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

"APPROVED"
By the decision of the Board of Directors of the
Non-Profit Joint-Stock Company
"K. Zhubanov Aktobe Regional University"
(Protocol No. ____dated "__" _____202_)

MODULAR EDUCATIONAL PROGRAM

Field of Education Code and Name: 8D05 – Natural Sciences, Mathematics and Statistics
Training Area Code and Name: 8D053 – Physical Sciences
Educational Program Code and Name: 8D05301 – Physics
Level of Education: PhD Doctoral Program
Awarded Degree: Doctor of Philosophy (PhD) in the Educational Program "8D05301 – Physics"
Total Number of Credits: 180 academic credits / 180 ECTS

Year of Admission: 2022.

Compilers:

Full Name	Position	Contact Information
Employers: Zhanturina N.N.	Associate Professor of the Department of Physics	87013684899, email - nzhanturina@mail.ru
Instructor Myasnikova L.N.	Associate Professor of the Department of Physics	87014367099, email - myasnikova_ln@mail.ru
Doctoral Student Istlyaup A S.	Doctoral Student	87772717712, email - i.asel_94@mail.ru
Employer Sergeev D. M	Head of the Department of Design and Operation of Radar Equipment T. Begeldinov Military Institute of Air Defense Forces	87081889024, email - serdau@mail.ru
Reviewer Lushchik A. Ch.	Head of the Laboratory of Ionic Crystals Institute of Physics, University of Tartu (Tartu, Estonia)	email - aleksandr.lushchik@ut.ee

1. University Mission, Vision, and Values

MISSION: Development of human capital for innovative transformation of the region and the country.

VISION: Leading positions in the national rankings and achieving the status of a flagship university of Kazakhstan.

VALUES:

- ✓ Academic excellence
- ✓ Integrity
- ✓ Openness and collaboration
- ✓ Highest quality of education
- ✓ Social engagement and civic initiative
- ✓ Leadership and creativity
- ✓ Respect and care for people
- ✓ Unity of science and innovation

2. Model of a University Graduate

- ✓ Possesses deep knowledge and understanding of the field of study
- ✓ Ready for professional self-realization in the modern world
- ✓ Entrepreneurial, capable of making decisions and creating new opportunities
- ✓ Adaptive to global challenges
- ✓ A person with high intelligence
- ✓ Demonstrates global citizenship

3. Master's Degree Program Profile

Field of Application	Education and Science
Program Code and Title:	8D05301 – Physics
Regulatory Framework:	1. Law of the Republic of Kazakhstan "On Education" dated June 27, 2007 No. 319-III (with amendments and additions) 2. "Rules for the Organization of the Educational Process Based on Credit Technology of Education" (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 12, 2018 No. 563) 3. Guide to the Use of the European Credit Transfer and Accumulation System (ECTS), 2015 4. State Compulsory Standard of Higher Education (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604) 5. Classifier of Areas of Training for Higher and Postgraduate Education (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 13, 2018 No. 569) 6. Model Rules for the Activities of Educational Organizations Implementing Educational Programs of Higher and/or Postgraduate Education (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595) 7. Model Educational Programs for the Cycle of General Education Disciplines for Higher and/or Postgraduate Educational Organizations (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 603) 8. Coding System for Academic Disciplines in Higher and Postgraduate Education. SCES RK 5.05.001-2005 9. Regulation on the Organization and Conduct of Professional Practice and Determination of Organizations as Practice Bases (Protocol No. 3 dated 09.11.2018) 10. Regulation on Ongoing Performance Monitoring and Interim Attestation (Examination Session) of Students (Protocol No. 13 dated 12.08.2020) 11. 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) 12. Sectoral Qualifications Framework in the Field of "Education" (Approved by the Sectoral Commission of the MES RK on Social Partnership and Regulation of Social and Labor Relations in

