Name of discipline and code : *B.2.1. Mathematics*

Lecturer	**Alapaeva Asel Aidarkulovna**
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Amount of credits:	5
Date:	1-semester 2019-2020 education year
Purpose and objectives of the course	7. **Objectives:** The primary objectives of this course are: • to develop abstract and logical (probative) thinking, • understanding how to set and solve problems, • acquiring as basic knowledge of linear algebra and analytic geometry, • appreciating the value of continued mathematical education for the major. To achieve these objectives, in the course of studying the course "Mathematics", the problem of providing a broad, general and sufficiently fundamental mathematical education for students of economic direction is being solved. Fundamental preparation includes a sufficient generality of mathematical concepts and constructions, providing a wide range of their applicability, reasonable accuracy of formulations of mathematical properties of the objects under study, logical rigor of the presentation of the subject, based on an adequate modern mathematical language.
Course Description	Mathematics is a two-semester course for the first year students studying at KEU. This course is an important part of the bachelor stage in education of the future economists. It has give students skills for implementation of the mathematical knowledge and expertise to the problems of economics. Its prerequisites are both the knowledge of the single variable calculus and the foundations of linear algebra and analytic geometry including operations on matrices and the general theory of systems of simultaneous linear equations, vector algebra, introduction to mathematical analysis, differential calculus of functions of one variable, study of functions using a derivative, indefinite integral, definite integral and its applications, functions of several variables, differential equations. The course is taught in English.
Prerequisites disciplines	The school course of algebra and the beginning of analysis; the school course of geometry.
Post-requisition discipline	Basic and special. course subjects
Competencies	As a result of mastering the discipline, a bachelor must **know:** • basic concepts of linear and vector algebra (matrices, determinants, vectors, scalar, vector and mixed products of vectors, etc.) • basic concepts and problems of analytic geometry (line on the plane, space, curves of the second order) • basic concepts and methods of differential and integral calculus

	(limit, derivative, differential of a function of one and several variables, extrema of functions, etc.); • basic types of ordinary differential equations and methods for their solutions. **To be able to:** • Develop the algebraic skills necessary for problem solving. • Develop the ability to model linear, quadratic, and other nonlinear relations, including the use of the graphing techniques and geometrical principles as tools, for the purpose of solving real-world problems. • Understand basic matrix operations and solve systems of linear equations. • Formulate and apply an equation, inequality or system of linear equations to a contextual (real-world) situation. • Determine equations of lines, including point-slope, slope-intercept forms and parametric and symmetric equations. • Understand two- and three dimensional vectors and solve the problems. **Use:** • methods of solving problems of differential, integral calculus; • numerical methods of solution; • methods of constructing a mathematical model of professional problems and a meaningful interpretation of the results obtained.
Course Policy	Students will be advised whether calculators are needed for specific assignments Do not be late for classes Do not skip classes, in case of illness, provide a certificate If the tasks are not fulfilled, the assessment is reduced Actively participate in the educational process Timely and diligently to do homework Be tolerant, open and friendly to fellow students and teachers Constructively support feedback in all classes Be punctual and compulsory
Teaching methods:	Active method, passive method, interactive method
Form of knowledge control	Assessment of knowledge will be conducted on the basis of the European ECTS system. The ECTS system initially divides students between the theses "credits", "not credits", and then assesses the work of these two groups separately. Students who score more than 50 points receive a "pass" rating. "Excellent" (from 85 to 100 points), "good" (from 70 to 84 points), "satisfactory" (from 50 to 69 points). The points of the final evaluation are distributed as follows: Current control work (max) -40 points Border control work (max) -40 points Final control (written examination max) -20 points At deducing of a total estimation activity of students in the decision of the problems offered on employment will be considered. • The current test (homework) is necessary to consolidate the material studied, as well as to check the level of understanding of the material.

