Federal State Autonomous Educational Institution for Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
(RUDN University)

Faculty of Economics

COURSE SYLLABUS

MATHEMATICS
(наименование дисциплины/модуля)

Recommended by the Didactic Council for the Education Field of
38.03.01 Economics
(code and name of the direction of training/specialty)

The development of the discipline is carried out within the framework of the implementation of the main professional educational program of higher education:

International Economic Relations
(name (profile/specialization))

2024

1. COURSE GOALS

The purpose of mastering the discipline "Mathematics" is the fundamentalization of education, the formation of a worldview and the development of systemic thinking. This discipline introduces students to the most important concepts and methods of linear algebra and analytical geometry, the theory of limits, differential and integral calculus of functions of one and several real variables and with typical problems solved with their application. The discipline is basic for study of all mathematical and special disciplines. Knowledge and practical skills acquired in the discipline "Mathematics" are used by students in the study of general professional disciplines, as well as in the performance of coursework and homework.

2. LEARNING OUTCOMES

4. Studying the discipline "Mathematics" is aimed at the formation of the following competencies (part of competencies) among students:

Table 2.1. List of competencies formed in students when studying the discipline (results of mastering the discipline)

Competence code	Competence	Competence indicators
GC-1	Able to search, critical analysis and synthesis of information, apply a systematic approach to solve tasks	GC-1.1. Know how to search information to solve the task for various types of requests
		GC-1.2. Able to analyze and contextually process information to solve tasks with the formation of their own opinions and judgments.
		GC-1.3. Able to offer options for solving the problem, analyzes the possible consequences of their use

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Mathematics" refers to the part formed by the participants of the educational relations of block B1 of the EP.

Within the framework of the EP, students also master other disciplines and / or practices that contribute to the achievement of the planned results of mastering the discipline "Mathematics".

Table 3.1. List of Higher Education Program (me) components / disciplines that contribute to expected learning/training outcomes

Code	Competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GC-1	Able to search, critical analysis and synthesis of information, apply a systematic approach to solve tasks		Business climate and regulation of foreign investment in the Russian Federation Cities in the global economy Institutional Economics Informatics A History of Financial Turmoil in the Global Economy Creativity and innovation in business Macroeconomics

Code	Competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
			International Economic Relations Microeconomics World Economy Neuromarketing Corporate Fraud Audit Basics Fundamentals of scientific research Modern financial transactions Statistics Technological Revolutions and Economic Growth Economics of Interstate Territorial Disputes Economic and mathematical modeling Economic geography Ecosystems in business Emotional Intelligence

4. COURSE WORKLOAD AND LEARNING ACTIVITIES

The total labor intensity of the discipline "Mathematics" is 4 credit units.

TABLE 4.1. Types of academic activities during the period of the HE program(me) mastering

Type of educational work		TOTAL, academic hours	Semester 1	2	3	4
Contact academic hours		*51*	*51*			
including:						
Lectures		17	17			
Lab work						
Seminars (workshops/tutorials)		34	34			
Self-study (ies), academic hours		*66*	*66*			
Evaluation and assessment academic hours		*27*	*27*			
Overall labor intensity of the discipline	*academic hours*	**144**	**144**			
	credit units	**4**	**4**			

5. COURSE MODULES AND CONTENTS

Table 5.1. The content of the discipline (module) by types of educational work.