	the Field of Education and Science. Protocol No. 3 dated 27.11.2019) 13. Register of Approved Professional Standards (No. 334 dated 07.12.2018, No. 263 dated 26.12.2019 by the Legal Entity "Eurasian Industrial Association" +77172 591544 epa@erg.kz) 14. Sectoral Qualifications Framework in the Field of "Teacher Training in Natural Sciences" (2016) 15. Regulation on Ongoing Performance Monitoring and Interim Attestation (Examination Session) of Doctoral Students (Protocol No. 13 dated 12.08.2020) 16. Regulation on Final Attestation of Doctoral Students (Protocol No. 13 dated 12.08.2020) 17. Regulation on Master's and Doctoral Programs (Protocol No. 1 dated 28.08.2020) 18. Regulation on Doctoral Dissertation (Protocol No. 1 dated 28.08.2020)
Training Profile Map within the Educational Program	
Program Objective:	To train highly qualified specialists in the fields of condensed matter physics and theoretical physics, capable of conducting scientific research both independently and as part of a team.
Qualification Characteristics of the Graduate	
Awarded Degree	Doctor of Philosophy (PhD) in the Educational Program "8D05301 – Physics"
List of Possible Positions:	Higher education institutions and research organizations, bodies of the state administrative system, public and private institutions of science and education, industrial production, design, technological, and engineering organizations, etc.
Field of Professional Activity	The field of professional activity of a doctoral graduate includes: • Scientific research in areas involving mathematical methods and computer technologies; • Development of new models and systems in the field of condensed matter physics using advanced technologies; • Solving various problems through mathematical modeling of processes and objects, as well as using software tools; • Development of effective methods for solving problems in natural sciences and engineering; • Software and information support for scientific, research, and administrative activities; • Teaching physics-related disciplines.

Functions and Types of Educational Activity	- Research Organizations, Educational and Administrative Institutions Scientific research organizations, educational institutions, and administrative bodies. Types of Professional Activity A doctoral graduate is prepared for the following types of professional activity: • Research activity; • Production and technological activity; • Organizational and managerial activity; • Educational (pedagogical) activity. Graduates of the doctoral program are qualified to carry out professional activities in accordance with their fundamental and specialized training in the following positions: • Specialist, leading specialist, senior physicist; • Research associate in research institutes and centers; • Physics lecturer at higher education institutions of the Republic of Kazakhstan; • Teacher of physics, or physics and informatics, at secondary vocational institutions, general secondary schools, lyceums, and gymnasiums.

4. Expected Learning Outcomes of the Educational Program

1. Reviews works of a scientific nature, independently writes articles in international peer-reviewed journals, monographs, textbooks, correctly draws up a dissertation;
2. Applies the advanced methods and skills put into practice in the field of physics.
3. Knows modern methods of obtaining new materials, registers their physical characteristics and makes recommendations for their further use;
4. Carries out further theoretical or applied research and development at the high level, making the significant contribution to creation of new approaches and methods of development of physical science;
5. Owns modern information technologies, including methods of studying, processing and storing scientific information;
6. Shows the presence of the considerable volume of the scientific knowledge acquired in the systematic way and reflecting the current state of physical science, its concrete direction.
7. Conducts independent research work according to clearly defined goals and extracts new information from them.
8. Evaluates the effectiveness of the experiment and the developed algorithm for solving physical problems of a research and applied nature, the statistical processing of the experimental results, the implementation of mathematical, physical and numerical modeling of the properties of objects and processes.
9. Organizes research that can contribute to the development of physical science and deserves publication in scientific journals with a high scientific rating, both nationally and internationally.
10. Studies the structure and optical properties of the condensed state, analyzes the absorption, radiation and excitation spectra.