	Homework will contain calculation tasks that use basic facts and statements. Doing homework will give students the opportunity to understand the material they have passed. • Border testing is given to check knowledge of current materials. We will propose computational tasks, as well as theoretical tasks that reveal an understanding of the basic definitions. Correct execution of tests will give students a chance to gain high credit marks. One of the basic conditions for recruitment of high scores is the student's possession of the material he has passed at a sufficiently high level. Test works will be held at the set time. Retake of control works is not provided. • Final control is a written examination. After receiving the exam ticket, the student must write down the answers to exam questions in writing. In order that students can properly prepare for the exam, a list of exam questions is given in advance. The answer is considered best if the theoretical facts are illustrated by concrete examples.
References:	**Basic** 1. Ron Larson, David C. Falvo. Elementary of Linear Algebra. USA, Boston: Houghton Mifflin Harcourt Publishing Company, 2009 2. Konev V.V. Linear Algebra, Vector Algebra and Analytical Geometry. Textbook. Tomsk: TPU Press, 2009 3. Konev V.V. Linear Algebra, Vector Algebra and Analytical Geometry. Workbook. Tomsk: TPU Press, 2009 4. Kydyraliev S.K. Mathematical Methods and Models in Economics I. Bishkek, KRSU, 2003 **Additional** 5. Jim Hefferon. Linear Algebra. USA, Vermont, 2017 6. Lynn H.Loomis, Shlomo Sternberg. Advanced Calculus. London: Jones and Bartlett Publishers International, 1990 7. Kremer NS, BA Pathko, IM Trishin, M, N. Fridman Higher mathematics for economists .- M: .UNITI, 2001. 8. Barysheva VK, Galanov Yu.I., Ivlev E.T., Pakhomova Ye.G. Theory of Probability.-Tomsk: ed. TPU, textbooks of Tomsk Polytechnic University, 2004. 9. Roman Schubert. Linear Algebra & Geometry. University of Bristol, 2012 10. Lial M., Miller C. *Finite mathematics and calculus with applications*. -Scott, Foresman and Company. 1989. 11. Mizrahi A., Sullivan M. *Mathematics for business and social sciences*.- John Wiley &Sons.1988. 12. Hoenig A.A. *Applied finite mathematics*. 1986. 13. Larson R.E., Hostetler R.P. *Brief calculus with applications*. - D.C. Heath and Company. 1987. 14. Grossman S.I. *Calculus of one variable*. -Academic Press. Inc.1986
Independent work of a student	**Homework №1** **(Deadline 02.10.19 -07.10.19)** 1. Calculate $5A-3B$, if a) $A=\begin{pmatrix}3 & -1 & 2 & 4\\ 1 & 2 & 5 & 6\end{pmatrix}$; $B=\begin{pmatrix}4 & 3 & -2 & 2\\ -3 & 3 & 1 & 8\end{pmatrix}$;

б) $A=\begin{pmatrix}-1 & 0 & 4\\ 3 & 1 & -2\\ 0 & 2 & 1\end{pmatrix}$; $B=\begin{pmatrix}2 & 1 & -1\\ 3 & 2 & -2\\ -1 & 1 & 4\end{pmatrix}$

2. Calculate $A\cdot B$

а) $A=\begin{pmatrix}1 & 5 & -2\\ 3 & -1 & 4\\ 3 & -2 & 6\end{pmatrix}$; $B=\begin{pmatrix}3 & 2 & -1\\ 4 & 2 & 5\\ 0 & -3 & 1\end{pmatrix}$

б) $A=\begin{pmatrix}-6 & 1 & 2\\ 4 & 1 & -3\\ 5 & 3 & 2\\ 1 & 7 & 4\end{pmatrix}$; $B=\begin{pmatrix}3 & 0\\ -3 & 2\\ 5 & 1\end{pmatrix}$

3. а) Calculate $D=(AB)^T-C^2$,

$A=\begin{pmatrix}3 & 4 & 2\\ 1 & 0 & 5\end{pmatrix}$; $B=\begin{pmatrix}2 & 0\\ 1 & 3\\ 0 & 5\end{pmatrix}$; $C=\begin{pmatrix}1 & 5\\ 3 & 2\end{pmatrix}$