Course Modules and Contents	Course Modules and Contents	Type of educational work *
Section 1. Elements of linear algebra	Topic 1.1. Conduct. Vectors and actions with them. Linear spaces The basis and rank of the vector system. The decomposition of the vector on the basis. The coordinates of the vector in the basis. Linear spaces.	**LC, SC**
	Topic 1.2. Matrices and actions with them The concept of a matrix. Addition, subtraction of matrices. Examples of the application of matrix calculus in economic problems.	**LC, SC**
	Topic 1.3. Determinants The properties of the determinants. Minors. Algebraic additions. Laplace's theorem. Matrix rank theorem.	**LC, SC**
	Topic 1.4. Systems of linear equations Collaborative and non-cooperative systems. Fundamental system of solutions of a system of linear homogeneous equations.	**LC, SC**
	Topic 1.5. Linear operators The concept of a linear operator. A linear operator matrix. Eigenvectors and eigenvalues of a linear operator.	**LC, SC**
Section 2. Linear models in economics	Topic 2.1. Linear exchange model Model of international trade as an example of a mathematical model of the economic process.	LC, SC
	Topic 2.2. Leontief's Model Leontiev's model. Leontiev's productive model. Productivity criteria.	LC, SC
Section 3. Elements of Analytic Geometry	Topic 3.1. Analytic geometry on a plane. The equation is a straight line on a plane. The angle between the straight lines. The distance from a point to a straight line. Second-order curves.	LC, SC
	Topic 3.2. Analytic geometry in space. The equation of a line and a plane in space. The angle between the planes. The distance from the point to the plane.	LC, SC
Section 5. Introduction to Analysis	Topic 4.1: Elements of Set Theory The concept of a set. Numeric sets. Numeric axis.	LC, SC

	Topic 4.2: Sequences: Functions 　　　The limit of the sequence. The concept of a function. Ways to specify a function. Basic elementary functions; their graphics and properties.	LC, SC
	Topic 4.3. Function Limit 　　　The limit of the function. The first wonderful limit. The second remarkable limit. The task of continuous accrual of interest.	LC, SC
	Topic 4.4: Function Continuity The continuity of the function at a point. Properties of functions that are continuous on a segment.	LC, SC
Section 5. Differential Calculus	Topic 5.1. Derivative of a Function: Differential 　　　Geometric and mechanical meaning of the derivative. Continuity of the differentiable function. Differential.	LC, SC
	Topic 5.2. Properties of Differentiable Functions 　　　Basic theorems of differential calculus. Lopital's rule. Disclosure of uncertainties of various kinds.	LC, SC
	Topic 5.3: Function Extremities 　　　Local extremum. Necessary and sufficient conditions of the extremum. Scheme of the study of the function on the extremum.	LC, SC
	Topic 5.4: Function research and graphing. General scheme of function research and graphing.	LC, SC
Section 6. Integral Calculus	Topic 6.1. Indeterminate integral. Integration methods. 　　　The primordial function and the indeterminate integral. Properties of an indeterminate integral. Basic integration methods.	LC, SC
	Topic 6.2. A certain integral and its properties. 　　　The concept of a certain integral. Properties of a certain integral. Newton-Leibniz formula.	LC, SC
	Topic 6.3: Applications of a specific integral. 　　　Geometric applications of a certain integral.	LC, SC
	Topic 6.4. Non-proper integrals. Non-native integrals with infinite limits of integration. Non-native integrals from unlimited functions.	LC, SC
Section 7: Functions of Multiple Variables	Topic 7.1: Defining and defining the function of multiple variables. 　　　Functions of several variables. Derivative by direction.	LC, SC

	Topic 7. 2. Extremes. Conditional extremes. The extremum of a function of two variables. Conditional extremum. Sufficient conditions of the conditional extremum.	LC, SC
Section 8. Differential Equations	Topic 8.1. Differential equations of I order. First-order differential equation. Cauchy's problem.	LC, SC
	Topic 8.2. Differential equations of the SECOND order. Linear differential equations of the second order.	LC, SC

* - is filled only in the **full-time** form of training: LC - lectures; LR - laboratory work; SC - seminar classes

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Logistics of discipline

Name of special placements and placements for independent work	Equipment of special placements and placements for independent work	List of licensed software. Details of the confirming document
Lecture Hall	Auditorium for lecture-type classes, equipped with a set of specialized furniture; whiteboard (screen) and technical means of multimedia presentations.	Notebook Asus F6A, Multimedia projector Casio XJ-S400UN, Multimedia projector Casio XJ-V100W, Projection screen GEHA 244*244, Screen with electric wire Draper 203*1, Speaker system Defender Mercury 35 Mkll, TV Philip
Seminary	Classroom for seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means of multimedia presentations.	Notebook Asus F6A, Multimedia projector Casio XJ-S400UN, Screen motorized Digis Electra MW DSEM - 1105
For independent work of students	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to EIOS.	Monoblock Lenovo AIO-510-22 ISH Intel I5 2200 MHz/8 GB/1000 GB/DVD/audio, monitor 21", Multimedia projector Casio XJ-V 100W, Screen motorized Digis Electra 200*150 Dsem-4303

7. RECOMMENDED SOURCES FOR COURSE STUDIES
Main reading(sources)

1. Pavlov O.I., Pavlova O.Yu., Mathematical analysis. Textbook. – M.: Iinformatsionni-izdatskiy tsentr ATiSO, 2021. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=505631&idb=0

2. Pavlov O.I., Pavlova O.Yu., Practicum on Linear Algebra and Analytic Geometry. Part I. Textbook. – M.: PUBLISHING HOUSE RUDN University, 2018. http://lib. rudn. ru/MegaPro/UserEntry? Action=Rudn_FindDoc&id=470033&idb=0

3. Pavlov O.I., Pavlova O.Yu., Practicum on Linear Algebra and Analytic Geometry. Part II. Studymanual. – M.: Izdatelstvo RUDN, 2018. http://lib. rudn. ru/MegaPro/UserEntry? Action=Rudn_FindDoc&id=475485&idb=0

4. Klyushin V. A. Higher Mathematics for Economists. Studymanual. 2nd edition e – M.: Yurayt, 2016.

5. Klyushin V.L. Higher mathematics for economists: problems, tests, exercises. 5-e izdaniee – M.: Yurayt, 2017.

Additional (optional) reading (sources)

1. Research of Operationsin Economics: Ucheb. posobie dlya vuzov / Pod red. prof. N.Sh. Kremer. 3-e izdaniee – M.: Yurayt, 2017.

2. Solodovnikov A.S. et al. "Mathematics in Economics". M.: «Finansy i statistika». 2011.

3. Crassus M. S., Chuprynov B. A. "Mathematics for Economists". SPb.: Piter, 2009.

4. Rosser Mike. Basic Mathematics for Economists. Taylor & Francis, 2012.

5. Pemberton M., Rau N. Mathematics for Economists: An Introductory Textbook. University of Toronto Press, 2011.

Resources of the information and telecommunication network "Internet":

1. RUDN University EBS and third-party EBS, to which university students have access on the basis of concluded contracts:
- ELECTRONIC LIBRARY SYSTEM RUDN University – EBS RUDN University http://lib.rudn.ru/MegaPro/Web
- EBS University Library Online http://www.biblioclub.ru
- EBS Jurait http://www.biblio-online.ru
- EBS Student Consultant www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/
- EBS Troitsky Bridge
- ....

2. Databases and search engines:
- electronic fund of legal and normative-technical documentation of the http://docs.cntd.ru/
- Yandex search engine https:// www.yandex.ru/
- Google https://www.google.ru/ search engine
- Abstract database SCOPUS http:// www.elsevierscience.ru/products/scopus/
- ....

Educational and methodical materials for independent work of students when mastering the discipline / module*:

1. Pavlov O.I., Pavlova O.Yu., Practicum on Linear Algebra and Analytical Geometry. Part I. Textbook. – M.: Publishing House RUDN University, 2018. .

2. Pavlov O.I., Pavlova O.Yu., Practicum on Linear Algebra and Analytical Geometry. Part I. Textbook. – M.: Publishing House RUDN University, 2018.

3. Pavlov O.I., Pavlova O.Yu., Mathematical analysis. Uchebnoe posobie. – M.: Iinformatsionni-izdathelskiy tsentr ATiSO, 2021.

* - all educational and methodological materials for independent work of students are placed in accordance with the current procedure on the page of **the discipline in TUIS**!

8. EVALUATION TOOLKIT & GRADING SYSTEM FOR ASSESSING THE LEVEL OF FORMATION OF COMPETENCIES IN THE COURSE

Evaluation materials and a grading system* for assessing the level of formation of competencies (part of competencies) based on the results of mastering the discipline "Mathematics" are presented in the Appendix to this Course Syllabus of the discipline

DEVELOPERS:

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