the random variables.	11	2	2 2	5
4.7	Statistical distributions of sample.	11	2	2 2	5
4.8	Estimates of unknown parameters.	11	2	2 2	5
4.9	Statistical testing of hypotheses.	8	2	2	4
4.10	Homework №2.2	4	–	–	4
4.11	Module test №4	6	–	2	4
Total by the module №4		**105**	**18**	**36**	**51**
In total by the second semester		**210**	**36**	**72**	**102**
In total by the discipline		**420**	**70**	**140**	**210**

2.4. Homework

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

Performance, 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

The following teaching methods are used in the study of the discipline:

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

The implementation of these methods is carried out during lectures, demonstrations, independent problem solving, work with educational literature, analysis and solving economic problems.

3.2. List of references

Basic literature

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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	Kind of Academic Work	Maximum Grade Values
1 semester			
Module № 1		**Module № 2**	
Kind of academic work	Grade values	Kind of academic work	Grade values
Problem solving, answers to theoretical questions, etc. during classroom work	16 (total)	Problem solving, answers to theoretical questions, etc. during classroom work	16 (total)
Carrying out and defense of homework 1.1	9 (total)	Carrying out and defense of homework 1.2	9 (total)

For admission to complete module test №1, a student must receive not less than	*15 points*	*For admission to complete module test №2, a student must receive not less than*	*15 points*
Carrying out Module Test №1	15	Carrying out Module Test №2	15
Total by the Module №1	**40**	**Total by the Module №2**	**40**
Total by the Modules №1, №2			**80**
Semester examination			**20**
In total by the first semester			**100**
2 semester			
Module № 3		**Module № 4**	
Kind of academic work	Grade values	Kind of academic work	Grade values
Problem solving, answers to theoretical questions, etc. during classroom work	16 (total)	Problem solving, answers to theoretical questions, etc. during classroom work	16 (total)
Carrying out and defense of homework 1.1	9 (total)	Carrying out and defense of homework 1.2	9 (total)
For admission to complete module test №1, a student must receive not less than	*15 points*	*For admission to complete module test №2, a student must receive not less than*	*15 points*
Carrying out Module Test №1	15	Carrying out Module Test №2	15
Total by the Module №1	**40**	**Total by the Module №2**	**40**
Total by the Modules №1, №2			**80**
Semester examination			**20**
In total by 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.

(Ф 03.02 – 01)

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				