6. Modular Curriculum for the Educational Program "8D05301 – Physics"

2022–2025 (full-time study, scientific and pedagogical track, duration of study – 3 years)

Cycle / Component	Course Codes	Course Title	Semester	Number of Academic Credits	Number of ECTS Credits	Type of Assessment	Coursework	Budgeted Student Workload Hours							Budgeted Hours of Student Work Time					
								Total Number of Hours	Number of Contact Hours	Classroom Activities			Independent Work		Year 2		Year 2		Year 3	
										Lecture	Seminar	Laboratory	GIWD	IWD	1st Semester	2nd Semester	3rd Semester	4th Semester	5th semester	6th semester
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Module 1.1 Scientific and Theoretical (15 academic credits)																				
BD-MC	AP 7201	Academic Writing	1	5	5	exam		150	45	15	30		25	80	5					
BD-MC	MNI 7202	Methods of scientific research	1	5	5	exam		150	45	15	30		25	80	5					
BD-EC	NN 7203	Nanotechnologies and Nanomaterials	1	5	5	exam		150	45	15	30		25	80	5					
Module 1.2 Scientific and Theoretical 2 (15 academic credits)																				
BD-MC	AP 7201	Academic	1	5	5	exam		150	45	15	30		25	80	5					

		Writing																	
BD-MC	MNI 7202	Methods of scientific research	1	5	5	exam		150	45	15	30		25	80	5				
BD-EC	PKM 7203	Polymer Composite Materials	1	5	5	exam		150	45	15	30		25	80	5				
Module 2.1 – Radiation Processes in Solids (20 academic credits)																			
PD-MC	LRDSGKPPSR 7302	Luminescence and radiation defects in alkali halide crystals with decreasing lattice symmetry	2	5	5	exam		150	45	15	30		25	80		5			
PD-EC	SDM 7303	Scintillation and Dosimetric Materials	2	5	5	exam		150	45	15	30		25	80		5			
BD-MC	PP	Teaching Practice	2	10	10	отчет		300	300		300					10			
Module 2.2 – Research Methods in Physics (20 academic credits)																			
PD-EC	MMKFI 7303	Monte Carlo Method in Physical Research	2	5	5	exam		150	45	15	30		25	80		5			
PD-MC	VMF 7304	Variation methods in physics	2	5	5	exam		150	45	15	30		25	80		5			

BD-MC	PP	Teaching Practice	2	10	10	exam		300	300		300					10				
Module 3 – Internship and Research Work (145 academic credits)																				
	NIRD	Research Work	1,2,3,4,5, 6	123	123	report		3690					3690		15	10	30	20	30	18
PD	IP	Research Internship	4	10	10	report		300	300		300							10		
	IA	Final Assessment	6	12	12			360					360							12
Total																				
	Total	Under the Cycle BD-MC		20	20			600	390	30	360		50	160	10	10				
	Total	Under the Cycle BD-EC		5	5			150	45	15	30		25	80	5					
	TOTAL	**Under the Cycle BD-EC**		**25**	**25**			**750**	**435**	**45**	**390**		**75**	**240**	**15**	**10**				
	Total	Under the Cycle PD-MC		5	5			150	45	15	30		25	80		5				
	Total	Under the Cycle PD-EC		5	5			150	45	15	30		25	80		5				
	Total	Under the Cycle PD		10	10			300	300		300							10		
	TOTAL	**Under the Cycle PD**		**20**	**20**			**600**	**390**	**30**	**360**		**50**	**160**		**10**		**10**		
	Total	Under the Cycle		135	135			4050					4050		15	10	30	20	30	30

	TOTAL	**Under the Cycle**		**135**	**135**			**4050**					**4050**		**15**	**10**	**30**	**20**	**30**	**30**
		TOTAL NUMBER OF CREDITS		**180**	**180**			**5400**	**825**	**75**	**750**		**4175**	**400**	**30**	**30**	**30**	**30**	**30**	**30**

8.1 Educational Program Map

Cycle/ Component	Code of the Discipline	Module Components	Semester	Credit	Number of ECTS Credits	Learning Outcomes
1	**2**	**3**	**4**	**5**	**6**	**7**
Module 1.1 Scientific and Theoretical (15 academic credits)						
BD UC	AW 7201	Academic Writing	1	5	5	LO 1; LO 5; LO 7
BD UC	SRM 7202	Methods of scientific research	1	5	5	LO 2; LO 4; LO 5; LO 9
BD EC	NN 7203	Nanotechnologies and Nanomaterials	1	5	5	LO 2; LO 3, LO 7
Module 1.2 Scientific and Theoretical 2 (15 academic credits)						
BD UC	AW 7201	Academic Writing	1	5	5	LO 1; LO 5; LO 7
BD UC	SRM 7202	Methods of scientific research	1	5	5	LO 2; LO 4; LO 5; LO 9
BD EC	PCM 7203	Polymer Composite Materials	1	5	5	LO 3; LO 4

