BORYS GRINCHENKO KYIV UNIVERSITY

«APPROVED»

Decision of the Academic Council,
Borys Grinchenko Kyiv University

23 March 2017, Protocol No.3

The Head of the Academic Council, Rector
Viktor Ogneviuk

Programme of Study (Vocational)

111.00.01 Mathematics
Level One (Bachelor)

Field of Knowledge: **11 Mathematics and Statistics**
Specialty: **111 Mathematics**
Qualifications**:** **Bachelor of Mathematics**

Enacted since 01 September 2017
(Order No.348, 26 May 2017)

Kyiv – 2017

LETTER OF APPROVAL
Programme of Study (Vocational)

The Chair of Information Technologies and Mathematical Disciplines
Protocol No. 1, 10 January 2017

The Head of the Chair _____ Oksana Lytvyn

The Academic Council of the Faculty of Information Technology and Management
Protocol No. 6, 15 March 2017

The Head of the Academic Council _____ Alla Mykhatska

The Head of the SMC of Standardization
and Quality Education _____ Olha Leontieva

Vice-Rector on Academic Affairs _____ Oleksii Zhyltsov

SRL Education Internationalization

The Head _____Olha Vyhovska
_____ _____ 2017

Vice-Rector for Research

_____ Nataliia Vinnikova

___ _____ 2017

PREAMBLE

The programme of study (vocational) complies with the Law of Ukraine "On Higher Education", 01.07.2015, No.1556-VII, and the Draft of the Standard for Higher Education of Ukraine in the field of knowledge 11 Mathematics and Statistics, specialty 111 Mathematics for Level One (Bachelor) of higher education by the project group:

Maria Astafieva, PhD in Physics and Mathematics, Associate Professor, Associate Professor of the Chair of Information Technologies and Mathematical Disciplines - project team leader (guarantor)

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Sergiy Radchenko, PhD in Physics and Mathematics, Associate Professor, Associate Professor of the Chair of Information Technologies and Mathematical Disciplines - project team member

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Svitlana Semenyaka, PhD in Physics and Mathematics, Associate Professor, Associate Professor of the Chair of Information Technologies and Mathematical Disciplines - project team member

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External Reviewers:

Prof. Sergiy Lyashko, Corresponding Member of the National Academy of Sciences of Ukraine, Doctor of physical and mathematical sciences, the Head of Computational Mathematics Chair, Taras Shevchenko National University of Kyiv

Ruslan Cherney, Candidate of Physics and Mathematics, Associate Professor, Associate Professor of Mathematics Chair, National University of "Kyiv-Mohyla Academy"

Actualized:

Date of Review of the PS /Amendments to PS			
Signature			
Full name of the Guarantor			

I. PROFILE OF THE PROGRAMME OF STUDY (VOCATIONAL)
Specialty 111 Mathematics
(specialization: Applied Mathematics / Business Mathematics)

1 - General information	
The full name of the higher education institution and the structural unit	Borys Grinchenko Kyiv University Faculty of Information Technology and Management
Degree of higher education	Bachelor
Educational qualification	Bachelor of Mathematics
Official name of the programme of study	111.00.01 – Mathematics
Type of diploma and term of study according to the programme	240 credits ECTS Bachelor degree, unitary term of study: 3 years 10 months
Availability of accreditation	Implemented in 2017
Cycle / Level	Level One (Bachelor) /Level 7 of the National Qualification Framework of Ukraine
The education level required to commence study under the programme	Complete secondary education
Language (s) of teaching	Ukrainian
Validity of the programme of study	2022
Internet address of the permanent placement of the description of the programme of study	http://kubg.edu.ua/
2 - The purpose of the programme of study (vocational)	
• to provide students Mathematics education with broad access to employment; • to prepare students for educational, scientific and methodical and organizational activities as high school teachers; • to form the appropriate competencies for further education and development;	
3 - Characteristics of the programme of study	
Subject area	*Objects of study and /or activity:* - mathematical structures, concepts and ideas for modeling and developing the theory in order to explain and / or optimize natural-technological or socio-economic phenomena; - mathematical methods of modeling in business, including - with the use of computer mathematical packages (for the specialization "business-mathematics") *Learning objectives:* application of knowledge, skills and communications in professional activities, development of mathematical theories, mathematical modeling, analysis and solving of applied problems; for applying mathematical methods in business (in addition to the specialization "business

	mathematics"). *The theoretical content of the subject area:* mathematical models allow to analyze and process data of scientific, natural, technical, economic, sociological research, create the basis of scientific and educational activity in the field of mathematics and statistics and promote the development and creation of the latest information technologies. *Methods, techniques and technologies:* - methods of mathematical modeling, parameter calculation, prediction of properties and behavior of mathematical models on the basis of empirical data; analysis of mathematical objects and structures; methodology of abstract thinking, analysis and synthesis; methods of scientific research; methods of algebra, geometry, mathematical analysis, discrete mathematics, differential equations, probability theory and mathematical statistics, mathematical physics, computational mathematics, variational calculus and optimization; information, software and communication technologies; *Instruments and equipment:* computer and network programmable devices. *The proportion of the volumes of the general and professional components and optional parts:* - general and special (professional) competencies for the specialty - 180 ECTS credits (75%); - optional part - 60 ECTS credits (25%), among which: free choice academic disciplines from the course catalogue - 17 credits ECTS. *Field practice share:* 39 ECTS credits (16%)
Orientation of the programme of study	Vocational The program is based on well-known (classical) scientific results, taking into account the current state of mathematics, its active penetration into a wide variety of fields of knowledge and practical activity, focuses on topical specializations, within which further professional and scientific careers are possible.
The main focus of the programme of study	General education in the field of mathematics and its applications in mathematical modeling; psychological and pedagogical preparation and formation of knowledge, skills, and other competences in the methodology of teaching mathematics at school. Additional specialization: Applied Mathematics / Business Mathematics
Specific features of the programme	The pedagogical component enables graduates to work as math teachers at school, and additional specialization - to perform professional work related to analytics and modeling
4 - Eligibility of graduates to employment and further studying	
Employment	Graduates of specialty 111 Mathematics can: - to participate in the development, implementation and use of mathematical methods and algorithms intended for various sectors of the national economy, mathematical support of theoretical and applied

	research in the field of natural sciences, technical sciences and economics, in particular, in the creation and use mathematical maintenance of electronic computing equipment. Functional duties of graduates can range from participation in research to management; - to work as mathematics teachers in general educational institutions of the I-II degrees (3340 - teacher of mathematics); - to work in the economic and analytical services of the business sector of the economy, sociology, marketing companies in positions: expert in the study of markets (financial, commodity, etc.); statistician, business optimization consultant, risk assessment (additionally for the specialization "Business Mathematics")
Further learning	Possibility of obtaining education at the second (Master) level in Master's programmess in Mathematics (theoretical and applied), Statistics, interdisciplinary Master's programmess with a mathematical component.

5 – Teaching and assessment

Teaching and learning	Student-centered learning, individual-personality approach. Teaching is implemented through studies based on research, strengthening of practical orientation and creative orientation is made in the form of a combination of lectures, practical classes, independent study and research work using elements of discipleship training, solving applied tasks, implementing projects, educational and production practice, course work.
Assessment	An accumulative rating system that includes assessment of students for all types of classroom and non-auditing educational activity (current, module, final control); modular control works, individual calculation and design work, tests, credits, practice reports, course work, examinations, complex examinations.

6 - Programme competencies

Integral competence	Ability to solve complex mathematical problems and practical problems in professional activity or in the process of learning that pre-sees application of theories and methods of mathematics, statistics and computer technologies and is characterized by complexity and / or uncertainty of the conditions.
1.	**General competencies**
GC 1	**The ability to solve the problem in a comprehensive manner.** Understanding the task; the ability to penetrate the essence of the phenomenon, problems, problems, to identify the characteristic features, essential features and interrelations, to carry out analogies, to generalize; possessing a system, a holistic approach to the analysis and assessment of the situation and the solution of the problem.
GC 2	**Critical thinking.** The ability to evaluate critically the received information, the use of logic and rational measures, the completeness of the argument to assess the situation and the correctness of the chosen solution to the problem based on the text.
GC 3	**Creativity.** Openness to new knowledge, ideas and technologies; the ability to produce non-standard ideas, to approach creatively to solving a problem or performing a task.
GC 4	**Managerial skills.** The ability to organize own activities and manage time effectively; the ability to carry out leadership functions in the

