Name of subject	Higher matematics (ECTS 14)
Subject/module code	OM112314
Science taught semester (s).	1st /2nd /3rd semestr
Responsible teacher	Mamatov Jahongir Khamraqulovich, assistant teacher
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent learning)	**Total hours - 420 .** **Audience Training hours - 168.** Lecture training hours - 72 Practical training hours - 96 **Independent learning -252 hours**
ECTS	14
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject** is to develop mathematical thinking in students, to acquire sufficient mathematical knowledge to solve theoretical and practical problems of research in the production process, including energy, to use them and to form skills and competencies to apply them. In addition, it is to provide students with solid fundamental knowledge, to teach them to translate the acquired knowledge into the mathematical "language" of modern practical problems, that is, to build mathematical models and make reasonable decisions by drawing conclusions based on their analysis. The main task of science is to fully and popularly explain to students (taking into account their level of knowledge) the essence of mathematical methods and their participation in modern computer programs using working educational documents compiled on the basis of the program in agreement with related and specialized departments. **The task of the subject** is to develop logical thinking and increase the level of mathematical knowledge in students, to be able to apply the acquired knowledge to solve practical problems, including energy-related problems, to improve fundamental skills in mathematical modeling of practical problems, and to independently increase the effectiveness of using modern literature and information technologies. **Learning outcomes:** 1. Students will have an idea of the fact that mathematics is a unique and special way of knowing the world, the generality of its concepts and hypotheses. 2. Students will study in depth the elements of analytical geometry and linear algebra. 3. Students will have the skills to know the basic concepts and methods of mathematical analysis and use them. 4. Students will know the elements of differential and integral calculus and be able to apply them in practice.
Course content (topics)	**I. Main theoretical part (Lecture)** Topic 1: Basic concepts about matrices. Types of matrices. Operations on matrices. Determinant of a square matrix. The second and third order determinants and their calculation. Properties of the determinant. Higher order determinants. Inverse matrix. Rank of the matrix. Topic 2: System of linear equations. Basic concepts. Solution of a system of linear equations. Kronecker-Capelli theorem. Solving a system of linear equations using the matrix method and Cramer's formulas. Solving a system of linear equations using the Jordan-Gauss method. Solving a system of arbitrary linear equations. System of linear homogeneous equations. Topic 3: Rectangular Cartesian coordinate system in the plane and in space. Distance between two points. Division of a section in a given ratio. Vectors. Linear operations on vectors. Projection of a vector on an axis.

	Propagation of a vector by the unit vectors of the coordinate axes. The modulus of a vector. Direction cosines. Linear connection of vectors, basis. Vectors in the Cartesian coordinate system. Dot, cross and triple cross products of vectors and their properties. Some applications of dot, cross and triple cross products. Topic 4: Line in the plane. Equations of a straight line in the plane. The location of two straight lines in the plane. The distance from a point to a straight line. Topic 5: General equation of second-order curves in the plane. Circle. Ellipse. Hyperbola. Parabola. Topic 6: Equations of a surface and a line in space. Equations of a plane. Mutual location of two planes in space. Conditions of parallelism and perpendicularity of two planes. The distance from a point to a plane. Equations of a straight line in space. The mutual location of two straight lines in space. Basic problems between a straight line and a plane in space. The distance from a point to a straight line. Topic 7: Function of one variable. Methods of function definition. Basic characteristics of a function. Basic elementary functions. Inverse function. Composite function. Topic 8: Sequences. Limit of a numerical sequence. Transition from inequality to limit. Limit of a bounded monotonic sequence. The number e. Limit of a function. One-sided limits. Infinitely large and infinitely small functions. Topic 9: Basic theorems on limits. First and second remarkable limits. Continuity of a function at a point and on an interval. Points of discontinuity of a function and their types. Theorems on continuous functions. Properties of a function that is continuous at an intersection. Topic 10: Derivative of a function. Geometric and mechanical meaning of the derivative. The normal and differential equations of a function at a given point on the graph of a function. Differentiability of a function. Derivatives of addition, subtraction, multiplication, and division. Derivatives of composite and inverse functions. Derivatives of basic elementary functions. Differentiation of functions given in implicit and parametric forms. Differential of a function. Geometric and mechanical meanings of the differential of a function. Applications of the differential of a function to approximate calculus. Higher-order derivatives and differentials. Topic 11: Basic theorems of differential calculus: Rolle, Cauchy and Lagrange theorems. L'Hopital's rule for solving uncertainties. Topic 12: Monotonicity conditions of a function. Extremum of a function, necessary and sufficient conditions for the existence of an extremum. Finding the largest and smallest values of a continuous function on the section. Convexity, concavity and inflection points of the graph of a function. Asymptotes of the graph of a function. General scheme and construction of a graph for checking a function. Application of differential calculus in practical problems. Taylor's formula for the residual solution in the Lagrange form. Expansion of functions according to the Taylor and Maclaurin formulas. Topic 13: Elementary function, indefinite integral and their geometric interpretations. Properties of indefinite integral. Integration methods: direct integration, integration by change of variable, integration by parts. Table of basic integrals. Topic 14: Integer and fractional rational functions. Expansion of fractional rational functions into the simplest fractional-rational functions of the I, II, III, and IV types and their integration. Integration of rational functions. Topic 15: Integral of trigonometric and irrational functions. Topic 16: Integral sum and definite integral. Geometric and mechanical meanings of definite integral. Properties of definite integral.