Module 2.1 – Radiation Processes in Solids (20 academic credits)						
PD UC	LRDSAHCCLSR 7302	Luminescence and radiation defects in alkali halide crystals with decreasing lattice symmetry	2	5	5	LO 6; LO 10
PD EC	SDM 7303	Scintillation and Dosimetric Materials	2	5	5	LO 2; LO 3; LO 10
BD UC	TP	Teaching Practice	2	10	10	LO 8
Module 2.2 – Research Methods in Physics (20 academic credits)						
PD EC	MCMPR 7303	Monte Carlo Method in Physical Research	2	5	5	LO 4; LO 5; LO 8
PD UC	VMP 7304	Variation Methods in Physics	2	5	5	LO 5; LO 6; LO 8
BD UC	TP	Teaching Practice	2	10	10	LO 8
Module 3 – Internship and Research Work (145 academic credits)						
	RW	Research Work	1,2,3,4,5,6	123	123	LO 3; LO 7; LO 10
PD	RI	Research Internship	4	10	10	LO 3; LO 7; LO 10
	FA	Final Assessment	6	12	12	LO 7; LO 8; LO 10

8.2 Correlation Matrix of Disciplines and Learning Outcomes

№	Learning Outcomes / Course Titles	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10
1	Academic Writing	+				+		+			
2	Methods of scientific research		+		+	+				+	
3	Nanotechnology and Nanomaterials		+	+				+			
4	Polymer Composite Materials			+	+						
5	Luminescence and radiation defects in alkali halide crystals with decreasing lattice symmetry						+				+
6	Scintillation and Dosimetric Materials		+	+							+
7	Teaching Practice								+		
8	Monte Carlo Method in Physical Research				+	+				+	
9	Variation Methods in Physics					+	+		+		
10	Research Work			+				+			+
11	Research Internship			+				+			+
12	Final Assessment							+		+	+

9. Credit Distribution by Educational Program Modules (Full-time, Scientific and Pedagogical Direction)

Course of Study	Semester	Number of Modules Completed	Number of Courses Studied					Number of KZ Credits					Total Hours	ECTS	Количество	
			ЕК	ЕВ	МК	DK		Theoretical Training	Pedagogical Practice	Research (Industrial) Practice	Research Work	Final Assessment			Total	Exam
1	1	2	2	1	0	0	1	15	0	0	15	0	30	900	30	4
1	2	2	2	1	0	0	1	10	10	0	10	0	30	900	30	4
2	3	1	0	0	0	0	1	0	0	0	30	0	30	900	30	1
2	4	1	0	0	0	0	2	0	0	10	20	0	30	900	30	2
3	5	1	0	0	0	0	1	0	0	0	30	0	30	900	30	1
3	6	1	0	0	0	0	2	0	0	0	18	12	30	900	30	2
Total:		**8**	**4**	**2**	**0**	**0**	**8**	**25**	**10**	**10**	**123**	**12**	**180**	**5400**	**180**	**14**

10. Resource Support of the Educational Program

Types of educational activity

A PhD graduate is prepared for the following types of professional activity:

✓ Research activity;
✓ Production and technological activity;
✓ Organizational and managerial activity;
✓ Educational (pedagogical) activity.

PhD graduates may carry out professional activities in accordance with the fundamental and specialized training received in the specialty in the following positions:

✓ Specialist, leading specialist, senior physicist;
✓ Researcher in research institutes and centers;
✓ Physics instructor at higher educational institutions of the Republic of Kazakhstan;
✓ Teacher of physics or physics and computer science at secondary vocational educational institutions, secondary schools, lyceums, and gymnasiums.

