Ministry of Science and Higher Education of the Republic of Kazakhstan
K. Zhubanov Aktobe Regional University

MODULAR EDUCATIONAL PROGRAM

Code and name of the field of education: 8D05 – Natural Sciences, Mathematics and Statistics
Code and name of the field of study: 8D054/0540 – Mathematics and Statistics
Code and name of the EP: 8D05401 – Mathematics
Level of education: Doctoral degree
Awarded degree: Doctor of Philosophy (PhD) in the educational program "8D05401 – Mathematics"
Total number of credits: 180 academic credits/180 ECTS

Year of admission: 2022

1. Compilers:

Full name	Position	Contact details
Employers: Kenzhegulov Beket Zineshovich	Doctor of Technical Sciences, Professor Director of the Institute of Mathematics and Applied Technologies at Atyrau University named after Kh. Dosmukhamedov	8-701-729-62-84
Asanova Anar Turmaganbetkyzy	Doctor of Physical and Mathematical Sciences, Professor Head of the Department of Mathematical Physics and Modeling at the Institute of Mathematics and Mathematical Modeling of KN MES RK	8-701-738-09-42
PhD student: Tankeeva Aigerim	1st year	8-705-376-24-29
Responsible compilers for the department: Abdikalikova Galiya Amirgalievna	Ph. D., Associate Professor	8-702-114-91-58
Kokotova Elena Viktorovna	Ph. D., Associate Professor of the Department	8-701-920-42-53
Reviewer: Alday Maktagul	PhD, Associate Professor, L. N. Gumilyov ENU	8-701-333-25-75

2. **MISSION:** Formation of human capital for innovative transformations of the region and the country

   VISION: Leading positions in the national ranking and achieving the status of an anchor university in Kazakhstan

   VALUES:
   1. Academic excellence
   2. Integrity
   3. Openness and cooperation
   4. Highest quality of education
   5. Social activity and civic initiative
   6. Leadership and creativity
   7. Respect and attention to people
   8. Unity of science and innovation

3. **Model of a university graduate**

   - Has in-depth knowledge and understanding of the field of study
   - A specialist possessing theoretical knowledge and skills to solve important tasks in everyday life and professional activities
   - Independent, capable of conducting research and experiments in the field of study, analyzing and interpreting results, drawing conclusions and making judgments
   - An organizer skilled in communication technologies and strategies
   - Able to apply innovative experience, self-motivated, striving for self-education and self-realization
   - Competent in the use of information and communication technologies in the field of professional activity

4. Passport of the educational program

Scope of application	The educational program "8D05401-Mathematics" (hereinafter - EP) is intended for training doctors of Philosophy (PhD) at Aktobe Regional University named after K. Zhubanov. The EP is a system of documents developed and approved by Aktobe Regional University named after K. Zhubanov independently on the basis of the State Air Defense Standard for the corresponding training area, the classifier of training areas for personnel with higher and postgraduate education in accordance with the code in the International Standard Classification of Education, the Professional Standard "Teacher". When developing the EP of higher professional education, the established scientific schools of the ARUnamed after K. Zhubanov were taken into account, as well as the needs of the regional and republican labor markets.
Code and name of the educational program	8D05401 – Mathematics
Regulatory and legal support	1. Law of the Republic of Kazakhstan "On Education"dated June 27, 2007 No. 319-III (with amendments and additions) 2. " Rules of organization of the educational process on credit technology of training "(Order No. 563 of the Minister of Education and Science of the Republic of Kazakhstan dated October 12, 2018) 3. Guidelines for the use of the European System of Transfer and Accumulation of Accounting Units (ECTS) 2015 4. State Mandatory Standard of Higher Education(Order No. 604 of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018) 5. Classifier of training areas for personnel with higher and postgraduate education (Order No. 569 of the Minister of Education and Science of the Republic of Kazakhstan dated October 13, 2018) 6. Rules for organizing dual education(Order of the Minister of Education and Science of the Republic of Kazakhstan No. 50 dated January 21, 2016 (as amended on September 11, 2018) 7. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education(Order No. 595 of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 2018) 8. Standard curricula of the cycle of general education disciplines for organizations of higher and (or) postgraduate education(Order No. 603 of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018) 9. Coding system for academic disciplines of higher and postgraduate education. State Standard of the Republic of Kazakhstan 5.05.001-2005 10. Professional standard " Teacher "(Appendix to the Order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 133 dated June 8, 2017) 11. Industry qualification framework for Education (Approved by the Industry Commission of the Ministry of Education and Science of the Republic of Kazakhstan on social partnership and regulation of social and labor relations in the field of

	education and science. Protocol No. 3 of 27.11.2019) 12. Regulations on the construction of a modular educational program (Protocol No. 13 of 12.08.2020 13. Regulations on Master's and Doctoral studies (Protocol No. 1 dated 08/28/2020) 14. Regulations on doctoral dissertation (Protocol No. 1 dated 08/28/2020) 15. Regulations on the organization and conduct of internships and scientific internships for magicians and doctoral students (Protocol No. 1 dated 08/28/2020)
Map of the training profile within the framework of the educational program	
Goal of the educational program	To train competitive, highly qualified scientific and teaching staff for higher education, postgraduate education and the scientific field with in-depth scientific, pedagogical and research training.
Qualification characteristics of the graduate	
Awarded degree	Doctor of Philosophy (PhD) in the educational program "8D05401 – Mathematics"
List of specialist positions	Graduates of the doctoral program can carry out professional activities in accordance with the received fundamental and specialized training in the specialty in the position: ● researcher (senior, leading, chief) employee in research institutes, laboratories, design and design bureaus, etc. ● teacher of mathematics in higher educational institutions and other educational organizations ● mathematician-analyst, chief specialist in industrial and management organizations that use mathematical methods in their work, in insurance companies, and financial institutions ● head of the university
Field of professional activity	● science ● education ● scientific and production sphere, economics and management
Functions and types of educational activities	Types of professional activities ● scientific research ● pedagogical ● administrative and managerial In accordance with the types of professional activity, a graduate of the EP "8D05401-Mathematics" can perform the following functions: 1. Research activities: ● scientific research using mathematical methods and computational technologies to solve fundamental problems of mathematical modeling of processes and objects

	● construction and research of mathematical models, development of algorithms, research methods on the subject of ongoing research and applied research ● development of high-tech mathematical and modern high-performance computing technologies, information technologies and software packages for solving applied problems in the field of natural sciences 2. Pedagogical activities: ● organization of the educational process and teaching of mathematics courses in institutions of higher and postgraduate education ● supervision of research projects of bachelor's, master's, and doctoral students ● development of teaching and methodological materials for institutions of higher and postgraduate education 3. Organizational and managerial activities: ● organization of the work of research groups, teams, institutes, and other academic units ● organization and conduct of scientific and methodological seminars and conferences

5. Learning outcomes for the educational program

1. To be able to plan and predict the further professional development; to have skills of acquisition of new knowledge in special area, in the field of the theory and a methodology of professional education
2. To generate own new scientific ideas, to synthesize the results of research and analytical work in the form of a doctoral dissertation, be competent in carrying out scientific projects and research in the professional field
3. To demonstrate deep and comprehensive knowledge of fundamental branches of mathematics, including the theory of Sobolev space, noncommutative analysis of operators, stochastic analysis, the theory of reducibility of systems of differential equations, the theory of dynamical systems; to apply research methods in solving current problems in the field of modern mathematics
4. To plan, to coordinate, to implement and to predict research results, to critically analyze, to evaluate and to compare various scientific theories and ideas
5. To apply methods for finding periodic solutions of differential and integro-differential equations with multidimensional time, solve the problem of stability of a multiperiodic solution and holomorphism in a small parameter
6. To use modern methods of data analysis, demonstrating the skills of searching, collecting, processing, storing and transmitting scientific information using modern information and innovative technologies
7. To apply methods of theoretical and applied scientific research in the field of systems of partial differential equations for the study of systems in the directions of a vector field, boundary value problems for hyperbolic equations with nonlocal conditions, multiperiodic and almost periodic solutions of applied problems for parabolic equations
8. To be able to formulate and solve modern scientific and practical problems in mathematics, to organize and conduct research, experimental research activities in the chosen direction
9. To build and evaluate phase portraits of dynamic systems, to distinguish between deterministic chaos and nondeterministic systems; to solve problems of qualitative research of a dynamic system

6. Modular curriculum for 2022-2025
(duration of study is 3 years)

Cycle / Component	Discipline code	Name of the discipline	semester	academic credits	ECTS credit	Forms of control	Course paper	Budget of working hours of doctoral students, hour							Distribution by courses and semesters					
										Classroom classes			Independent work		1st course		2nd course		3rd course	
								in total	Classroom	Lectures	Laboratory classes	Practical exercises	SIWT	SIW	1 sem 15 week	2-sem 15 week	3-sem 15 week	4-sem 15 week	5-sem 15 week	6-sem 15 week
Module 1. - Problems of scientific research in fundamental areas of mathematics, 26 academic credits																				
BD UC	AW 7201	Academic writing	1	3	3	exam		90	30	15		15	15	45	3					
BD UC	MSR 7202	Methods of scientific research	1	3	3	exam		90	30	15		15	15	45	3					
BD UC	APFDM 7203	Actual problems of fundamental directions of mathematics	1	5	5	exam		150	45	15		30	25	80	5					
DSRW		Doctoral student's research work, including the completion of a doctoral thesis	1	15	15	report		450							15					
Module 2.1. – Theory of oscillations, 24 academic credits																				
PD EC	RSDE 7301	Reducibility of a system of differential equations	1	4	4	exam		120	40	20		20	20	60	4					
PD EC	OSDISEMT 7302	Oscillatory solutions of differential and integro-differential systems of equations with multidimensional time	2	5	5	exam		150	45	15		30	25	80		5				

PD EC	MAPSSPE 7303	Multiperiodic and almost periodic solutions of a system of parabolic equations	2	5	5	exam	150	45	15		30	25	80		5				
DSRW		Doctoral student's research work, including the completion of a doctoral thesis	2	10	10	report	300								10				
		Module 2.2. – Dynamical systems, non-local boundary value problems and methods for solving systems of differential equations, 24 academic credits																	
PD EC	SMSSDEPR 7301	Special methods for solving systems of partial differential equations	1	4	4	exam	120	40	20		20	20	60	4					
PD EC	DS 7302	Dynamic systems (in English)	2	5	5	exam	150	45	15		30	25	80		5				
PD EC	NBVPDE 7303	Non-local boundary value problems for partial differential equations (in English)	2	5	5	exam	150	45	15		30	25	80		5				
DSRW		Doctoral student's research work, including the completion of a doctoral thesis	2	10	10	report	300								10				
		Module 3. – Scientific and practical, 118 academic credits																	
BD	PP	Pedagogical practice	2	10	10	report	300								10				
PD	RP	Research practice	4	10	10	report	300										10		
DSRW		Doctoral student's research work, including the completion of a doctoral thesis	3,4,5,6	98	98	report	2940									30	20	30	18
FC		**Final certification. Preparation and defense of a doctoral thesis**	6	12	12		360												12
DSRW		Doctoral student's research work, including the completion of a doctoral dissertation		123	123		3690							15	10	30	20	30	18
Total		by cycle BD UC		11	11		330	105	45		60	55	170	11					
Total		by cycle BD EC		0	0		0	0	0		0	0	0						
		BD Pedagogical practice		10	10		300	0	0		0	0	0		10				

Total	by cycle **BD**		21	21			630	105	45	0	60	55	170	11	10	0	0	0	0
Total	by cycle PD UC		0	0			0	0	0		0	0	0						
Total	by cycle PD EC		14	14			420	130	50		80	70	220	4	10				
	PD Research practice		10	10			300	0	0		0	0	0				10		
Total	by cycle **PD**		24	24			720	130	50		80	70	220	4	10	0	10	0	0
Total number of credits:			180	180			5400	235	95	0	1440	125	390	30	30	30	30	30	30

Abbreviated names:

BD	-basic discipline
PD	- profile disciplines
EC	- component of choice

UC	- the university component
exam	-exam

7.1. Map of the educational program

Cycle/component	Discipline code	Name of the discipline	Semester	Academic credits	Number of ECTS	Learning outcomes
1	*2*	*3*	*4*	*5*	*6*	*7*
Module 1. - Problems of scientific research in fundamental areas of mathematics, 26 academic credits						
BD UC	AW 7201	Academic writing	1	3	3	LO-2, LO-8
BD UC	MSR 7202	Methods of scientific research	1	3	3	LO-3, LO-6, LO-8
BD UC	APFDM 7203	Actual problems of fundamental directions of mathematics	1	5	5	LO-3, LO-4
Module 2.1 – Theory of oscillations, 24 academic credits						
PD EC	RSDE 7301	Reducibility of a system of differential equations	1	4	4	LO-3, LO-7
PD EC	OSDISEMT 7302	Oscillatory solutions of differential and integro-differential systems of equations with multidimensional time	2	5	5	LO-1, LO-2, LO-4, LO-5, LO-8
PD EC	MAPSSPE 7303	Multiperiodic and almost periodic solutions of a system of parabolic equations	2	5	5	LO-1, LO-4, LO-7, LO-8
Module 2.2 – Dynamical systems, non-local boundary value problems and methods for solving systems of differential equations, 24 academic credits						
PD EC	SMSPDE 7301	Special methods for solving systems of partial differential equations	1	4	4	LO-1, LO-2, LO-4, LO-7
PD EC	DS 7302	Dynamic systems (in English)	2	5	5	LO-3, LO-8, LO-9
PD EC	NBVPPDE 7303	Non-local boundary value problems for partial differential equations (in English)	2	5	5	LO-3, LO-4, LO-7

7.2 Matrix of the ratio of discipline and learning outcomes

№	Learning outcomes Name of disciplines	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9
1.	Academic writing		+						+	
2.	Methods of scientific research			+			+		+	
3.	Actual problems of fundamental directions of mathematics			+	+					
4.	Reducibility of a system of differential equations			+				+		
5.	Oscillatory solutions of differential and integro-differential systems of equations with multidimensional time	+	+		+	+			+	
6.	Multiperiodic and almost periodic solutions of a system of parabolic equations	+			+			+	+	
7.	Special methods for solving systems of partial differential equations	+	+		+			+		
8.	Dynamic systems (in English)			+					+	+
9.	Non-local boundary value problems for partial differential equations (in English)			+	+			+		
	Total	**3**	**3**	**5**	**5**	**1**	**1**	**4**	**5**	**1**

8. Summary table reflecting the volume of credits disbursed by modules of the educational program

Course of study	Semester	Number of modules to be mastered	Number of disciplines studied UK	Number of disciplines studied EC	Theoretical learn	Pedagogical practice	Research practice	Doctoral student's research work, including the completion of a doctoral dissertation	Final certification. Preparation and defense of a doctoral thesis	Total	Total hours	ECTS	Number of exams	Number of reports
1	1	2	3	1	15			15		30	900	30	4	1
1	2	2		2	10	10		10		30	900	30	2	2
2	3	1						30		30	900	30		1
2	4	1					10	20		30	900	30		2
3	5	1						30		30	900	30		1
3	6	1						18	12	30	900	30		1
Total :		3	3	3	25	10	10	123	12	180	5400	180	6	8

9. Resource support of the educational program

The resource provision is formed on the basis of the requirements for the conditions for the implementation of doctoral degree programs in the EP "8D05401 – Mathematics" and includes:
- staffing
- educational, methodological and informational support
- logistical support

Staffing

The implementation of the Doctoral Educational Program should be provided by scientific and pedagogical personnel who, as a rule, have a basic education corresponding to the profile of the discipline being taught, and who are systematically engaged in scientific and (or) scientific and methodological activities.

The graduate department is the Department of Mathematics. The staff of the department is staffed in accordance with the legislation of the Republic of Kazakhstan and the Rules of competitive filling of positions of scientific and pedagogical staff of higher educational institutions.

The total number of full-time teachers at the Department of Mathematics is 30 teachers, including 2 Doctors of Sciences, 13 candidates of Sciences, 4 PhD doctors and 9 masters. The share of full-time teachers out of their total number, including in the cycles of basic and core subjects of the state mandatory standard of education is 79%, the share of teachers with academic degrees and titles out of the number of full-time teachers is 63%.

Educational, methodological and informational support

The educational, methodological and informational support of the educational program "8D05401 - Mathematics" includes: a standard and operational curriculum of the discipline, UMKD, syllabus, control and measuring materials, active handouts, didactic materials on all academic disciplines of the curriculum, normative documents regulating the types of educational activities.

Each doctoral student has access to the Internet, including the university's electronic library, the Russian Library of Economics, KazNET, the Web of Knowledge (Thomson Reuters) and the Web of Science, Scopus, Springer, and the resources of the university's scientific library. The library's collection is equipped with printed and electronic publications, educational and scientific literature in all disciplines of the specialty. In addition, doctoral students have contractual access to the AF RNTB foundation, including access to the RSL dissertation fund. The educational, methodological and informational support of the educational process meets the requirements of higher education.

Material and technical support

When implementing the EP "8D05401 Mathematics", the material and technical base is used to ensure that all types of classes are provided for in the work curriculum and comply with current sanitary and fire safety rules and regulations.

The material and technical base is provided by the presence of an educational building (at 263 Br. Zhubanovykh St.) with in-line classrooms, equipped classrooms and laboratories, computer classes for conducting classes on the EP "8D05401 Mathematics"

For the implementation of the EP "8D05401 Mathematics", the Faculty of Physics and Mathematics has the necessary classroom fund,

methodological and specialized classrooms (Daulet Umbetzhanov Scientific and Innovative Auditorium, multilingual education room, mathematics theory and teaching methods room, Algebra room, Geometry room), computer classes and special laboratories (Laboratory of Streaming Data Analytics and Machine Learning, Computer Modeling and Numerical Methods, Computer.

10. Environmental characteristics of K. Zhubanov Aktobe Regional University, providing the development of general cultural and socio-personal competences of graduates

The University has all the necessary conditions and opportunities to ensure the formation and development of general cultural and socio-personal competencies of graduates.

An integral part of the educational process is educational work, the purpose of which is the formation of a professional, harmoniously developed and morally stable personality. Special attention in educational work is focused on fostering patriotism, citizenship, a sense of responsibility, decency, honesty, loyalty to professional duty, law-abiding, respect for each other and others. Educational work is carried out in the following areas:

- fostering civic and spiritual and moral culture
- fostering aesthetic culture
- physical education and healthy lifestyle formation
- fostering an ecological culture
- labor education

As the basic regulatory document for organizing the educational process at the university, the "Concept of Educational Work" has been developed, as well as internal university normative documents such as the Regulations on "Self-Government", the Regulations on 'Organizing Educational Work at ARU named after K. Zhubanov', the Regulations on 'The Council for the Prevention of Offenses', the Regulations on 'The School of Legal Knowledge', the Regulations on 'The Sports Club', the Regulations on 'The Debate Club', and others.

To organize educational work at the university, the Department for educational work and youth policy has been established, which includes the department for work with students and youth organizations, the department for socio-cultural work. In addition, the university has a student parliament, a student dormitory council, a sports club, a Council for the Prevention of Offenses, etc.

There is a sufficient material and technical base at the university for organizing cultural activities and forming a healthy lifestyle:

- Youth Palace
- The Palace of Students
- Two sports complexes
- Sports facilities
- 3 separate gyms
- A stadium with a running track and a grass soccer field
- Tennis court
- Shooting range
- Student multidisciplinary polyclinic

- Modern library

For the harmonious development of personality, contributing to the strengthening of moral, civic, patriotic, and general cultural competencies of doctoral students, various organizations operate at ARU named after K. Zhubanov. These include the debate clubs "Ritor" and "Zaman Bizdiki", the School of Legal Knowledge, the student theater 'Zhubanov Zhastary', the Young Poets Club 'Tarazy', the 'English Club', the 'Education Club', the 'Universal Programmer Club', the KVN club, the charity club 'Ümitiñ üzilmesin', the volunteer club 'Zhubanov Zhyluy', the dance groups 'ARSU STAR' and 'Big Fam', the School of Public Service 'Mansap', sports sections, and others.

Educational work is carried out through a complex of informational and promotional, individual-psychological, legal, socio-economic, moral and ethical, cultural, sports and mass, and other activities.

AGREED:

Director of the Institute of Mathematics and Applied Technologies
at Atyrau University named after H. Dosmukhamedov

Kenzhegulov B.Z

Head of the Department of Mathematical Physics and Modeling at
the Institute of Mathematics and Mathematical Modeling of KN
MES RK

Asanova A.T.

Reviewed at the meeting of the Academic Council of the University.
Protocol no. __ from "___" _____ 2022