	Newton-Leibniz formula. Integral by change of variable in definite integral. Integral by parts of definite integral. Topic 17: Improper integrals with infinite limits. Improper integrals of functions with discontinuities. Signs of approximation of improper integrals. Topic 18: Applications of definite integral: calculating surfaces, arc lengths and volume of a body using definite integrals. Calculating the surface area of a surface formed by rotation. Mechanical applications of definite integral. Topic 19: Function of several variables. Its domain and range. Limit, continuity of a function of two variables. Partial derivatives and total differential of a function. Differentiability of a function. Geometric meaning of the total differential. Tangent and normal plane equations of a surface. Application of the total differential in approximate calculations. Topic 20: Higher-order partial derivatives and differentials. Differentiation of a composite function. Differentiation of implicit functions. Extrema of a function of two variables. The largest and smallest values of a function of two variables in a bounded closed domain. Conditional extrema. Topic 21: Problems that can be reduced to differential equations. First-order differential equations. Cauchy problem. First-order differential equations with separated and separable variables. First-order homogeneous differential equations and equations reduced to homogeneous differential equations. First-order linear differential equation. Bernoulli equation. Total differential equation. Integrating multiplier. Topic 22: Higher-order differential equations. Cauchy problem. Differential equations that can be reduced in order. Linear homogeneous higher-order differential equations. Linear homogeneous second-order differential equation with constant coefficients. Linear homogeneous higher-order differential equation with constant coefficients. Topic 23: Nonhomogeneous second-order linear differential equation. Lagrange's method of variation of an arbitrary constant. Linear nonhomogeneous second-and higher-order differential equations with constant coefficients with special forms on the right-hand side. Topic 24: Basic concepts. Normal system of differential equations. Methods for solving a normal system. Solving a system of linear first-order differential equations with constant coefficients. Applications of differential equations in the fields of electricity and energy. Topic 25: Double integrals. Calculating double integrals in Cartesian and polar coordinates. Triple integrals. Calculating triple integrals. Applications of multiple integrals. Topic 26: Curved integrals of the first kind. Calculating curved integrals of the first kind. Calculating curved integrals of the second kind. Connection between curved integrals of the first and second kind. Green's formula. Topic 27: Surface integrals of the first kind. Calculating surface integrals of the first kind. Surface integrals of the second kind. Calculating surface integrals of the second kind. Stokes and Ostrograd-Gauss formulas. Topic 28: Basic concepts. Geometric progression series. Necessary condition for convergence of a finite series. Harmonic series. Sufficient signs for convergence of finite series with constant sign. Signs for comparison of series. D'Alembert's sign. Cauchy's radical and integral signs. Series with alternating signs. Leibniz's sign. Numerical series with variable signs. Absolute and conditional convergence of numerical series. Topic 29: Basic concepts. Power series. Convergence of a power

series. Abel's theorem. Radius and interval of convergence of a power series. Properties of a power series. Expansion of functions into power series. Taylor and Maclaurin series. Expansion of some elementary functions into Taylor (Maclaurin) series.

Topic 30: Basic concepts of field theory. Scalar field. Surface and level lines. Directional derivative. Gradient of a scalar field and its properties.

Topic 31: Field vector lines. Field flow. Field divergence. Ostragrad Gauss formula. Field circulation. Field rotor. Stokes formula. Solenoid field. Potential field. Harmonic field.

