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**FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER  
EDUCATION PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER  
PATRICE LUMUMBA  
RUDN UNIVERSITY**

**Faculty of Economics**

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**COURSE SYLLABUS**

**MATHEMATICS**

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((code and name of the direction of training/specialty))

**Recommended by the Didactic Council for the Education Field of  
38.03.01 Economics**

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((code and name of the direction of training/specialty))

**The course instruction is implemented within the professional education programme of  
higher education**

**International Economic Relations**

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((name (profile/specialization))

## 1. COURSE GOALS

The goal 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 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 analyze and synthesize of information, apply a systematic approach to solve tasks	GC-1.1. Know how to find 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, analyze 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 Programme 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 analyze and synthesize 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 6 credit units.

TABLE 4.1. Types of academic activities during the period of the HE programme mastering

Type of educational work		TOTAL, academic hours	Semester			
			1	2	3	4
<i>Contact academic hours</i>		102	51	51		
including:						
Lectures		17	17	17		
Lab work						
Seminars (workshops/tutorials)		34	34	34		
<i>Self-study (ies), academic hours</i>		78	49	49		
<i>Evaluation and assessment academic hours</i>		36	18	18		
<b>Overall laboriousness of the discipline</b>	<i>academic hours</i>	<b>216</b>	<b>144</b>	<b>72</b>		
	credit units	<b>6</b>	<b>4</b>	<b>2</b>		

#### 5. COURSE MODULES AND CONTENTS

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

<b>Course Modules and Contents</b>	<b>Course Modules and Contents</b>	<b>Type of educational work *</b>
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.	<b>LC, SC</b>
	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.	<b>LC, SC</b>
	Topic 1.3. Determinants The properties of the determinants. Minors. Algebraic additions. Laplace's theorem. Matrix rank theorem.	<b>LC, SC</b>
	Topic 1.4. Systems of linear equations Collaborative and non-cooperative systems. Fundamental system of solutions of a system of linear homogeneous equations.	<b>LC, SC</b>
	Topic 1.5. Linear operators The concept of a linear operator. A linear operator matrix. Eigenvectors and eigenvalues of a linear operator.	<b>LC, SC</b>
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

	<p>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.</p>	LC, SC
	<p>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.</p>	LC, SC
	<p>Topic 4.4: Function Continuity The continuity of the function at a point. Properties of functions that are continuous on a segment.</p>	LC, SC
Section 5. Differential Calculus	<p>Topic 5.1. Derivative of a Function: Differential Geometric and mechanical meaning of the derivative. Continuity of the differentiable function. Differential.</p>	LC, SC
	<p>Topic 5.2. Properties of Differentiable Functions Basic theorems of differential calculus. L'opital's rule. Disclosure of uncertainties of various kinds.</p>	LC, SC
	<p>Topic 5.3: Function Extremities Local extremum. Necessary and sufficient conditions of the extremum. Scheme of the study of the function on the extremum.</p>	LC, SC
	<p>Topic 5.4: Function research and graphing. General scheme of function research and graphing.</p>	LC, SC
Section 6. Integral Calculus	<p>Topic 6.1. Indeterminate integral. Integration methods. The primordial function and the indeterminate integral. Properties of an indeterminate integral. Basic integration methods.</p>	LC, SC
	<p>Topic 6.2. A certain integral and its properties. The concept of a certain integral. Properties of a certain integral. Newton-Leibniz formula.</p>	LC, SC
	<p>Topic 6.3: Applications of a specific integral. Geometric applications of a certain integral.</p>	LC, SC
	<p>Topic 6.4. Non-proper integrals. Non-native integrals with infinite limits of integration. Non-native integrals from unlimited functions.</p>	LC, SC
Section 7: Functions of Multiple Variables	<p>Topic 7.1: Defining and defining the function of multiple variables. Functions of several variables. Derivative by direction.</p>	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*

<b>Name of special placements and placements for independent work</b>	<b>Equipment of special placements and placements for independent work</b>	<b>List of licensed software. Details of the confirming document</b>
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 Mkl, 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

## 1. RESOURCES RECOMMENDED FOR COURSE STUDY

### 7. Main reading(sources)

1. Pavlov O.I., Pavlova O.Yu., Mathematical analysis. Textbook. – M.: Informatsionni-izdatiskiye tsentr ATiSO, 2021. [http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn\\_FindDoc&id=505631&idb=0](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](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](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 izdanie – M.: Yurayt, 2017.

### **Additional (optional) reading (sources)**

1. Research of Operations in Economics: Ucheb. posobie dlya vuzov / Pod red. prof. N.Sh. Kremer. 3-e izdanie – 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](http://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/](http://docs.cntd.ru/)
- Yandex search engine [https:// www.yandex.ru/](https://www.yandex.ru/)
- Google <https://www.google.ru/> search engine
- Abstract database SCOPUS [http:// www.elsevierscience.ru/products/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.: Informatsionni-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. ASSESSMENT TOOLKIT AND GRADING SYSTEM\* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION**

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:**

Associate professor of the  
Department of EMM

\_\_\_\_\_  
position, educational department

Pavlov O. I.

\_\_\_\_\_  
signature

\_\_\_\_\_  
name and surname.

Head of the Higher Education Program(me)  
Doctor of Economics, Professor of International  
economic relations

**I.V.Andronova**