

BUNIN YELETS STATE UNIVERSITY

WORKING PROGRAM OF THE DISCIPLINE

B1.C.04.01 Maths

Training area: 38.03.02 Management

Orientation (profile): Organization management and logistics

Qualification (degree): Bachelor's degree

Form of study: full-time

Institute of Economics, Management and Service Technologies

Department: Mathematics, Computer Science, Physics and Teaching Methods

	full-time form	full-shape	time correspondence
Course	1		
Semester / trimester	12		
12Lectures and	72		
Laboratory classes	-		
Practical (seminar) classes	72		
Consultations Form			
(s) of intermediate certification	1 sem-test, 2 sem-eexam-0,33		
Control	9		
Other forms of work	-		
Independent work	98,7,7		

Total hours: 252

Labor intensity: 7 credits.

Developer(s) of the work program: к.п. PhD., senior lecturer *K. G. Lykova*

I.ORGANIZATIONAL AND METHODOLOGICAL SECTION

The purpose of studying the discipline: theoretical and practical training in the field of mathematics for future specialists in the field of economics, which is necessary for competent mathematical formulation of various accounting and audit problems in doing business, the choice of mathematical tools for modeling and solving them, the analysis of the results obtained and their application in professional activities.

Objectives of studying the discipline:

- mastering the conceptual framework, basic ideas and methods of mathematics;
- development of logical and algorithmic thinking, ability to generalize, analyze, perceive information, set goals and choose ways to achieve it;
- formation of the ability to model real financial and economic processes, describe the dynamics of socio-economic systems;
- mastering research techniques and solving mathematically formalized financial problems.

Place of the discipline in the structure of OPOP: implemented within the subject-content module of the mandatory part of block B1. Disciplines (modules).

Planned results of training in the discipline:

Code of competence	Indicators of competence	Planned results of training in the discipline
UC-1	Knowledge: - methods of searching for information and working with it; - consistency of a systematic approach.	Knows: - terms and concepts of the system approach, is guided in the basic mathematical ideas and patterns, methods applied to the professional activity
	of the Mind you: - analyze the problem, identify the stages of its solution, perform actions to solve it; - find various options for solving the problem, evaluate their advantages and risks.	Can: - search for solutions to a mathematical problem. - identify the stages of solution, - find rational ways to solve mathematical problems
	of the Owner: - skills in assessing the practical consequences of possible solutions to the problem; - skills of competent, logical, reasoned formulation of their own judgments and assessments.	Owns: - skills of evaluating the results of solving mathematical problems; - skills of reasoned, logical formulation of mathematical statements.
GPC-2	Knowledge: - the process of collecting financial, economic, statistical and accounting information; - ability to process the collected information using information	Knows: - methods and techniques for processing quantitative information; - fundamentals of linear algebra and mathematical analysis necessary for solving economic problems;

	technologies and various financial and accounting programs.	- methodological approaches to statistical calculations and economic analysis
	Mindyou. - determine the value of collecting, analyzing and processing the collected financial and economic information; - correlate the collection of information for a certain date and use various methods of statistical processing when analyzing data.	Can: - use mathematical symbols to express quantitative and qualitative relations of objects; - apply the methods of algebra, mathematical analysis and mathematical statistics for modeling, theoretical and experimental research of economic problems
	VladTOwned by: - skills of statistical, comparative and financial analysis to determine the place of professional activity in the economic paradigm; - techniques for analyzing complex socio-economic indicators.	Owens: - methods of graphical representation of research results; - methods of constructing, analyzing and applying mathematical models to assess the state and forecast the development of economic phenomena and processes.

II. CONTENT AND SCOPE OF THE DISCIPLINE

with an indication of the number of hours allocated for students' contact work with a teacher (by type of training sessions) and for independent work