	team in order to achieve the mutual goal; the ability to design and manage projects, to set goals, to adopt and implement solutions.
GC 5	**Interacting with others.** Readiness and ability to carry out projects within the group, to assume responsibility for joint work; the ability to debate, defending own point of view reasoned.
GC 6	**Communication.** The ability to written and oral communication in Ukrainian and at least in one of the most common European languages; ability to express clearly, be persuasive; skills of interpersonal relationships; skills of effective use of modern communication technologies.
GC 7	**Emotional intelligence.** Understanding your own emotional state, self-control and self-regulation; self-esteem and confidence; ability to overcome difficulties, resistance to stress; general optimistic mood, initiative, willingness to achieve positive results.
GC 8	**Cognitive Flexibility.** The ability to acquire new knowledge, skills and integrate them with existing ones; the ability to analyze the phenomenon, situation, problem, taking into account different parameters, factors, causes; the ability to adapt thinking to solve problems in changed circumstances or non-standard situations.
GC 9	**Targeting high score.** Internal need to work well; the ability to plan the stages and progress of the work to be performed, to evaluate and ensure the quality of the works under way, to present the results of the work and substantiate the proposed solutions at the modern scientific, technical and professional level.
GC 10	**Formulation of judgments and decision making.** The ability to orientate in different perspectives on the problem and ways of its solution, to form their own opinion; be able to formulate the task, to choose reasonably the optimal ways to solve it, analyze and comprehend the resulting solution, represent it convincingly.
GC 11	**Outlook.** The ability to orientate in different perspectives on the world and the place and role of man in it, the ability to have, justify own ideological position, the conviction of the fundamental importance for every person of free, self-evident self-determination; the ability to realize and understand the sociocultural differences in professional activity, to show tolerance to different cultures; awareness of the role of cognition and scientific knowledge for social development.
GC 12	**Civic position.** Understanding the regularities of socio-political, cultural and economic development of Ukraine in the world community, awareness of their professional, social and civic roles in these processes; awareness of personal responsibility for the team, to which you belong, the fate of your country.
2.	**Professional competencies**
PC 1	**Knowledge and understanding.** Fundamental knowledge of compulsory academic disciplines, including awareness of certain contemporary achievements, critical thinking of basic theories, principles, methods and concepts.
PC 2	**Logic-mathematical thinking**. The ability to conduct reasoning, observing laws and rules of mathematical logic.
PC 3	**Culture of proof.** The ability to conduct mathematical proofs on the basis of the axiomatic approach, the ability to distinguish plausible

	arguments from formally flawless.
PC 4	**Solving tasks.** The ability to solve typical and untypical tasks, problems in the field of professional activity and training, involving the application of theories, concepts, methods, innovative approaches, collection and interpretation of information (data), choice of tools.
PC 5	**Computing culture.** Skills of computing, including verbal, identical expression transformations, choice of rational methods and methods of calculations, transformations, effective use of technical means; the ability to explain in mathematical terms the results obtained during calculations.
PC 6	**Data analysis.** The ability to receive qualitative information on the basis of quantitative data; the ability to develop experimental and observational studies and to analyze the data obtained on their basis.
PC 7	**Research skills.** The ability to observe, to identify problems, to analyze, to compare, to classify, to generalize; creativity and ability to generate ideas; possession of modern methods of searching for targeted information; the ability to develop a research program and means of implementation.
PC 8	**Instrumental competencies.** The ability to formulate problems mathematically and in symbolic form in order to simplify their analysis and solution; the ability to understand and use mathematical means of visibility (graphs, diagrams, tables, diagrams, etc.) for illustration, interpretation, argumentation; the ability to use auxiliary tools and tools, especially information technology in education and professional activities; the ability to use computing tools for numerical and symbolic calculations and for setting and solving tasks.
PC 9	**Modeling.** The ability to apply mathematical facts, theorems, methods and algorithms, software packages to solving applied problems from various spheres of human life and society or branches of science: physics, computer science, economics, etc.; in particular, the ability to express the terms of a specific subject area of mathematics, to develop a mathematical model of the state of the real world and to transfer mathematical knowledge in non-thematic contexts; the ability to formulate tasks of optimization and decision making and interpret their solutions in the original context of these tasks; the ability to check the mathematical model for the adequacy of empirical data.
PC 10	**Communication.** The ability to provide mathematical reasoning and conclusions from them in a form suitable for the target audience, which is addressed, both verbally and in writing, as well as to understand the mathematical considerations of other persons involved in solving the same problem.
PC 11	**Fundamentals of pedagogical skill.** Possession of a complex of knowledge, abilities and other competencies (on psychology, pedagogy, mathematical, informatics disciplines, physics, methods of teaching mathematics, Ukrainian studies and ideological disciplines), which provides the ability to organize and conduct qualitative studies and educational work in a student's team.
3.	**Additional professional competences**

APC 1	**For specialization "Applied Mathematics".** The skills of the basics of modeling by modern mathematical methods from the sections of mathematics, the study of which is envisaged by the curriculum in the framework of this specialization, with the use relevant computer programs and information technologies including.
APC 2	**For specialization "Business Mathematics".** Skills for assessment and forecasting of business development prospects, financial status of business entities.