Topic 32: Subject of probability theory. Random events and their classes. Operations on events. Random event. Algebra of events. Relative frequency of an event. Stability of relative frequency. Statistical and classical definitions of probability. Elements of combinatorics.

Topic 33: Geometric definition of probability. Axiomatic definition of probability. Properties of probability. Conditional probability. Probability of a product of events. Discontinuity of events. Probability of a sum of events. Formula for total probability. Bayes' formula.

Topic 34: Repetition of trials. Bernoulli's formula. Local and integral theorems of Moivre-Laplace.

Topic 35: The concept of a random variable. The law of distribution of a random variable. The law of distribution of a discrete random variable. Distribution polygon. Distribution function and its properties. Distribution function of a discrete random variable. Distribution density and its properties.

Topic 36: Numerical characteristics of random variables. Mathematical expectation, variance and standard deviation of random variables. Binomial distribution law. Geometric distribution. Uniform distribution law. Exponential distribution law. Normal distribution law.

II. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with studying the initial documents (curriculum, thematic plan, etc.) and ends with drawing up a lesson plan. The teacher should have an idea of the goals and objectives of the practical training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of the practical training is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

III. Recommended practical topics:

1. Matrices. Operations on matrices. Second and third order determinants and their calculation. Calculating the determinant using its properties.

2. Calculating higher order determinants. Inverse matrix. Rank of matrix.

3. Systems of linear equations. Cramer and matrix methods for solving systems of linear equations.

4. Solving systems of linear equations using the Jordan-Gauss method. Solving systems of arbitrary linear equations. Systems of linear homogeneous equations

5. Cartesian coordinate system with right angles in the plane and in space. Distance between two points. Division of a section in a given ratio. Area of a triangle. Vectors. Linear operations on vectors

6. Dot, cross and triple cross products of vectors and their properties. Some applications of scalar, vector and mixed products.

7. Equations of a straight line in the plane. Location of two straight

	lines in the plane. Distance from a point to a straight line. 8. Equations of a straight line in the plane. Location of two straight lines in the plane. Distance from a point to a straight line. 9. Second-order curves in the plane. Circle. Ellipse. 10. Hyperbola. Parabola. 11. Equations of a plane. The mutual location of two planes in space. Conditions for parallelism and perpendicularity of two planes. Distance from a point to a plane. 12. Equations of a straight line in space. The mutual location of two straight lines in space. Basic problems between a straight line and a plane in space. Distance from a point to a straight line. 13. Function. Domain of a function. Basic elementary functions. 14. Inverse function. Composite function. 15. Limit of a sequence of numbers. Converging sequences. The number e. 16. Limit of a function. 17. First and second remarkable limits. Continuity of a function. 18. Points of discontinuity of a function and their types. Properties of a function that is continuous at an intersection. 19. Derivative of a function. Geometric and mechanical meaning of the derivative. The normal equations of the function graph at a given point. Derivatives of addition, subtraction, multiplication and division. Derivatives of complex and inverse functions. 20. Differentiation of functions given in implicit and parametric forms. Differential of a function. Higher-order derivatives and differentials. Applications of the differential of a function to approximate calculations. Higher-order derivatives and differentials. 21. Basic theorems of differential calculus: Roll, Cauchy and Lagrange theorems. 22. L'Hospital's rule for revealing uncertainties. 23. Monotonicity conditions of a function. Extremum of a function, necessary and sufficient conditions for the existence of an extremum. Finding the largest and smallest values of a continuous function on an intersection. 24. Convexity, concavity and inflection points of a function graph. Asymptotes of the graph of a function. General scheme for checking a function and constructing a graph. Application of differential calculus in practical problems. Taylor formula for the residual solution in the Lagrange form. Expansion of functions according to the Taylor and Maclaurin formulas. 25. Elementary function and indefinite integral. Methods of integrating indefinite integrals. 26. Integrating rational functions. 27. Integrating trigonometric and irrational functions. 28. Calculation of definite integrals. Newton-Leibniz formula. Integrating by changing a variable in a definite integral. Integrating a definite integral by parts. 29. Improper integrals with infinite limits. Improper integrals of functions with discontinuities. Convergence signs of improper integrals. 30. Applications of the definite integral: calculating surfaces, arc lengths, and volume of a body using the definite integral. Calculating the surface area of a surface formed by rotation. Application of the definite integral in the energy and electrical fields. 31. Function of several variables. Its definition and range of values. Limit, continuity of a function of two variables. Partial derivatives and total differential of a function. Differentiability of a function. Tangent and normal equations of a surface. Application of total differential in approximate calculations.