Full-time education

n /	a Name of sections and	topics Total	Classroom classes			Sam. rab.
			LK	PZ	LB	
	Section 1. ЛLinearaya algebraa and analyticalgebra and analytic geometryя	108	36	36		36
1	Topic 1. Matrices and determinants	31	10	12		9
2	Topic 2. Systems of linear algebraic equations	31	10	12		9
3	Topic 3. Vector algebra 2	23	6	8		9
4	Topic 4. Elements of analytic geometry geometry	23	10	4		9
	<i>Credit</i>					
	<i>Total for 1 semester</i>	108	36	36		36
	Section 2. Fundamentals of Mathematical analysis	75.7,7	22	22		31.7,7
5	Topic 5. Limit and continuity of a	18	6	6		6

	function					
6	Topic 6. Differential calculus of a function of one variable	28	8	8		12
7	Topic 7. Integral calculus and its economic applications	29.7,7	8	8		13.7,7
	Section 3. Elements of probability theory	59	14	14		31
8	Topic 8. Random events and their probabilities	24	6	6		12
9	Topic 9. Random variables. Random variable systems	35	8	8		19
	Control	9				
	Exam	0.3				
	Total for 2 semester	144	36	36		62.77
	TOTAL:	252	72	72		98.4,4

Full-time and part-time education -not implemented
Part-time education – not implemented

III. EVALUATION MATERIALS FOR THE CURRENT AND FUTURE EVALUATION OF THE PROJECT. INTERMEDIATE CERTIFICATION OF STUDENTS IN THE DISCIPLINE

The current certification is carried out in the form of a control work.

Типовые варианты of control work options работ

Test work #1

1 semester (full-time)

1. Solve the matrix equation $\begin{pmatrix} 1 & 1 & -1 \\ 2 & 1 & 0 \\ 1 & -1 & 1 \end{pmatrix} X = \begin{pmatrix} 9 & -5 & 6 \\ 17 & 8 & 19 \\ 7 & -2 & -3 \end{pmatrix}$

2. Determine the rank of the matrix $\begin{pmatrix} 7 & -2 & 2 & -2 & 3 \\ 2 & -1 & 1 & -1 & 3 \\ 1 & 1 & -1 & 1 & -6 \end{pmatrix}$

3. Calculate the determinant $\begin{vmatrix} 2 & 1 & 2 & 3 & 2 \\ 3 & -2 & 7 & 5 & -1 \\ 3 & -1 & -5 & -3 & -2 \\ 5 & -6 & 4 & 2 & -4 \\ 2 & -3 & 3 & 1 & -2 \end{vmatrix}$

4. Solve a system of linear equations $\begin{cases} x_1 + x_2 + x_3 - x_4 + x_5 = 1, \\ x_1 + x_2 + 3x_3 - 2x_4 + x_5 = 8, \\ x_1 + x_2 - 5x_3 + x_4 + 2x_5 = -10 \end{cases}$

5. Solve the case using the inverse matrix method and Cramer's formulas

$$\begin{cases} 3x_1 + x_2 + 3x_3 = 2, \\ 5x_1 - 2x_2 + 2x_3 = 1, \\ 2x_1 + 2x_2 + 3x_3 = 1 \end{cases}$$

6. Vectors on the plane are given $\vec{a}, \vec{b}, \vec{c}$. Known for: $|\vec{a}| = 2, |\vec{b}| = 2, |\vec{c}| = 5, (\vec{a}, \vec{b}) = \frac{\pi}{3}, (\vec{b}, \vec{c}) = \frac{\pi}{3}$. Find the length of the vector $\vec{d} = -\vec{a} + \vec{b} - \vec{c}$.

7. Given two adjacent vertices A(-3, -1) and B (2, 2) of the parallelogram ABCD and the point Q(3, 0) of the intersection of its diagonals. Create equations for the sides of the parallelogram.

8. Write the equation of a plane passing through a straight $\frac{x-1}{1} = \frac{y+1}{2} = \frac{z+2}{2}$ line and perpendicular to the plane $2x+3y-z+7=0$.

Test work #2 **2nd semester (full-time study)**

1. Find the derivatives of functions: $y = \frac{x \arctg x}{1+x^2}, y = 2^{3x^2} + \ln \sin x$.

2. Investigate the function for extrema: $y = \frac{3-x^2}{x+2}$

3. Find the convexity intervals and inflection points of the function: $y = \frac{x^2}{x^3-1}$

4. Find the integrals: $\int \lg x dx, \int \ln^2 x dx, \int e^x \sin x dx$

5. Calculate the integral: $\int_0^{\frac{\pi}{2}} \sin^3 x dx$

6. Calculate the area of the shape bounded by lines $y = \arcsin 2x, x = 0, y = -\frac{\pi}{2}$

7. The distance from the Stadium stop to the School stop is 2 minutes by bus, and Andrey is 15 minutes away. The time interval for driving cars is 25 minutes. At a random moment of time, Andrey leaves the stadium, being late for school. Should he walk or wait for the bus?