Human Resources Support

The implementation of the PhD educational program must be ensured by academic and teaching staff who, as a rule, possess a relevant educational background corresponding to the profile of the discipline they teach, hold an academic degree and title, and are regularly engaged in scientific and/or scientific-methodological activities. The proportion of full-time faculty members in the Department of Physics, including those teaching basic and core disciplines of the state compulsory standard, is 80%. The proportion of academic supervisors who meet the qualification requirements among degree-holding teaching staff is 85%.

Educational, Methodological and Information Support

Educational, Methodological, and Information Support includes the standard and working curricula for each discipline, teaching and methodological complexes (TMC), syllabi, assessment and measurement materials, active handout materials, didactic materials, and regulatory documents governing types of academic activity.

The doctoral educational program "8D05301 – Physics" is fully provided with educational and methodological documentation and materials for all academic disciplines in the curriculum. This includes standard and working curricula, TMCs, syllabi, assessment and measurement materials, active handout materials, didactic materials, and more.

Each doctoral student has access to the Internet, including the university's electronic library, the branch of the Republican Scientific and Technical Library (AF RNTB), KazNEB, Clarivate Analytics, Scopus, Springer, and the resources of the university's scientific library.

The library collection is equipped with printed and electronic publications, as well as academic and scientific literature covering all disciplines of the specialty. In addition, doctoral students have contractual access to the resources of the AF RNTB, including access to the dissertation collection of the Russian State Library (RSL).
The educational, methodological, and information support of the learning process meets the requirements of higher education.

Material and Technical Support
The implementation of the doctoral educational program "8D05301 – Physics" is supported by a material and technical base that ensures the conduct of all types of academic activities specified in the working curriculum. This infrastructure complies with current sanitary and fire safety regulations and standards.
The material and technical base includes an academic building with lecture halls, equipped classrooms and laboratories, and computer labs for delivering educational components of the "8D05301 – Physics" program.
There are 7 teaching laboratories, as well as a research laboratory for nanotechnology and a scientific center titled "Radiation Physics of Materials."

11. Characteristics of the Environment at K. Zhubanov ARSU that Support the Development of General Cultural and Social-Personal Competencies of Graduates.

The university provides all necessary conditions and opportunities to ensure the formation and development of general cultural and social-personal competencies of its graduates.

An integral part of the educational process is educational and character-building work, the purpose of which is the formation of a professional, harmoniously developed, and morally resilient individual. Special attention in this work is devoted to matters of academic discipline, behavioral culture, student appearance, the development of patriotism, civic responsibility, integrity, honesty, commitment to professional duty, law-abiding behavior, and respectful attitudes toward others and the surrounding community.

To organize cultural and recreational activities and promote a healthy lifestyle, the university has a well-developed material and technical base, including:

- Youth Palace
- Student Palace
- Two sports complexes
- Sports facility
- Three separate sports halls
- Stadium with a running track and a grass football field
- Tennis court
- Shooting range
- Multidisciplinary clinic

To support the harmonious personal development of students and master's students, which contributes to strengthening moral, civic, patriotic, and general cultural competencies, K. Zhubanov ARSU hosts various student organizations and clubs, including: Debate clubs “Ritor” and “Zaman Bizdiki”, School of Legal Knowledge, Student theater “Zhubanov Zhastary”, Young Poets Club “Tarazy”, “English Club,” “Education Club,” and “Universal Programmer Club”, KVN comedy club, Student Legal Clinic “Femida”, Charity club “Ümitiñ üzilmessin”, Volunteer club “Zhubanov Zhyluy”, Dance groups “ARSU STAR” and “Big Fam”, Public Service School “Mansap”, Various sports sections and others.

Educational and character-building work is carried out through a complex of informational and advocacy events, individual psychological support, legal education, socio-economic initiatives, moral and ethical education, cultural and leisure activities, sports events, and more.

APPROVED:

Head of the Department of Radar Equipment Design and Maintenance, Talgat Begeldinov Sergeev D.M.
Military Institute of the Air Defense Forces

Reviewed and approved at the meeting of the University Academic Council
Minutes No. __dated "_" _____202_