7 – Programme learning outcomes

PLO 1	To reproduce the historical development of mathematical knowledge and paradigms, to know modern trends in mathematics; to understand the civilization significance of mathematics and its applications, the nature of mathematical knowledge, the structure of mathematical knowledge, the reason for its effectiveness in other areas of activity.
PLO 2	To have the basics of legal and ethical relations and the basics of psychological peculiarities of behavior.
PLO 3	To reproduce key facts from different constituents of the subject, principles of modus ponens (rule for deriving logical expressions), and modus tollens (proof from supra), and to use conditions, formulation, conclusions, proofs and implications of mathematical statements in various constituents. parts of mathematics; using graphic and other means to explain, to argue, to illustrate, to interpret the content of mathematical statements.
PLO 4	To reproduce the basic knowledge of the fundamental sections of the subject in the amount necessary for the possession of the mathematical apparatus of the corresponding field of knowledge and the use of mathematical methods in the chosen profession.
PLO 5	To demonstrate understanding of interdisciplinary connections, the ability to find out the essence of the same concept (process, phenomenon) from the standpoint of various mathematical disciplines.
PLO 6	To have basic knowledge in the field of discrete mathematics, computer science and modern information technologies in the amount necessary for the mastering of general professional disciplines; to demonstrate the skills of using software tools and computer skills, the ability to create databases and use Internet resources.
PLO 7	To understand the role and significance of proof in mathematics, as well as the notion of essential, necessary, sufficient conditions; to be able to evaluate the completeness of the evidence base, to draw counterexamples to refute the false hypothesis or to find a logical error in the above considerations.
PLO 8	To have the basics of mathematical theories used in mathematical modeling.
PLO 9	To have solid knowledge of elementary mathematics, to be able to interpret them from the point of view of higher mathematics; to have knowledge of psychological and pedagogical disciplines, didactics in the amount necessary for professional activity.
PLO 10	To know and understand the limits of the application of various mathematical theories, methods, tools.
PLO 11	To explain mathematical concepts in a language understandable to non-specialists in the field of mathematics.
PLO 12	To communicate orally and in writing with the native language on professional issues, in particular, to provide comprehensive information, to put an idea, to explain the essence of the mathematical problem (task), the way of solution and the result; to read a special literature in a foreign language, to find, analyze and use information from various reference sources.
PLO 13	To adhere to the rules of ethical behavior in relation to other people, to adapt and communicate.

PLO 14	To carry out correctly logical considerations, to build up competently the proof of mathematical facts, using, among other things, classical methods of proof (from opposite, mathematical induction, constructive, etc.).
PLO 15	To possess methods of solving typical tasks; to demonstrate the ability to solve mathematical problems that persuade the integration of acquired theoretical knowledge, methods from different sections of mathematics, the desire and ability to solve the problem in different ways, to compare these methods; to solve problems with mathematical rigor and mathematical methods, to check the conditions for the implementation of mathematical statements, to transfer conditions and statements to new classes of objects.
PLO 16	To recognize mathematical structures in other (non-mathematical) theories; to formalize tasks formulated in the language of a particular subject field; to formulate their mathematical formulation and to choose a rational method of decision; to apply mathematical theorems and formulas from different sections of mathematics to solving applied problems of average complexity; to carry out basic transformations of mathematical models in order to solve mathematical and / or applied problems; to evaluate the accuracy and reliability of the results.
PLO 17	To use rational ways to search and use scientific and technical information, including electronic communications networks, to use informational resources, including electronic ones, to search for existing mathematical models.
PLO 18	To apply mathematical analysis methods to investigate the functions of one and many valid variables.
PLO 19	To possess methods of analytical, projective, differential geometry and topology.
PLO 20	To apply algebraic methods to study mathematical structures.
PLO 21	To apply the methods of the theory of differential equations for the study of dynamical systems.
PLO 22	To use the basic methods of probability theory, the theory of random processes and mathematical statistics to investigate random phenomena, test hypotheses, processing real data and analysis of long random phenomena.
PLO 23	To apply the methods of the theory of functions of a complex variable.
PLO 24	To solve the basic mathematical problems of data analysis, to apply basic general mathematical models for specific situations, information management skills, principles of computer software for statistical analysis of data.
PLO 25	To solve basic problems on your own with numerical data in various sections of mathematics, to verify the correctness of the answer, and transfer the correct solutions to similar tasks.
PLO 26	To demonstrate the ability to apply acquired knowledge in solving pedagogical, educational tasks, taking into account the age and individual-typological characteristics of students and socio-pedagogical situation.
PLO 27	To be able to provide educational process in mathematics at school, using advanced methods and technologies of teaching, to develop students' interest in mathematics and related sciences, to organize individual work with students on programs of different levels of studying mathematics (academic, professional, advanced).
PLO 28	To demonstrate the ability to apply the latest educational technologies in professional activities, readiness and ability through self-education, studying positive experiences, and enhancing their pedagogical skills.
PLO 29	To be able to formulate a mathematical / pedagogical problem, to find and analyze the correspondence between the set task and existing models, to choose reasonably the optimal ways of solution, to analyze and comprehend the solution obtained, to present

	the results of work and to substantiate the proposed solutions on modern scientific, technical and professional level.

Additional programme learning outcomes

APLO 1	**For specialization "Applied Mathematics".** To use the methods of disciplines studied within the framework of specialization (econometrics, operational calculations, variation numbers, financial mathematics, operations research, symbolic calculations and computer algebra), to solving light and medium complexity of applied tasks, in particular, optimization; to apply methods of mathematical physics for modeling real physical, biological, ecological, socio-economic and other processes and phenomena.
APLO 2	**For specialization "Business Mathematics**". To use the methods of disciplines studied in the specialization (econometrics, financial mathematics, operations research, forecasting methods) for analyzing and forecasting the prospects of business development, financial status of business entities in a market economy; to possess methods of mathematical and computer simulation of business processes.

8 - Resource support for the implementation of the programme

Staff support	Complies with Licensing Terms
Material and technical support	Specially equipped hardware-software, visual and methodological materials centers of competence development: center of living mathematics, center of modeling and programming, center of educational technologies.
Information, educational and methodological support	Library electronic resources, electronic scientific editions, electronic training courses with the possibility of distance learning and independent work, Microsoft cloud services.
9 – Academic mobility	
National Credit Mobility	
International Credit Mobility	Student mobility agreements were signed with Pomorskaya academy in Slupsk (Poland), Vilnius University (Lithuania) Erasmus + CA1 Program with Foggia University (Italy), University of Cadiz (Spain)
Training of foreign applicants for higher education	The license provides the training of foreigners and persons without citizenship.

II. The List of the Components of the Programme of Study (vocational) Mathematics and Their Logical Coherence

2.1 The List of the Components of the PS

Component Code	Components of the Programme of Study (academic discipline, practice, degree paper)	Credits ECTS	The Form of the Final Control
1	2	3	4
Compulsory components of PS			
Formation of general competencies			
ОД3.01	University Studies	4	credit
ОД3.02	Foreign Language	10	credit, exam
ОД3.03	Physical Education	4	credit, credit
ОД3.04	Ukrainian Studies	6	exam
ОД3.05	Philosophical Studies	4	exam
Formation of professional competencies			
ОДФ.01	Elementary Mathematics	11	exam, exam
ОДФ.02	Linear Algebra	5	exam
ОДФ.03	Mathematical Analysis 1	11	credit, exam
ОДФ.04	Computer Science	7	credit, exam
ОДФ.05	Analytical Geometry	5	credit
ОДФ.06	Algebra and Number Theory	5	exam
ОДФ.07	Fundamentals of Geometry	4	exam
ОДФ.08	Probability Theory and Mathematical Statistics	5	exam
ОДФ.09	Mathematical Analysis 2	11	credit, exam
ОДФ.10	General Physics	4	exam
ОДФ.11	Discrete Mathematics and Theory of Algorithms	4	exam
ОДФ.12	Projective Geometry and Image Methods	4	credit
ОДФ.13	Differential Equations	5	exam
ОДФ.14	Differential Geometry and Topology	5	exam
ОДФ.15	Complex Analysis	6	exam
ОДФ.16	Psychology	7	credit
ОДФ.17	Pedagogy	8	exam
ОДФ.18	Methodology of teaching mathematics	7	exam
ОДФ.19	Course paper on the methodology of teaching mathematics	1	credit
ОДФ.20	Course paper in Mathematics	1	credit
Total for theoretical training		*144*	-
Practice			
ОП.01	Educational (in Mathematics)	6	credit, credit
ОП.02	Productive (in Mathematics)	9	credit
ОП.03	Educational (pedagogical)	3	credit
ОП.04	Productive (pedagogical)	15	credit, credit
Total for practice		*33*	-
Attestation			
ОА.1	Complex Examination in Higher Mathematics	1,5	

ОА.2	Complex Examination on Psychology, Pedagogy and Methods of Teaching Mathematics	1,5	
Total amount of the compulsory components:		**180**	
Optional components of EP			
Sample block 1 (specialization "Applied Mathematics")			
ВДС.1.01	Econometrics	5	credit
ВДС.1.02	Symbolic Computing and Computer Algebra	5	credit
ВДС.1.03	Financial Mathematics	5	credit
ВДС.1.04	Operations Research	5	credit
ВДС.1.05	Operating Calculus	4	credit
ВДС.1.06	Variation Calculus	4	credit
ВДС.1.07	The Equation of Mathematical Physics	5	credit
ВДС.1.08	Methods of Solving Optimization Problems	4	credit
ВП.1.02	Productive practice in specialization	6	credit, credit
ВД.1	Free choice of academic disciplines from the course catalogue	17	credits
Total for specialization		60	
Sample block 2 (specialization "Business Mathematics")			
ВДС.2.01	Econometrics	5	credit
ВДС.2.02	Market economy	5	credit
ВДС.2.03	Financial Mathematics	5	credit
ВДС.2.04	Operations Research	5	credit
ВДС.2.05	E-business	4	credit
ВДС.2.06	Methods of Forecasting	4	credit
ВДС.2.07	Mathematical and Computer Simulation of Business Processes	5	credit
ВДС.2.08	Methods of Solving Optimization Problems	4	credit
ВП.2.02	Productive practice in specialization	6	credit
ВД.2	Free choice of academic disciplines from the course catalogue	17	credit
Total for specialization		60	
Sample block 3 (without specialization)			
	Free choice of academic disciplines from the course catalogue	60	credit
Total amount of the optional components		**60**	
TOTAL AMOUNT OF THE PROGRAMME OF STUDY		**240**	

2.2 Structural Logical Scheme of the Programme of Study (Vocational) Social Communications

1st year		2nd year		3rd year		4th year
Formation of general competencies						
University Studies *4 credits*		Ukrainian Studies *6 credits*	Philosophical Studies *4 credits*			
Foreign Language *5 credits* *5 credits*						
Physical Education *2 credits* *2 credits*						
Formation of professional competencies						
Elementary Mathematics *4 credits* *7 credits*			General Physics *4 credits*		Psychology *7 credits*	Productive practice (in Mathematics) *9 credits*
Linear Algebra *5 credits*		Algebra and Number Theory *5 credits*			Pedagogy *8 credits*	Productive practice (pedagogical) *15 credits*
	Analytical Geometry *5 credits*	Fundamentals of Geometry *4 credits*	Projective Geometry and Image Methods *4 credits*		Methodology of Computer Science education *8 credits coursework*	

				Differential Geometry and Topology *5 credits*	Educational practice (pedagogical) *3 credits*	
Mathematical Analysis 1 *6 credits* *5 credits*		Mathematical Analysis 2 *5 credits* *6 credits*		Differential Equations *5 credits*		
Computer Science *4 credits* *3 credits*		Probability Theory and Mathematical Statistics *5 credits*	Discrete Mathematics and Theory of Algorithms *4 credits*	Complex Analysis *6 credits*		
			Coursework in Mathematics *1 credit*			

	Educational practice (in Mathematics) *3 credits*		Educational practice (in Mathematics) *3 credits*		Attestation 1)Complex Examination in Higher Mathematics 2)Complex Examination on Psychology, Pedagogy and Methods of Teaching Mathematics *3 credits*	
		Specialization (Applied Mathematics/Business Mathematics)				
		Free choice of academic disciplines from the course catalogue *5 credits* *4 credits*	Compulsory disciplines *10 credits*	Free choice of academic disciplines from the course catalogue *4 credits*	Compulsory disciplines *27 credits*	
			Free choice of academic disciplines from the course catalogue *4 credits*		Practice in specialization *3 credits*	Practice in specialization *3 credits*

III. Form of Attestation of Higher Educational Learners

The graduate students majoring in 111 Mathematics (Programme of Study (Vocational) Mathematics) get attestation in the form of complex examination on higher mathematics and a complex examination on psychology, pedagogy and teaching methods of mathematics and they are given the document of the state standard issued to confirm that they are awarded with the degree and education qualification of: Bachelor of Mathematics.