8. 3 aerial bombs are dropped on the bridge, the probabilities of hitting which are respectively equal to: 0.3; 0.4; 0.6. Find the probability that the bridge will be destroyed if it is necessary to drop on it: a) all three bombs; b) only one bomb; c) at least two.

Intermediate certification of students is carried out in the form of a test and exam using the following assessment materials.

Questions for the test **(1 semester, full-time study)**

1. Matrices, types of matrices. Iteration over matrices and their properties.
2. Invertible matrices. Elementary transformations of matrices. Finding the inverse matrix using elementary transformations.

3. Rank of a matrix, determining the rank of a matrix by converting it to a stepwise form.
4. The determinant and its properties. Calculation of determinants of the 2nd and 3rd order.
5. Finding the inverse matrix using the adjoint matrix.
6. Algebraic complement of a matrix element. Calculation of determinants of order $n > 3$.
7. Eigenvalues and eigenvectors of the matrix.
8. Linear equations.
9. System of linear equations, forms of writing. Equivalent systems. Allowed cases.
10. Solving systems of linear equations by the inverse matrix method.
11. Solving systems of linear equations by Cramer's formulas.
12. The Gauss method. General solution of a system of linear equations (for example).
13. Homogeneous SLA, its properties. Algorithm for constructing a fundamental system of solutions (for example).
14. Vectors. Linear operations on vectors.
15. Linearly dependent and independent vector systems, their properties.
16. Basis of the vector system. Coordinates of the vector in the basis. Actions on vectors in coordinate form.
17. Scalar product of vectors and its properties. The angle between vectors.
18. Orthonormal basis. Cartesian coordinate system.
19. Methods for setting a straight line on a plane.
20. Relative position of two straight lines.
21. The angle between straight lines. Distance from a point to a straight line.
22. Methods for setting the plane.
23. Relative position of two planes.
24. The angle between the planes. Distance from the point to the plane.
25. Methods for setting a straight line in space.

Questions for the exam (2nd semester, full -time study)

1. Functions and their properties. Elementary functions and their graphs.
2. Limit of a function at infinity and at a point. One-way limits.
3. Infinitesimal functions and their properties. Remarkable limits.
4. Continuity of a function at a point. Gaps of the first and second kind.
5. Definition of the derivative, its geometric and economic meaning.
6. Rules of differentiation, table of derivatives. Higher-order derivatives.
7. Правила Lопital's rules. Methods for disclosing uncertainties.
8. Extrema of the function, necessary and sufficient features.
9. Convexity and concavity of the function graph. Inflection points.
10. Asymptotes. Plotting charts.
11. Elasticity of the function.
12. Definition and properties of an indefinite integral. Table of basic integrals.
13. Integration methods (direct integration, variable substitution, piecemeal integration).
14. Problem calculating the area of a curved trapezoid. Basic properties of a definite integral.
15. The Newton-Leibniz formula. Geometric applications of a definite integral.
16. The space of elementary events. Algebra of events.

17. Equally possible outcomes. Classical probabilities. Applying elements of combinatorics to the calculation of probabilities.
18. Geometric probability. Statistical probability.
19. Conditional probabilities. The multiplication theorem. The addition theorem.
20. Random variables: DSV and NSV. The law of distribution of a random variable.
21. Numerical characteristics of discrete random variables.
22. Continuous random variables. Distribution function.
23. Probability distribution density of a random variable and its properties.
24. Numerical characteristics of a continuous random variable.
25. Systems of random variables. Distribution function of a system of random variables.
26. Probability density of a system of random variables.
27. Dependent and independent random variables.
28. Moments, mathematical expectation, and variance of a system of random variables.
29. Correlation and covariance of a system of random variables.

IV. LIST OF LITERATURE REQUIRED FOR MASTERING THE DISCIPLINE

4.1. Basic literature

1. Высшая математика в упражнениях и задачах : Danko P. E., Popov A. G., Kozhevnikova T. Ya., Danko S. P. Vysshaya matematika v razrazhneniyakh i zadachakh : uchebnoe posobie dlya vuzov [Higher mathematics in exercises and tasks: a textbook for universities]. - Moscow: Mir i Obrazovanie Publ., 2023. - 816 p. - ISBN 978-5-94666-506-3. - Text: electronic. - URL: <https://znanium.ru/catalog/product/1993566> (accessed: 18.04.2024.04).
2. Ровба Е. А. математика : учебник / Е. А. Ровба, Lyalikov A. S., Setko E. A. Vysshaya matematika : uchebnik [Higher Mathematics: textbook]. - Minsk: Vysheyshaya shkola Publ., 2018. - 398 p. - ISBN 978-985-06-2838-1. - Text: electronic. - URL: <https://znanium.com/catalog/product/1012700> (accessed: 18.04.2024.04).