б) Calculate D=ABC-3I

$A=\begin{pmatrix}1 & 2 & -3\\ 1 & 0 & 2\\ 4 & 5 & 3\end{pmatrix}$ $B=\begin{pmatrix}1\\ 2\\ 1\end{pmatrix}$; $C=\begin{pmatrix}2 & 0 & 5\end{pmatrix}$; I

4. Calculate determinants

а) $\begin{vmatrix}3 & -2\\ 4 & 5\end{vmatrix}$; б) $\begin{vmatrix}6 & 2\\ 7 & 3\end{vmatrix}$; в) $\begin{vmatrix}1 & 2 & 3\\ 4 & 5 & 6\\ 7 & 8 & 9\end{vmatrix}$; г) $\begin{vmatrix}1 & 1 & 1\\ 2 & -3 & 1\\ 4 & -1 & -5\end{vmatrix}$

5. а) $\begin{vmatrix}-1 & 3 & 1 & 2\\ -5 & 8 & 2 & 7\\ 4 & -5 & 3 & -2\\ -7 & 8 & 4 & 5\end{vmatrix}$; б) $\begin{vmatrix}3 & 5 & 7 & 2\\ 7 & 6 & 3 & 7\\ 5 & 4 & 3 & 5\\ -5 & -6 & -5 & -4\end{vmatrix}$

6. Calculate A^{-1}

а) $A=\begin{pmatrix}3 & 1 & -1\\ 2 & -2 & 3\\ 1 & 4 & 2\end{pmatrix}$; б) $A=\begin{pmatrix}1 & 2 & -1\\ 2 & 1 & -1\\ 1 & -7 & 3\end{pmatrix}$;

7. а) $\begin{cases}2x_1-x_2+5x_3=-1,\\ x_1+4x_2-x_3=14,\\ 3x_1+x_2+x_3=2\end{cases}$ б) $\begin{cases}x_1-x_2+2x_3=2,\\ 2x_1+x_2-3x_3=-7,\\ 4x_1+2x_2+x_3=0\end{cases}$

Homework №2

(Deadline 06.11.19 -11.11.19)

1. Given vectors $\alpha=(2,-1,0,3)$; $\hat{a}=(-1,1,2,-1)$; $C=(2,1,-2,0)$

Find a) the vectors $d=3(a+c)+2(a-b)-(\hat{a}+b)+2\hat{a}+c$ and

$f=2c+2(a-b)-3(a+b)$

	b) the scalar product of the vector d by the vector f; c) the length of the vectors d and f 2. Compose the simplest equation of the hyperbola if the distance between its vertices is 30, and the distance between the foci is 40. 3. Write the equation of the circle with the center at the point C (5, -4) and the radius equal to 7. 4. . Find the lengths of the axes, the coordinates of the foci, and the eccentricity of the ellipse $9x^2 + 16y^2 = 196$. 5. The straight line ℓ_1 has the equation 6y-4x-3 = 0, the straight line is the equation 2y-40x + 7 = 0, the straight line is the equation 18y-17x + 51 = 0. Which of these lines goes up faster than everyone. Draw the graphs of these lines in one coordinate system. 6. Find the equation of a straight line passing through the point (1,2) and parallel to the line 4x + 12y + 3 = 0. Draw the graphs. 7. Find the equation of the straight line passing through the point (6, -3) and perpendicular to the line x-3y + 12 = 0. Draw the graphs. 8. Given a triangle with sides 4; 8; 9. Find the length of the bisectrix drawn to the larger side.
Note	Homework should be presented in the exact time set by the teacher. In the case of delivery of work after a fixed period, 50% of the points received by the student for work are removed.