	32. Higher-order partial derivatives and differentials. Differentiation of a composite function. Differentiation of indeterminate functions. Extrema of a function of two variables. The largest and smallest values of a function of two variables in a bounded closed domain. Conditional extrema. 33. First-order differential equations. Cauchy problem. First-order differential equations with separated and separable variables. Homogeneous differential equations and differential equations that reduced to homogeneous differential equations. Linear differential equation. Bernoulli equation. Complete differential equation. Integrating multiplier. 34. Higher-order differential equations. Cauchy problem. Differential equations that can be reduced to a lower order. Linear homogeneous higher-order differential equations. Second-order linear homogeneous differential equation with constant coefficients. Higher-order linear homogeneous differential equation with constant coefficients. 35. Nonhomogeneous second-order linear differential equation. Lagrange's method of variation of an arbitrary constant. Linear nonhomogeneous second- and higher-order differential equations with constant coefficients, the right-hand side of which is in a special form. 36. Normal system of differential equations. Methods for solving a normal system. Solving a system of first-order linear differential equations with constant coefficients. Applications of differential equations in the fields of electricity and energy. 37. Double integrals. Calculation of double integrals in Cartesian and polar coordinates. Triple integrals. Calculation of triple integrals. Applications of double integrals. 38. First-order linear integrals. Calculation of first-order linear integrals. Second-order linear integrals. Connection between first- and second-order linear integrals. Green's formula. 39. Surface integrals of the first kind. Calculation of surface integrals of the first kind. Surface integrals of the second kind. Calculation of surface integrals of the second kind. Stokes and Ostrograd-Gauss formulas 40. Finite series. Necessary condition for convergence of a finite series. Sufficient signs for convergence of finite series with fixed sign. Signs for comparison of series. D'Alembert's sign. Cauchy's radical and integral signs. Series with alternating signs. Leibniz's sign. Finite series with variable signs. Absolute and conditional convergence of finite series. 41. Functional series. Power series. Convergence of a power series. Abel's theorem. Radius and interval of convergence of a power series. Properties of a power series. Expansion of functions into power series. Taylor and Maclaurin series. Expansion of some elementary functions into Taylor (Maclaurin) series. 42. Scalar field. Surface and level lines. Derivative with respect to direction. Gradient of a scalar field and its properties 43. Field vector lines. Field flow. Field divergence. Ostrograd-Gauss formula. Field circulation. Field rotor. Stokes formula. Solenoid field. Potential field. Harmonic field. 44. Operations on events. Random event. Algebra of events. Relative frequency of an event. Stability of relative frequency. Statistical and classical definitions of probability. Elements of combinatorics. 45. Geometric definition of probability. Properties of probability. Conditional probability. Probability of a product of events. Discontinuity of events. Probability of a sum of events. Formula of total probability. Bayes formula. 46. Repetition of trials. Bernoulli formula. Local and integral

	theorems of Moivre-Laplace. 47. Random quantities. Law of distribution of random quantities. The distribution law of a discrete random variable. Distribution polygon. Distribution function and its properties. The distribution function of a discrete random variable. Distribution density and its properties. 48. Numerical characteristics of random variables. Expectation, variance and standard deviation of random variables. Binomial distribution law. Geometric distribution. Uniform distribution law. Exponential distribution law. Normal distribution law. **IV. Independent learning and independent work.** The competence of independent learning serves to promote independent self-development of students and increase the effectiveness of professional activity. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form. Independent learning for recommended topics: 1. Contributions of great scholars of Central Asia and mathematicians of Uzbekistan to the development of mathematics. 2. Matrices. Operations on matrices. Determinants. Properties of the determinant. Calculation of higher-order determinants. Inverse matrix. Matrix color. System of linear equations. Solving a system of nonlinear equations. Verification and solving a system of linear equations with m–n unknowns. System of homogeneous linear equations. 3. Vectors. Linear operations on vectors. Vectors in the Cartesian coordinate system. Linear dependence and independence of vectors. Basis. Scalar, vector and mixed products of vectors and their properties. Some applications of scalar, vector and mixed products. 4. Line on the plane. Equations of a straight line on the plane. Location of two straight lines on the plane. Distance from a point to a straight line. General equations of second-order curves. Circle and ellipse. Hyperbola. Parabola. General equations of second-order surfaces. Sphere and ellipsoids. Hyperboloids. Conic surfaces. Paraboloids. Cylindrical surfaces. Construction problems solved using equations of a straight line. 5. Equations of a plane in space. Angle between two planes. Conditions for parallelism and perpendicularity of two planes. Distance from a point to a plane. Equations of a straight line in space. Basic problems of straight lines in space. Basic problems between a straight line and a plane in space. General equations of second-order surfaces. Sphere and ellipsoids. Hyperboloids. Conic surfaces. Paraboloids. Cylindrical surfaces. Equation of conic sections in polar coordinates. 6. Complex numbers. Operations on complex numbers. Writing a complex number in trigonometric and exponential form. Raising a complex number to a power and extracting its root. Moivre formulas. 7. Function. Methods of function assignment. Main characteristics of a function. Inverse function. Composite function. Graphs of basic elementary functions. Hyperbolic functions and their similarity properties with trigonometric functions. 8. Sequences. Limit of a sequence of numbers. Limit of an increasing sequence. The number e. Limit of a function. Basic theorems about limits. First and second remarkable limits. Points of discontinuity of a function and its types. Properties of a function continuous in a section. 9. Problems leading to the concept of a derivative. Definition of a derivative. Its mechanical and geometric meaning. The tangent equation and the normal equation of a curve. Derivatives of basic elementary functions. Derivatives of implicit and parametric functions. Higher-order derivatives. Geometric meaning of a second-order derivative. Higher-order derivatives of a given implicit function. Higher-order derivatives of a parametric function. Differential of a function. Geometric meaning of

	the differential of a function. Application of the differential to approximate calculus. Higher-order differentials. 10. Basic theorems on differentiable functions. L'Hôspital's rule for revealing uncertainties. Checking a function using the first-order derivative. Convexity, concavity and inflection points of a function graph. Asymptotes of a function graph. Maximum and minimum values of a continuous function in a section. General scheme for checking and plotting a function completely. Taylor's formula. Energy problems related to finding the maximum and minimum of a function. 11. Indefinite integral. Initial function and indefinite integral. Properties of the indefinite integral. Basic table of indefinite integrals. Integrating by change of variable. Integrating by parts. Integrating rational functions. Integrating trigonometric functions. Integrating irrational functions. Euler's substitutions. Some recurrent formulas of integral calculus. 12. Definite integral. Geometric and physical meaning of the definite integral. Newton-Leibniz formula. Basic properties of the definite integral. Calculating the definite integral. Integrating by change of variable. Integrating by parts. Improper integrals. Signs of approximation of improper integrals. Geometric and physical applications of the definite integral. Approximating the definite integral. Right rectangle formula. Trapezoid formula. Simpson's formula. 13. Functions of several variables. Function of two variables. Its domain and range. Limit, continuity of a function of two variables. Partial derivatives and differentials of a function of several variables. Differentiability of a function and total differential. Geometric meaning of a total differential. Equations of a tangent plane and normal to a surface. Applications of the total differential in approximate calculations. Higher-order differentials. Derivative of a composite function. Total derivative. Derivative of an implicit function. 14. Extrema of a function in two variables. Necessary and sufficient conditions for an extremum. Conditional extremum. Maximum and minimum values of a function in a closed area. 15. Ordinary differential equations. Problems that can be reduced to differential equations. First-order differential equations. Cauchy problem. First-order differential equations with separated and separable variables. First-order homogeneous and homogeneous differential equations. First-order linear differential equation. Bernoulli equation. Complete differential equation. Integrating multiplier. 16. Higher-order differential equations. Cauchy problem. Differential equations that can be reduced in order. Linear homogeneous higher-order differential equations. Linear homogeneous second-order differential equation with constant coefficients. Linear homogeneous higher-order differential equation with constant coefficients. Nonhomogeneous second-order linear differential equation. Lagrange's method of variation of an arbitrary constant. Linear nonhomogeneous second-order differential equations with constant coefficients with a special form on the right-hand side. 17. System of differential equations. Normal system of differential equations. Methods for solving a normal system. Solving a system of linear first-order differential equations with constant coefficients. Application of differential equations in energy fields. 18. Multiple integrals. Double integrals. Calculation of double integrals in Cartesian and polar coordinate systems. Triple integrals. Calculation of triple integrals in Cartesian coordinates. Calculation of triple integrals in spherical and cylindrical coordinates. Applications of multiple integrals. 19. Curved integrals. First-order curved integrals. Calculation of first-order curved integrals. Some applications of first-order curved integrals.

	Second-order curved integrals. Calculation of second-order curved integrals. Ostrograd-Green's formula. Connection between first-order and second-order curved integrals. Some applications of second-order curved integrals. 20. Surface integrals. First-order surface integrals. Calculation of first-order surface integrals. Some applications of first-order surface integrals. Second-order surface integrals. Calculation of second-order surface integrals. Ostrograd-Gauss and Stokes formulas. Some applications of surface integrals of the second kind. 21. Numerical series. Basic concepts. Necessary condition for convergence of a numerical series. Harmonic series. Signs of comparison of series. Sufficient signs of convergence of numerical series with invariant sign. D'Alembert's sign. Cauchy's radical and integral signs. Generalized harmonic series. Numerical series with alternating signs. Leibniz's sign. Numerical series with changing signs. Absolute and conditional convergence of numerical series. 22. Functional series. Basic concepts. Power series. Convergence of a power series. Abel's theorem. Radius and interval of convergence of a power series. Properties of a power series. Expansion of functions into power series. Taylor and Maclaurin series. Expansion of some elementary functions into Taylor (Maclaurin) series. Some applications of power series. Approximate calculation of the value of a function. Approximate calculation of definite integrals. Approximate calculation of differential equations. 23. Elements of field theory. Basic concepts of field theory. Scalar field. Surface and surface lines. Derivative with respect to direction. Gradient of a scalar field and its properties. 24. Vector field. Vector lines of a field. Field flow. Field divergence. Ostrograd-Gauss formula. Field circulation. Field rotor. Stokes formula. Solenoid field. Potential field. Harmonic field. 25. Subject of probability theory. Random events. Random events and their classes. Operations on events. Random event. Algebra of events. Relative frequency of an event. Stability of relative frequency. Statistical and classical definitions of probability. Elements of combinatorics. Geometric definition of probability. Axiomatic definition of probability. Properties of probability. Conditional probability. Probability of a product of events. Discontinuity of events. Probability of the sum of events. Complete probability formula. Bayes' formula. 26. Repetition of trials. Bernoulli's formula. Local and integral theorems of Moivre-Laplace. 27. Random variables. The concept of a random variable. The law of distribution of a random variable. The law of distribution of a discrete random variable. Distribution polygon. Distribution function and its properties. Distribution function of a discrete random variable. Distribution density and its properties. Numerical characteristics of random variables. Expectation, variance and standard deviation of random variables. Binomial distribution law. Geometric distribution. Law of uniform distribution. Law of exponential distribution. Law of normal distributionLaw of uniform distribution. Law of exponential distribution. Law of normal distribution.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions

	for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL

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Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.
Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.
Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.
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<td>Criteria for assessing student knowledge</td>
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<tr><th>5 grade</th><th>100 points</th><th></th><th>Assessment criteria</th></tr>
<tr><td>5</td><td>90-100</td><td>Excellent</td><td>When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.</td></tr>
<tr><td>4</td><td>70-89,9</td><td>Good</td><td>When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.</td></tr>
<tr><td>3</td><td>60-69,9</td><td>Satisfactory</td><td>When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.</td></tr>
<tr><td>2</td><td>0-59,9</td><td>Unsatisfactory</td><td>When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.</td></tr>
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<tr>
<td>Course assessment criteria and procedure</td>
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<table>
<tr><th>Assessment type</th><th>Total points allocated</th><th>Control (task) form</th><th>Distribution of points</th><th>Qualifying score</th></tr>
<tr><td rowspan="2">Current assessment</td><td rowspan="2">30 points</td><td>System tasks</td><td>20 points (divided by the number of tasks)</td><td rowspan="2">18 points</td></tr>
<tr><td>Student activity (in seminars, practical, laboratory classes)</td><td>10 points</td></tr>
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Midterm assessment	20 points	Supervision: Written work	10 points	12 points
		System tasks	10 points (divided by the number of tasks)	
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points

* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.

Recommended Literature

Main literatures:

1. Xurramov Sh.R. Oliy matematika. T.: “Tafakkur”, 1-jild, 2-jild, 2018.
2. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, II. Sprinder-Verlag Italia, Milan 2008, 2010.
3. Д.Т. Писменный. Конспект лекций по высшей математике. Полный курс. М.: Айрис Пресс, 2009.
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