4.2. Additional literature

1. Yachmenev L. T. Vysshaya matematika : uchebnik [Ячменёв Higher Mathematics: textbook]. - Moscow: RIOR: INFRA-M, 2020. - 752 p. - (Higher education: Bachelor's degree). - ISBN 978-5-369-01032-7. - Text: electronic. - URL: <https://znanium.ru/catalog/product/1056564> (accessed: 18.04.2024.04).
2. Yudin S. V. Matematika i ekonomiko-matematicheskie modeli: Uchebnik [Mathematics Бакалавриат and Economic and Mathematical Models: Textbook]. - ISBN 978-5-369-01409-7. - Text: electronic. - URL: <https://znanium.com/catalog/product/937964> (accessed: 18.04.2024.04).

V.. LIST OF RESOURCES OF THE INFORMATION AND TELECOMMUNICATION NETWORK "INTERNET" REQUIRED FOR MASTERING THE discipline

№ Item No	. Link to the information resource	Name of the development in electronic form	Availability
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1.	http://www.biblioclub.ru	Electronic Library System (EBS) University Library online	Registration via any university computer. In the future, individual unlimited access from any point where there is access to the Internet
2.	http://www.school.edu.ru	Russian general education portal	Unlimited access
3.	http://www.krugosvet.ru	Electronic encyclopedia, which provides material on basic mathematical terms, as well as biographical information data about famous mathematicians.	Unlimited access
4	http://www.exponenta.ru	Educational mathematical website that contains mathematical packages to support classes, as well as methodological developments	Unlimited access
5	https://www.matburo.ru/Справочная	information on mathematical disciplines	Unlimited access
6	http://allmath.ru	mathematical portal containing the following sections: higher mathematics, applied mathematics, school mathematics, and Olympiad mathematics.	Unlimited access
7	http://www.e.lanbook.com	http://www.e.lanbook.com Lan Publishing House	Registration via any university computer. In the future, individual unlimited access/
8	<u>EBS "Yurayt"</u>	Virtual reading room of textbooks and study guides from authors from leading Russian universities in economic, legal, humanitarian, engineering and natural science areas and specialties.	<u>biblio-online.ru</u> Access after registration

VI. MODERN PROFESSIONAL DATABASES AND INFORMATION AND REFERENCE SYSTEMS

1	THE GUARANTOR	Legal information portal	Free access
2	<u>ConsultantPlus</u>	Russian Computer Reference and Legal system	Free access <u>www.consultant.ru</u>

3	zbMATH	Mathematical database covering about 4,000,000 documents from more than 3,000 journals and 170,000 books on mathematics, statistics, computer science, physics, and natural sciences	Access is free zbmath.org
4	http://www.biblioclub.ru	Electronic Library System (EBS) University Library Online	Registration via any university computer. In the future, unlimited individual access is provided from any point where there is access to the Internet.
5	www.elibrary.ru	Russian information portal in the field of science, technology, medicine and education	Free access
6	http://mathedu.ru	Mathematical education: public electronic library	Free access

VII. LICENSED AND FREELY DISTRIBUTED SOFTWARE

When implementing an academic discipline, the following licensed and freely distributed software is used:

- Microsoft Windows;
- Microsoft Office;
- LibreOffice, etc..

VIII. EQUIPMENT AND TECHNICAL MEANS OF TRAINING REQUIRED FOR THE IMPLEMENTATION OF THE EDUCATIONAL PROCESS IN THE DISCIPLINE, НЕОБХОДИМЫЕ ДЛЯ ОСУЩЕСТВЛЕНИЯ ОБРАЗОВАТЕЛЬНОГО ПРОЦЕССА ПО ДИСЦИПЛИНЕ

Training sessions are held in classrooms equipped with specialized furniture, including stationary or portable teaching equipment (projector, screen, computer / laptop).

Independent work is carried out in classrooms equipped with computer equipment with the ability to connect to the Internet and provide access to the electronic information and educational environment of the university.