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 "__" _____ 2023)

MODULAR EDUCATIONAL PROGRAM

Field of Education Code and Name: 7M05 – Natural Sciences, Mathematics and Statistics
Training Area Code and Name: 7M053 – Physical and Chemical Sciences
Educational Program Code and Name: 7M05301 – Physics

Level of Education: Master's degree
Awarded Degree: Master of Natural Sciences in the educational program "7M05301 – Physics"

Total Number of Credits: 120 academic credits / 120 ECTS

Year of Admission: 2023.

Compilers:

Full Name	Position	Contact Information
Employers:		
Bulekov K.Sh.	Director of the Aktobe Regional Planetarium	8-701-431-71-39
Mukhambetpaizova Zh.S.	Director of Aktobe Higher Polytechnic College	8(7132) 562 - 051
Responsible Compilers from the Department:		
Zhubayev A.K.	Docent of the Department of Physics	8-708-802-76-27
Reviewers: Baysanov O.A.	Senior Lecturer of the Department of General Engineering Disciplines, Military Institute of Air Defence Forces named after T.Ya. Begeldinov, PhD in Physics and Mathematics	8-701-557-22-65

2. 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

3. Model of a University Graduate

- ✓ Possesses profound scientific knowledge and understanding in the chosen field of study.
- ✓ A specialist equipped with theoretical knowledge and practical skills to solve essential tasks in daily life and professional activities.
- ✓ Independent, capable of conducting research and experiments in the area of study, analyzing and interpreting results, drawing conclusions and making judgments.
- ✓ An organizer proficient in communication technologies and communication strategies.
- ✓ Able to apply innovative experience, demonstrate self-motivation, and committed to lifelong learning and self-realization.
- ✓ Competent in the use of information and communication technologies within the scope of professional activities.

4. Master's Degree Program Profile

Field of Application	– The field of experimental, theoretical, and applied physics, as well as related natural and technical sciences. – The field of education, including pedagogy, theory, and methodology of teaching physics in higher educational institutions.
Program Code and Title:	7M05301 - Physics
Regulatory Framework:	1. Guidelines for the Use of the European Credit Transfer and Accumulation System (ECTS), 2015. 2. Professional Standard "Teacher" (Annex 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). 3. "Rules for Organizing the Educational Process Using Credit Technology" (Order of the Minister of Education and Science of the Republic of Kazakhstan No. 563 dated October 12, 2018). 4. State Compulsory Educational Standard for Higher Education (Order No. 604, dated October 31, 2018). 5. Classifier of Training Areas for Higher and Postgraduate Education (Order No. 569, dated October 13, 2018). 6. Rules for Organizing Dual Education (Order No. 50 dated January 21, 2016, with amendments of September 11, 2018). 7. Model Rules for the Activities of Educational Institutions Implementing Higher and/or Postgraduate Education Programs (Order No. 595 dated October 30, 2018). 8. Model Curricula of General Education Disciplines for Institutions of Higher and/or Postgraduate Education (Order No. 603 dated October 31, 2018). 9. Law of the Republic of Kazakhstan "On Education" dated June 27, 2007, No. 319-III (with amendments and additions). 10. System for Coding Academic Disciplines in Higher and Postgraduate Education. SCES RK 5.05.001-2005. 11. Regulation on the Organization and Implementation of Professional Practice and Definition of Base Organizations (Protocol No. 3 dated 09.11.2018). 12. Regulation on Ongoing Academic Performance Monitoring and Interim Attestation (Examination Sessions) of Students (Protocol No. 3 dated 09.11.2018). 13. Regulation on Final Attestation of Students (Protocol No. 3 dated 09.11.2018).
Training Profile Map within the Educational Program	

Program Objective:	To train competitive specialists in the field of natural sciences with a strong foundation in theoretical and experimental physics, enabling graduates to succeed in their chosen professional fields and possess both general and specialized competencies.
Graduate Qualification Characteristics	
Degree Awarded:	Master of Natural Sciences in the Educational Program "7M05301 – Physics"
Possible Job Positions:	✓ Specialist in research institutes and laboratories, design and engineering bureaus, and companies. ✓ Specialist in state and non-state educational organizations and enterprises. ✓ Specialist in industrial enterprises and associations.
Field of Professional Activity:	✓ Experimental, theoretical, and applied physics, as well as related natural and technical sciences. ✓ Education, including pedagogy, theory, and methods of teaching physics in higher education institutions. ✓ Translation of scientific and technical literature from and into foreign languages.
Functions and Types of Professional Activity	**Functions:** ✓ Research ✓ Analytical ✓ Design and development ✓ Industrial ✓ Teaching **Types of Professional Activity:** ