MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
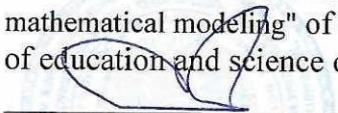## KARAGANDY BUKETOV UNIVERSITY

«AGREED »
Director Republican state enterprise on the right of economic management
"Institute of mathematics and
mathematical modeling" of the committee of science of the ministry
of education and science of the Republic of Kazakhstan

_____ M.A.Sadybekov

« 28 » 03 2022.

«APPROVED»
Chairman of the Board - Rector

_____ N.O.Dulatbekov

« 26 » 05 2022.

«AGREED»
Director NIS of Chemistry and Biology
directions of Karaganda

_____ R.M.Yakupov

«___»_____20___.

EDUCATIONAL PROGRAM

7M05401–«Mathematics»

Level: Magistracy

Karaganda, 2022

The educational program "7M05409201-Mathematics " was developed on the basis of:

- the Law of the Republic of Kazakhstan of July 27, 2007 No. 319-III "About education"

- the Law of the Republic of Kazakhstan of July 11, 1997 No. 151-I. "About languages in the Republic of Kazakhstan" ,

- the State Compulsory Standard of Postgraduate Education of August 31, 2018 No. 604

– a national frame of qualifications of March 16, 2016 the Republican tripartite commission on social partnership and regulation of the social and labor relations.

- Order of the Ministry of Education and Science of the Republic of Kazakhstan "On approval of the Rules for the organization of the educational process on credit technology of education" dated October 2, 2018 No. 152

– the classifier of areas of training with higher and postgraduate education from October 13, 2018. No. 569.

- professional standard "Teacher" (Addendum to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated June 8, 2017 No. 133)

Recommended by the decision of the Academic Council of the University for entry into force on September 1, 2020.

Content:

Passport of the educational program:«7M05401-Математика»

1. Code and name of the educational program: "7M05401-Mathematics"
2. Code and classification of the field of education, areas of training: 7M05 Natural Sciences, Mathematics and Statistics, 7M054 Mathematics and Statistics
3. Group of educational programs: M092 Mathematics and Statistics
4. Volume of loans:120 ECTS
5.: Form of study full-time
6. Language of instruction: Kazakh, Russian
7. Degree awarded: "Master of Natural Sciences" in the educational program "7M05401-Mathematics"
8. Type of OP: current
9. ISCED level (International Standard Classification of Education) – Level 7;
10. Level of NQF (National Qualifications Framework) – Level 7;
11. OORC level (Industry Qualifications Framework) – Level 7.
12. Distinctive features of OP:no
13. Number of the appendix to the license training direction: LICENSYKZ83LAA00018495, AppendixNo. 016, date of issue 28.07.2020
14. The name of the accreditation body and the validity period of the accreditation of the OP: Certificate of institutional accreditation of NAOKO IA No. 0086 dated 02.04.2018 - 31.03.2023.
15. The purpose of the OP: Training, taking into account the prospects for the development of the country, competitive specialists of a new formation with fundamental knowledge, innovative approaches, research skills to carry out scientific, pedagogical, professional and practical activities in higher educational institutions, educational management bodies, educational organizations, research centers.
16. Qualification characteristics of the graduate in the OP "7M05401-Mathematics"
a)List of graduate positions:
   - university lecturer,
   - researcher,
   - statistical analyst,
   -mathematician-programmer
b)The sphere of professional activity of graduates of the educational program "7M05401- Mathematics" are:
   - higher educational institutions,
   - research institutes,
   - design, technological and design organizations,
   - bodies of the state administrative management system.

The objects of professional activity of undergraduates under the educational program "7M05401- Mathematics" are:
- pedagogical process of universities,
- methodical and administrative work in educational institutions;
- research work in areas related to the use of mathematics.

c) Types of professional activity of the graduate:

Undergraduates of education under the educational program "7M05401-Mathematics" can perform the following types of professional activities:
- research;
- administrative and managerial (analyst, strategist in the field of science, education and high technologies);
- expert advisory (examination of scientific articles and projects, scientific management of master's theses, application of elements of innovation in the scientific and technical field).

d) Functions of professional activity of the graduate:

Undergraduates of education under the educational program "7M05401-Mathematics" can perform the following functions:
- scientific research,
- educational (pedagogical)
- production and technological
-organizational and managerial

17. Formulation of learning outcomes based on competencies

Type of competencies	Learning result code	Learning result (according to Bloom's taxonomy)
Behavioral skills and personal qualities: (Softskills)	**LO1**	Demonstrates current knowledge of modern history and philosophy of science, applied natural science disciplines that contribute to the implementation of the main directions of modernization of public consciousness. He is able to form and solve problems that arise in the pedagogical process and require in-depth pedagogical knowledge; analyze and comprehend the realities of modern theory and practice of higher education.
Professional competencies: (Hardskills)	**LO2**	He is able to use numerical methods to solve differential equations and problems of mathematical physics. Demonstrates current knowledge about loaded differential equations and their classification, connection with inverse problems, reduction of boundary value problems to special integral equations, characteristic integral equations. Has the skills of reducing boundary value problems to special integral equations, applying the regularization method.
	LO3	Capable of abstract thinking, analysis, synthesis; the ability to use in management activities, strives for objectivity, tolerance, attentiveness and tolerance in solving controversial, conflict situations. Applies methodological and methodical knowledge in conducting scientific research, pedagogical and educational work. Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students. Has the skills of designing and analyzing the management of the holistic pedagogical process of educational organizations.
	LO4	Has a clear understanding of the language of manifolds and external differential forms, integration problems on manifolds and their applications. Has fundamental knowledge of stochastic analysis. Uses the methodology of describing random processes and phenomena for optimal results in solving applied problems using mathematical tools.
	LO5	He knows the basic concepts and methods of the theory of topological spaces and their most important example – metric spaces. He is able to solve problems of the theory of metric and topological spaces, is able to independently search for relevant information necessary both in the process of studying this discipline and in the study and writing of a master's thesis. Has the skills of geometric interpretation of abstract results.
	LO6	Knows the properties of the approximation module, continuity, direct and inverse theorems of approximation theory. Applies methods for determining the best approximations of various spatial elements, methods for calculating the modulus of continuity of a function, theorems of approximation theory. He is able to analyze studies related to approximation theory, determine the differential properties of a function, and draw conclusions about the relationship of functional spaces.
	LO7	Analyzes, processes, generalizes and reproduces information and phenomena; correctly uses socially marked linguistic units of the language being studied. He is able to communicate freely, easily and convincingly in verbal and non-verbal form in three languages to solve the tasks of professional activity. Knows and understands the functional features of oral and written professionally-oriented texts, including scientific and technical ones. Uses foreign terminology for reading, speaking, listening, writing in professional communication. Owns the technique of translating professionally-oriented text. He is able to solve boundary value problems for the heat equation in regions degenerating into a point at the initial or final moment of time; to solve singular Volterra integral equations of the second kind; to investigate the issues of their solvability. Has the skills of modeling physical processes of boundary value problems for the heat equation, owns the methods of research and analysis of installation problems.
	LO8	Knows the basic concepts of structural and constructive properties of mastered functions. It is able to analyze the structural and constructive properties of functions, to use in the analysis of advanced scientific literature in scientific research.
	LO9	Knows the theoretical foundations of the subjects studied in the learning process and their application in research activities in the development of mathematical models, algorithms for solving the problem set in the master's thesis, tasks. Owns the methods of searching and selecting sources of information; using the basic techniques of research activities, conducting an experiment. Knows the general scientific methodology, logic and technology of research work.
	LO10	Knows the peculiarities of presenting the results of scientific activity in oral and written form when working in national and

		international research teams. He is able to identify and systematize the main ideas in scientific texts; critically evaluate any incoming information, regardless of the source; avoid the automatic application of standard formulas and techniques when solving problems, conduct scientific discussion, demonstrate the ability of public speaking. Has the skills of working with bibliographic reference books, compiling scientific bibliographic lists, using bibliographic descriptions in scientific papers, designing and carrying out complex research, knowledge of modern methods and principles of developing scientific problems on the topic of scientific qualification work. He is able to develop models, algorithms for solving a specific problem, task; find a solution, get results and interpret them; systematize the necessary materials of a master's thesis.
	LO11	Knows the basic concepts and results of model theory concerning types, categorical theories, saturated and simple models, is able to formulate mathematically correctly and prove theorems describing the behavior of countable models of complete theories.. Has the skills of applying the semantic properties of theories to study their model classes. He is able to prove basic theorems and solve typical problems of group theory. Has skills of working with finite and finitely generated Abelian groups; professional thinking necessary to use methods of group theory.
Digital competencies: (Digitalskills):	**LO12**	Knows the basic methods and models of commercialization of innovative technologies. Applies in practice modern methods of analysis of innovative solutions to applied problems of scientific and scientific-technical developments. Owns the technology of commercialization of the results of scientific research and innovative developments in the IT field. He is able to use pedagogical approaches, educational materials in accordance with the latest innovations in mathematics and education. Possesses modern didactic and methodological tools to achieve successful learning outcomes.

18. Determination of modules of disciplines in accordance with the results of training

Learning result code	Name of the module	Name of disciplines	Volume (ECTS)
LO 1, LO3, LO 9, LO10, LO12	World view bases and pedagogics	History and science philosophy	4
		Pedagogics of higher school	4
		Management psychology	4
		Pedagogical practice	4
LO 4, LO7, LO 8, LO10	Professional languages	Foreign language (professional)	4
		Professional foreign terminology in mathematics Technical literature in mathematics in a foreign language	5
LO 1, LO 3, LO 5, LO9, LO12	Modern questions of science and technique	High-tech innovative entrepreneurship Commercialization of results of scientific and scientific and technical activity	5
		Innovatika in mathematics Distance learning technologies in teaching mathematics in higher education	5
LO 2, LO4, LO5, LO7, LO8, LO9, LO 11	Fundamental mathematics	Mathematical analysis on varieties and the stochastic analysis	4
		Differential equalizations, mathematical physics and numeral methods of their decisions	4
		Theories and their classes of models (in English language)	4
LO 1, LO2, LO3, LO4, LO5, LO 6, LO7, LO8, LO11, LO12	Quality questions of analysis, geometry and differential equalizations	Technique of teaching mathematical subjects mathematics inhigher school Theory and methods of teaching mathematics	4
		Introduction to the theory of approaching Embedding theory of function spaces	4
		Functional-differential equations Loaded differential equalizations	5
		Selected issues of Group Theory (in English language) Ring and modules (in English)	4

		Structural and structural properties of functions Function approximation theory	4
		Boundary value problems of heat conduction in degenerating domains (in English language) Singular integral equations for heat boundary value problems	4
LO3, LO8, LO9, LO 10, LO12	Research work	Research practice	12
LO1, LO 3, LO8, LO9, LO10, LO 12		Undergraduate research work, including internship and master thesis (URWIIMT)	24
LO 1, LO 8, LO 9, LO10, LO 12	Final examination	Registration and defence of master	12

19. Matrix of achievability of learning outcomes

NN п/п	Name of the disciplin	Brief description of the discipline (30-40 words)	Number of credits	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO10	LO11	LO12
				Generated learning outcomes (codes)											
D1	History and science philosophy	The history and philosophy of science as the study of the general laws of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Science as a cognitive activity and tradition, as a social institution and as a special sphere of culture.	4	+											
D2	Pedagogics of higher school	Основные принципы содержания высшего образования, современные дидактические концепции в высшем образовании; особенности пLOек-тиLOвания и организации педагогического пLOцесса в университете, современные образовательные технологии; основы педагогического мастерства и педагогической техники, менеджмент в образовании, управление пLOцессом формиLOвания и развития личности обучающегося.	4	+		+									+
D3	Management psychology	As a result of mastering the program of the course "Psychology of Management", magicians should know: basic concepts, theoretical positions and actual problems of management psychology; theoretical features of management psychology; personal characteristics of the head; the peculiarities of communication between the head and subordinates in the organization; be able to: determine the main aspects of management psychology.	4	+		+									
D4	Foreign language (professional)	Formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level; formulation and reasoned statement of their position, using the language means of the languages studied; possession of business speech skills in the professional sphere of communication.	5										+		
D5	Professional foreign terminology in mathematics Technical literature in mathematics in a foreign language	The basic conceptual apparatus of mathematics. The main professional foreign terminology: algebra, geometry, analysis, mathematical logic. Lexical problems of translation of technical texts. Grammatical problems of translation of technical texts. How to write an article on mathematics in English. The discipline studies the basics, characteristics, principles and aspects of studying and translating technical literature in mathematics, key grammatical phenomena and difficulties in studying and translating technical texts, features of technical and business style in mathematics, taking into account their oral and written forms.	5				+			+	+				
D6	Commercialization of results of scientific and scientific and technical activity	Fundamentals of commercialization of research results; stages of preparation of research results for commercialization, basic theoretical knowledge about the use of information technologies in the organization of project work, mechanisms for the protection of intellectual property, technology of commercialization of the results of scientific and scientific-technical activities.	5									+			+

Code	Subject	Description																				
	High-tech innovative entrepreneurship	Strategic planning and management of knowledge-intensive industries. Modern approaches and trends in the management of knowledge-intensive investment design. Theoretical foundations of the organization of high-tech production. Organizational structures of management of high-tech industries and enterprises at the present stage. Traditional methods and modern standards of knowledge-intensive production management.																				
D7	Innovatika in mathematics	This course covers the following sections: the use of modern technologies in mathematics lessons, pedagogical innovation processes, theoretical foundations of the use of information technologies in the educational process, historical aspects of computerization of the learning process, problems of technology in the educational process, new technologies of teaching in mathematics lessons.	5	+				+			+							+				
	Distance learning technologies in teaching mathematics in higher education	The concept of distance learning in the school system. Technical requirements for the organization of distance learning. Pedagogical principles of the organization of distance education. Methods of organizing the educational process in online and offline modes. Methods of distance education. The main types of distance learning: video lectures, conferences, webinars, chats.																				
D8	Mathematical analysis on varieties and the stochastic analysis	Данный курс охватывает следующие разделы: Язык многообразий и внешние дифференциальные формы. ПLOблема интегриLOвания с общей точки зрения. Общая теорема Стокса и ее приложения в различных разделах физики, техники, теории многообразий и теории интегриLOвания. Важнейшие классы случайных пLOцессов. Элементы случайного анализа.	4					+	+							+	+					
D9	Differential equalizations, mathematical physics and numeral methods of their decisions	Theorems of the existence and uniqueness of the solution of the boundary value problem. An algorithm for constructing solutions to the Cauchy problem and boundary value problems for linear differential and integro-differential equations. Boundary value problems for parabolic equations in a domain with an irregular boundary. Boundary value problems for equations with discontinuous coefficients.	4			+								+			+					
D10	Theories and their classes of models (in English language)	Compactness theorem, completeness theorem, Voot's theorem, existence theorem of atomic models, uniqueness theorem for atomic models, existence theorem of countably saturated models, description theorem of countably categorical theories, elementary equivalence, atomic model, simple model, countably simple model, countably saturated model, elementary embeddings, type of theory.	4														+			+		
D11	Technique of teaching mathematical subjects mathematics inhigher school	Goals and objectives of the methodology of teaching mathematical disciplines in higher education. Mathematical education in higher education. Fundamentals of higher school didactics. Psychological and pedagogical bases of methodical activity of a higher school teacher. Methods and forms of organization of mathematics education at the university. Fundamentals of pedagogical control in higher education.	4	+				+													+	
	Theory and methods of	The methodology of teaching mathematics consists in the study of the main																				

Code	Discipline	Content												
	teaching mathematics	components of the system of teaching mathematics at school and the connections between them. The main components are understood as the goals, content, methods, forms and means of teaching mathematics. The subject of the methodology of teaching mathematics is the goals and content of mathematical education, methods, means and forms of teaching mathematics.												
D12	Introduction to the theory of approaching	Sections of the analysis, in which approximations of this function are considered by functions with better properties and an estimate of the resulting error. When studying this discipline, undergraduates will gain knowledge about the best approximation of an element of a normalized space, the properties of the best approximation, and general theorems about the element of the best approximation.	4		+			+	+					
	Embedding theory of function spaces	The fundamentals of the theory of Sobolev spaces are presented. It contains embedding theorems of different metrics and different dimensions for whole-order Sobolev spaces in the case of bounded and unbounded domains, elements of trace theory and theory of non-integer Sobolev spaces.												
D13	Loaded differential equalizations	Loaded differential equations and their classification. Connection with inverse problems. Loaded differential operator equations of the first order. Loaded equations with periodic boundary conditions. Spectral-loaded parabolic equations in an unbounded domain. A task with a constant speed of movement of the load point.	5		+	+		+						
	Functional-differential equations	On the spectrum of operators and their conjugates. A task with a variable speed of movement of the load point. The second boundary value problem for a "substantially" loaded parabolic equation. The Cauchy problem with a time load. On the dimension of the kernel of the Cauchy problem operator. Class and criterion of unambiguous solvability.												
D14	Selected issues of Group Theory (in English language)	The simplest information of group theory. Normal subgroups and quotient groups. Homomorphism. Direct product of groups. Transformation groups. A free group. Free works of groups. Finite Abelian groups. Finitely generated Abelian groups.	4									+		
	Ring and modules (in English)	The concept of a group, an abelian group, a ring, a field, an ideal, examples. Module over a ring, module submodule, submodule generated by a set, module homomorphism, isomorphic modules, direct sum and direct product of a family of modules, kernel of module homomorphism, types of modules over a ring. The homomorphism theorem of modules.												
D15	Structural and structural properties of functions	The relationship of structural properties (differentiability, smoothness) of functions with constructive ones (the nature of approximation in one way or another) is considered. Lebesgue space and trigonometric polynomials, Dirichlet kernel and its norm, higher-order function differences and modulus continuity, approximation by trigonometric polynomials, embedding theorems for Nikolsky classes.	4				+	+		+				

	Function approximation theory	General theorems of the existence and uniqueness of the element of the best approximation. The criterion of the element of the best approximation in the Lebesgue space. Approximation in space in Lebesgue space. Direct and inverse theorems of approximation theory. Bernstein's inequality. Approximations of Sobolev classes by Feyer sums in a uniform metric.															
D16	Boundary value problems of heat conduction in degenerating domains (in English language) Singular integral equations for heat boundary value problems	The course is devoted to the study of the first boundary value problem for the heat conduction equation in degenerate domains: the formulation of the problem, its reduction to the singular Volterra integral equation of the second kind using thermal potentials, its solution by regularization, determination of the uniqueness classes of the solution. The singular Volterra integral equation of the second kind is investigated, to which, due to the "incompressibility" of the kernel, the classical method of successive approximations is inapplicable. It is shown that the corresponding homogeneous equation at $|\lambda| > 1$ has a continuous spectrum.	4		+					+						

20. Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LO1	Demonstrates current knowledge of modern history and philosophy of science, applied natural science disciplines that contribute to the implementation of the main directions of modernization of public consciousness. He is able to form and solve problems that arise in the pedagogical process and require in-depth pedagogical knowledge; analyze and comprehend the realities of modern theory and practice of higher education.	Lecture Practice Analysis and problem solving Exercises	Test control Written control Colloquium Express survey
LO2	He is able to use numerical methods to solve differential equations and problems of mathematical physics. Demonstrates current knowledge about loaded differential equations and their classification, connection with inverse problems, reduction of boundary value problems to special integral equations, characteristic integral equations. Has the skills of reducing boundary value problems to special integral equations, applying the regularization method.	Lecture Practice Analysis and problem solving Exercises	Test control Written control Colloquium Express -survey
LO3	Capable of abstract thinking, analysis, synthesis; the ability to use in management activities, strives for objectivity, tolerance, attentiveness and tolerance in solving controversial, conflict situations. Applies methodological and methodical knowledge in conducting scientific research, pedagogical and educational work. Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students. Has the skills of designing and analyzing the management of the holistic pedagogical process of educational organizations.	Discussion Round table Interactive lecture Oral presentation	Testing Oral interview Preparation of the abstract Writing an essay
LO4	Has a clear understanding of the language of manifolds and external differential forms, integration problems on manifolds and their applications. Has fundamental knowledge of stochastic analysis. Uses the methodology of describing random processes and phenomena for optimal results in solving applied problems using mathematical tools.	Interactive lecture Practical work Analysis and problem solving Exercises	Test control Written control Colloquium Calculation and graphic task
LO5	He knows the basic concepts and methods of the theory of topological spaces and their most important example – metric spaces. He is able to solve problems of the theory of metric and topological spaces, is able to independently search for relevant information necessary both in the process of studying this discipline and in the study and writing of a master's thesis. Has the skills of geometric interpretation of abstract results.	Interactive lecture Practical work Analysis and problem solving Exercises	Test control Written control Colloquium Calculation and graphic task
LO6	Knows the properties of the approximation module, continuity, direct and inverse theorems of approximation theory. Applies methods for determining the best approximations of various spatial elements, methods for calculating the modulus of continuity of a function, theorems of approximation theory. He is able to analyze studies related to approximation theory, determine the differential properties of a function, and draw conclusions about the relationship of functional spaces.	Interactive lecture Practical work Analysis and problem solving Exercises	Test control Written control Colloquium Presentation
LO7	Analyzes, processes, generalizes and reproduces information and phenomena; correctly uses socially marked linguistic units of the language being studied. He is able to communicate freely, easily and convincingly in verbal and non-verbal form in three languages to solve the tasks of professional activity. Knows and understands the functional features of oral and written professionally-oriented texts, including scientific and technical ones. Uses foreign terminology for reading, speaking, listening, writing in professional communication. Owns the technique of translating professionally-oriented text. He is able to solve boundary value problems for the heat equation in regions degenerating into a point at the initial or final moment of time; to solve singular Volterra integral equations of the second kind; to investigate the issues of their solvability. Has the skills of modeling physical processes of boundary value problems for the heat equation, owns the methods of research and analysis of installation problems.	Discussion Round table Interactive lecture Oral presentation	Testing Oral interview Preparation of the abstract Writing an essay
LO8	Knows the basic concepts of structural and constructive properties of mastered functions. It is able to	Discussion	Testing

		Round table Interactive lecture Oral presentation	Oral interview Preparation of the abstract Writing an essay
	analyze the structural and constructive properties of functions, to use in the analysis of advanced scientific literature in scientific research.		
LO9	Knows the theoretical foundations of the subjects studied in the learning process and their application in research activities in the development of mathematical models, algorithms for solving the problem set in the master's thesis, tasks. Owns the methods of searching and selecting sources of information; using the basic techniques of research activities, conducting an experiment. Knows the general scientific methodology, logic and technology of research work.	Interactive lecture Practical work Analysis and problem solving Exercises	Тестовый контLOль Письменный контLOль Коллоквиум Презентация
LO10	Knows the peculiarities of presenting the results of scientific activity in oral and written form when working in national and international research teams. He is able to identify and systematize the main ideas in scientific texts; critically evaluate any incoming information, regardless of the source; avoid the automatic application of standard formulas and techniques when solving problems, conduct scientific discussion, demonstrate the ability of public speaking. Has the skills of working with bibliographic reference books, compiling scientific bibliographic lists, using bibliographic descriptions in scientific papers, designing and carrying out complex research, knowledge of modern methods and principles of developing scientific problems on the topic of scientific qualification work. He is able to develop models, algorithms for solving a specific problem, task; find a solution, get results and interpret them; systematize the necessary materials of a master's thesis.	Lecture Practice Analysis and problem solving Exercises	Test control Written control Colloquium Express survey
LO11	Knows the basic concepts and results of model theory concerning types, categorical theories, saturated and simple models, is able to formulate mathematically correctly and prove theorems describing the behavior of countable models of complete theories.. Has the skills of applying the semantic properties of theories to study their model classes. He is able to prove basic theorems and solve typical problems of group theory. Has skills of working with finite and finitely generated Abelian groups; professional thinking necessary to use methods of group theory.	Discussion Round table Interactive lecture Oral presentation	Testing Oral interview Preparation of the abstract Writing an essay
LO12	Knows the basic methods and models of commercialization of innovative technologies. Applies in practice modern methods of analysis of innovative solutions to applied problems of scientific and scientific-technical developments. Owns the technology of commercialization of the results of scientific research and innovative developments in the IT field. He is able to use pedagogical approaches, educational materials in accordance with the latest innovations in mathematics and education. Possesses modern didactic and methodological tools to achieve successful learning outcomes.	Interactive lecture Practical work Analysis and problem solving Exercises	Test control Written control Colloquium Presentation

21. Criteria for assessing the achievability of learning outcomes

CodesofLO	Criteria
LO1	Knows: conceptual and theoretical foundations of mathematics, their place in the general system of sciences and values, the history of development and the current state
	Can: apply knowledge of fundamental and applied mathematics to solve mathematical problems, to interpret phenomena and processes in nature
	Owns: basic mathematical concepts, definitions, theorems and methods of their proofs, methods, techniques, algorithms and ways of applying modern mathematical apparatus.
LO2	Knows: basic mathematical concepts, definitions, theorems and methods of their proofs, methods, techniques, algorithms and ways of applying modern mathematical apparatus.
	Can: He is able to use the acquired knowledge for independent analysis of boundary and extreme problems, to build mathematical models of boundary and extreme problems based on analytical methods
	Owns: the basic concepts of the theory of partial differential equations of the second order; methods of finding solutions to differential equations, differential and integral calculus in the study of functions and convergence of series, in solving boundary and extreme problems in various fields of modern natural science
LO3	Knows the basic definitions and theorems of the theory of functional and real analysis, the theory of functions of a complex variable, algebra, geometry and number theory, the theory of differential and integral equations, the theories of differentiable manifolds and partial differential equations
	Can: he is able to apply algebraic and geometric apparatus, apparatus of functional and real analysis, analytical methods for solving problems, acquired knowledge in production practice for solving and researching problems, proof of the results obtained
	Owns:he has the methodological foundations of modern science, is able to adapt natural science knowledge and skills to the goals and objectives of mathematical education, professional and general scientific terminology
LO4	Knows the conceptual and theoretical foundations of model theory, probability theory and mathematical statistics, their place in the general system of sciences and values, the history of development and the current state
	Can: how to use modern probabilistic and statistical tools to solve applied problems
	Owns: a system of knowledge about fundamental mathematical laws and theories in the field of model theory, probability theory and mathematical statistics
LO5	He knows the main types of algebraic structures, both classical and constructions of modern universal algebra, the most important theorems related to specific classes of algebras and universal algebras
	Can:he is able to use knowledge of the basics of algebra and number theory to translate information from natural language into the language of mathematics and vice versa; apply knowledge of the basics of algebra and number theory in describing processes and phenomena in various fields of knowledge, formulate and prove the main results related to algebraic systems, use the language of mathematical logic to formulate typical statements related to classes algebras and algebraic systems
	Owns:concepts and methods of algebra and number theory at a level that allows to formulate and solve model-theoretic problems and problems related to various algebraic systems; skills of formalization of theoretical and applied practical problems, basic constructions available in the apparatus of general algebra
LO6	Knows fundamental physical laws and theories, physical essences of phenomena and processes in nature and technology formulation and mathematical expression of physical laws; principles of operation of physical devices and mechanisms
	Can appeal to data from experimental and theoretical physics, fundamental and applied physics, and mathematical modeling of physical processes; use the laws of physics to explain various phenomena in nature and technology
	Owns: has the following skills: apply theoretical knowledge of physics in practical activities and everyday life
LO7	He knows the laws of mechanics, molecular physics, electricity and magnetism, optics, atomic physics and physical phenomena; experimental and theoretical mechanics, the influence of physics as a science on the development of technology; the connection of physics with other sciences
	Can solve typical problems based on the laws studied and using well-known formulas; assemble an installation; can make tables of the dependence of quantities

	and build graphs
	Owns:has the skills to conduct observations, plan and perform experiments, put forward hypotheses and build models, apply the knowledge gained in physics to explain a variety of physical phenomena and properties of substances; practical use of physical knowledge; evaluate the reliability of natural scientific information
LO8	Knows the essence and features of pedagogy as a science, its methodological foundations and pedagogical approaches; the essence and main characteristics of modern teaching methods and technologies
	Can :is able to apply the methods of pedagogical research in the analysis of real reality from a pedagogical perspective; use the criterion-based assessment system to achieve the learning goals of the updated curriculum.
	Owns: has the following skills: substantiate the legitimacy of implementing various educational paradigms in pedagogical practice (knowledge — based and humanistic; technocratic — cultural; societal — human — oriented; pedocentric-child-centered)
LO9	Knows modern approaches to modeling scientific and pedagogical activities; the basics of teaching and methodical work in higher education
	Can he is able to analyze the difficulties that arise in pedagogical activity and develop an action plan to resolve them; present subject material on the interrelationships between research and educational processes in higher education, including the possibility of attracting his own scientific research as a means of improving the educational process.
	Owns: the technique of using technical training tools when conducting classes in academic disciplines; methods of self-analysis and self-assessment of the results and effectiveness of classroom classes of various types
LO10	Knows methods of numerical data analysis, multimedia tools, computer graphics and animation, computer modeling
	Can apply modern application software packages and Internet technologies to develop Web applications
	Owns: the methods of designing and developing Web applications and processing two-dimensional and three-dimensional graphic objects, video and audio information, using specialized software, proficient in software tools for analyzing, interpreting and visualizing the results of computer modeling, and applies numerical methods and application software packages to solve applied problems
LO11	Knows foreign terminology and terminology in Kazakh in mathematics, compositional and semantic organization of scientific text
	Can compose various elementary expressions and tasks using Kazakh foreign terminology, formulate the topic, define the language means of organizing the text and use them to generate your own texts on the topic
	Owns the language of business communication and professional vocabulary(terminology), the language system and ways of its use in cross-cultural and communicative activities; the speech system and communication as a willingness and ability to carry out when reading texts that differ in content and structure
LO12	Knows important stages of the modern history of Kazakhstan, the basics of philosophy, applied economic, legal, natural science disciplines
	Can :he is able to apply knowledge about society as an integral system and a person, the legal interests of the parties in the field of protecting the rights of individuals and legal entities, the economic and social conditions of doing business, the impact of harmful and dangerous factors on humans and the natural environment.
	Owns: He has knowledge of society as an integral system and a person, the role of spiritual processes in modern society, the legal interests of the parties in the field of protecting the rights of individuals and legal entities, the economic and social conditions of entrepreneurial activity.

22. The graduate model of the educational program

Graduate Attributes

Deep professional knowledge in their field of study

Interest in mastering trends in education and science

Ability to collaborate in the professional community

Independence in the search for professional and personal development opportunities

Communication skills

Tolerance and good manners

Academic integrity

Willingness to participate in solving state tasks and strategies of Kazakhstan

Types of competencies	Description of competencies
Behavioral skills and personal qualities (Softskills)	Demonstrates current knowledge of modern history and philosophy of science, applied natural science disciplines that contribute to the implementation of the main directions of modernization of public consciousness. Is able to formulate and solve problems arising in the pedagogical process and requiring in-depth pedagogical knowledge; analyze and comprehend the realities of modern theory and practice of higher education.
Professional competencies (Hardskills)	He is able to use numerical methods to solve differential equations and problems of mathematical physics. Demonstrates current knowledge about loaded differential equations and their classification, connection with inverse problems, reduction of boundary value problems to special integral equations, characteristic integral equations. Has the skills of reducing boundary value problems to special integral equations, applying the regularization method.
	Capable of abstract thinking, analysis, synthesis; the ability to use in management activities, strives for objectivity, tolerance, attentiveness and tolerance in solving controversial, conflict situations. Applies methodological and methodological knowledge in conducting scientific research, pedagogical and educational work. Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students. Has the skills of designing and analyzing the management of the holistic pedagogical process of educational organizations.
	Has a clear understanding of the language of manifolds and external differential forms, integration problems on manifolds and their applications. Has fundamental knowledge of stochastic analysis. Uses the methodology of describing random processes and phenomena for optimal results in solving applied problems using mathematical tools.
	Knows the basic concepts and methods of the theory of topological spaces and their most important example – metric spaces. He is able to solve problems of the theory of metric and topological spaces, is able to independently search for relevant information necessary both in the process of studying this discipline and in the study and writing of a master's thesis. Has the skills of geometric interpretation of abstract results. Knows the properties of the approximation module, continuity, direct and inverse theorems of approximation theory. Applies methods for determining the best approximations of various spatial elements, methods for calculating the modulus of continuity of a function, theorems of approximation theory. He is able to analyze studies related to approximation theory, determine the differential properties of a function, and draw conclusions about the relationship of functional spaces. Analyzes, processes, generalizes and reproduces information and phenomena; correctly uses socially marked linguistic units of the language being studied. He is able to communicate freely, easily and convincingly in verbal and non-verbal form in three languages to solve the tasks of professional activity. Knows and understands the functional features of oral and written professionally-oriented texts, including scientific and technical ones. Uses foreign terminology for reading, speaking, listening, writing in professional communication. Owns the technique of translating professionally-oriented text. He is able to solve boundary value problems for the heat equation in regions degenerating into a point at the initial or final moment of time; to solve singular Volterra integral equations of the second kind; to investigate the issues of their solvability. Has the skills of modeling physical processes of boundary value problems for the heat equation, owns the methods of research and analysis of installation problems.

	Knows the basic concepts of structural and constructive properties of mastered functions. It is able to analyze the structural and constructive properties of functions, to use in the analysis of advanced scientific literature in scientific research. Knows the theoretical foundations of the subjects studied in the learning process and their application in research activities in the development of mathematical models, algorithms for solving the problem set in the master's thesis, tasks. Owns the methods of searching and selecting sources of information; using the basic techniques of research activities, conducting an experiment. Knows the general scientific methodology, logic and technology of research work. Knows the peculiarities of presenting the results of scientific activity in oral and written form when working in domestic and international research teams. He is able to identify and systematize the main ideas in scientific texts; critically evaluate any incoming information, regardless of the source; avoid the automatic application of standard formulas and techniques when solving problems, conduct a scientific discussion, demonstrate the ability of public speaking. Has the skills of working with bibliographic reference books, compiling scientific bibliographic lists, using bibliographic descriptions in scientific papers, designing and carrying out complex research, knowledge of modern methods and principles of developing scientific problems on the topic of scientific qualification work. He is able to develop models, algorithms for solving a specific problem, task; find a solution, get results and interpret them; systematize the necessary materials of a master's thesis. Knows the basic concepts and results of model theory concerning types, categorical theories, saturated and simple models, is able to formulate mathematically correctly and prove theorems describing the behavior of countable models of complete theories. Has the skills of applying the semantic properties of theories to study their model classes. He is able to prove basic theorems and solve typical problems of group theory. Has skills of working with finite and finitely generated abelian groups; professional thinking necessary for using methods of group theory.
Digital competencies (Digital skills):	Knows the basic methods and models of commercialization of innovative technologies. Applies in practice modern methods of analysis of innovative solutions to applied problems of scientific and scientific-technical developments. Owns the technology of commercialization of the results of scientific research and innovative developments in the IT field. He is able to use pedagogical approaches, educational materials in accordance with the latest innovations in mathematics and education. Owns modern didactic and methodological tools to achieve successful learning outcomes.

Developers:
Working group members:
Head of the Department "Mathematical Analysis and Differential Equations"   G.Sh.Iskakova
Head of the Department "Mathematical Analysis and Differential Equations"   A.O. Tanin

1st year Master's student   M.T.Omarov

The educational program was considered by the faculty council from   28. 03. 2022   protocol no 6/1

The educational program was considered at a meeting of the Academic Council from   28. 04. 2022   protocol no 5

The educational program was reviewed and approved at a meeting of the University Board from   26. 05. 2022   protocol no 12
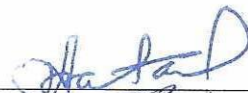
Member of the Board - Vice-Rector for Academic Affairs   T.Z.Zhusipbek
Director of the Department of Academic Affairs   G.S.Akybayeva
Dean of the Faculty   D.A. Kazimova

EDUCATIONAL PROGRAM DEVELOPMENT PLAN
«7M05401-Математика»

The purpose of the Plan is to contribute to improving the quality of the conditions for the implementation of the educational program, taking into account the current requirements of the labor market and the achievements of modern science.

Target indicators

№	Indicators	Unit of measurement	2022-2023	2023-2024	2024-2025	2025-2026
1	**Human resources development**					
1.1	Increase in the number of teachers with academic degrees	Number of people	1	1	1	1
1.2	Advanced training in the teaching profile	Number of people	2	3	4	5
1.3	Involvement of practitioners in teaching	Number of people				
2	**Promotion of the EP in the ratings**					
2.1	IQAA	Position	3	2	2	2
2.2	IAAR	Position	3	3	2	2
2.3	Atameken	Position				
3.	**Development of educational and scientific-methodical literature, electronic resources**					
3.1	Training manuals	Number		1		1
3.2	Methodological recommendations/instructions	Number		1		1
3.3	Electronic textbook	Number		1		1
3.4	Video/audio lectures	Number		1	1	1
3.5	Мультимедийные презентации	Кол-во		1	2	2
3.6	Электронные лекции	Кол-во		1	2	2

No.	Item	Unit				
4.	**Development of educational and laboratory facilities**	Number				
4.1	Purchase of software products	Number				
4.2	Purchase of equipment	Number				
5.	**Updating the content of the EP**					
5.1	Updating the learning outcomes and the list of disciplines taking into account the requirements of the labor market, scientific achievements, professional standards	Year			+	
5.2	Introduction to the EP of academic disciplines in foreign languages*	Year				+
5.3	Introduction of new teaching methods	Year			+	
5.4	Opening of joint/two-degree program on the basis of the EP	Year				+

Head of the Department "Mathematical Analysis and Differential Equations" 　　　　　　　　　　　　　　　　　　**G.Sh.Iskakova**