The attestation is performed openly and publicly.

IV. Matrix of the Programme Competence Compliance with the Programme Components

	ОД3.01	ОД3.02	ОД3.03	ОД3.04	ОД3.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
GC1	•				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•		•	•		•		•			
GC2					•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
GC3	•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
GC4		•		•					•												•	•		•	•		•	•	•			
GC5	•																				•	•	•	•	•		•		•			
GC6		•		•																	•	•						•	•			
GC7	•																				•											
GC8						•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•									
GC9	•	•	•																		•	•				•	•	•	•			
GC10					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
GC11	•			•	•																						•		•			
GC12	•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
PC1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•									
PC2						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•								
PC3						•	•	•		•	•	•	•	•		•	•	•	•	•			•									
PC4						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
PC5						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
PC6						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•	•							
PC7						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•				
PC8						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•	•	•		•				
PC9						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•	•	•						
PC10	•	•		•		•	•	•	•	•	•	•	•	•		•	•	•	•	•			•	•	•		•		•				
PC11	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•				
APC1						•	•	•	•	•	•		•	•	•	•	•	•	•	•					•					•			
APC2						•	•	•	•	•	•		•	•		•		•							•						•		

Programme Competencies: GC – general competence, PC – professional competence, APC – additional professional competence

V. Matrix of Providing Programme Learning Outcomes with the Relevant Programme Components

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
PLO1	•				•			•				•	•	•	•	•		•	•	•					•		•				
PLO2	•																				•	•									
PLO3						•	•	•		•	•	•	•	•		•	•	•	•	•			•		•						
PLO4							•	•		•	•		•	•				•	•	•										•	•	
PLO5						•	•	•	•	•	•		•	•	•		•	•	•	•					•	•	•					
PLO6				•												•									•	•	•					
PLO7						•	•	•		•		•		•		•		•	•	•												

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
PLO 8							•	•		•			•	•		•		•	•	•												
PLO 9						•															•	•	•	•				•	•			
PLO 10						•	•	•		•	•	•	•	•		•	•	•	•	•					•							
PLO 11						•	•	•		•	•	•	•	•		•	•	•	•	•			•									
PLO 12	•	•		•		•	•	•		•	•	•	•	•		•	•	•	•	•			•									
PLO 13	•	•	•	•	•																•	•										
PLO 14						•	•	•		•	•		•	•		•	•	•	•	•												

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
PLO 15						•	•	•		•	•		•	•		•	•	•	•	•												
PLO 16						•	•	•		•	•		•	•	•	•		•	•	•											•	•	
PLO 17									•																							
PLO 18								•						•																		
PLO 19										•		•					•		•													
PLO 20							•				•																					
PLO 21																		•														

	ОДЗ.01	ОДЗ.02	ОДЗ.03	ОДЗ.04	ОДЗ.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
PLO 22													•																			
PLO 23																				•												
PLO 24				•									•																			
PLO 25						•	•	•		•	•		•	•		•		•		•						•	•					
PLO 26			•																		•	•	•	•								
PLO 27																					•	•	•	•				•	•			
PLO 28																							•	•				•	•			

	ОД3.01	ОД3.02	ОД3.03	ОД3.04	ОД3.05	ОДФ.01	ОДФ.02	ОДФ.03	ОДФ.04	ОДФ.05	ОДФ.06	ОДФ.07	ОДФ.08	ОДФ.09	ОДФ.10	ОДФ.11	ОДФ.12	ОДФ.13	ОДФ.14	ОДФ.15	ОДФ.16	ОДФ.17	ОДФ.18	ОДФ.19	ОДФ.20	ОП.01	ОП.02	ОП.03	ОП.04	ВБ.1	ВБ.2	ВБ.3
PLO 29			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•		•		•	•	•	
APLO 1																														•		
APLO 2																															•	