Calendar-thematic plan of distribution of hours with the indication of the week, topics

№	Date	Subject	Number of hours	Literature	Preliminary questions on modules
1	1	Introduction to Linear Algebra. Matrices. Definitions.	4	**References:** **Basic** 1. Ron Larson, David C. Falvo. Elementary of Linear Algebra. USA, Boston: Houghton Mifflin Harcourt Publishing Company, 2009 2. Konev V.V. Linear Algebra, Vector Algebra and Analytical Geometry. Textbook. Tomsk: TPU Press, 2009 3. Konev V.V. Linear Algebra,	1. Definition of the concept of a matrix/row vector/column vector/matrix entries 2. Types of matrices
2	1,2	Operations with matrices.	4		1. Rules of Multiplication, transpose, Addition
3	2	Properties of matrices operations.	2		1. Properties of Multiplication, transpose, Addition
4	3	Linear Equations. Break-even-point.	2		1. Types of linear equation form 2. Definition of BEP, methods to define BEP
5	3	Systems of Linear Equations.	2		1. Definitions of the consistent/inconsistent of a system
6	4	Gaussian Eliminates	4		1.Conditions for solving systems of equations by the Gauss method 2. The Gauss method as a universal method for solving systems of equations
7	5	Determinants	4		1.Methods of calculating determinants

				Vector Algebra and Analytical Geometry. Workbook. Tomsk: TPU Press, 2009 4. Kydyraliev S.K. Mathematical Methods and Models in Economics I. Bishkek, KRSU, 2003 **Additional** 5. Jim Hefferon. Linear Algebra. USA, Vermont, 2017 6. Lynn H.Loomis, Shlomo Sternberg. Advanced Calculus. London: Jones and Bartlett Publishers International, 1990 7. Kremer NS, BA Pathko, IM Trishin, M, N. Fridman Higher mathematics for economists .- M: .UNITI, 2001. 8. Barysheva VK, Galanov Yu.I., Ivlev E.T., Pakhomova Ye.G. Theory of Probability.-Tomsk: ed. TPU, textbooks of Tomsk Polytechnic University, 2004. 9. Roman Schubert. Linear Algebra & Geometry. University of Bristol, 2012	2.What is a minor (co-factor)?
8	6	Cramer's Rules	2		1. Conditions for the application of the Cramer rule
9	7	The Inverse of a Matrix	2		1.Conditions for the existence of an inverse matrix 2. Inverse matrix formula
10	7	Applications of Linear Algebra	4		1. Application of matrix operations 2. Application of linear systems
11	8	Examination №1			
12	9	Vectors. Linear operations on vectors	4		1. Definition of a vector 2. Linear operations on vectors
13	9	The scalar product of two vectors	2		1.Formula for the scalar multiplication of two vectors 2. Application of the scalar product of vectors in solving economic problems
14	10	Exercises	2		
15	10	Equations of lines. Direct on the plane	4		1.Types of equations of lines in the plane and in space 2. Singularities of lines in space
16	11	Plane. Equations of plane	4		1. Definition of a plane as a geometric concept 2. Equation of a plane and application.
17	11	Direct in space	2		1. The equation of a line in space. 2. The problem of direct
18	12	Lines and plane in space	2		1.Features of lines in space 2.Features of the plane in space 3.Plane equation
19	12	Curves 2 order. Circle.	4		1.The concept of 2-order curves 2.Types of equations of a circle
20	13	Ellipse	2		1.Ellipse equation 2. Basic characteristics of the ellipse
21	13	Hyperbola	2		1. Hyperbola equation 2. Basic characteristics of the hyperbola
22	14	Parabola	2		1. Parabola equation 2. Basic characteristics of the parabola
23	14	Exercises	2		
24	15	The use of analytic geometry in the economy	1		1.Which areas linear programming problems can be applied in?
25	15	Examination №2			
		TOTAL	**75** hours		

Schedule of independent work of students

№	Weeks Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Amount of points
		October				November						December						
1	Current control	10				15						15						40 points
2	Deadline IWS*.																	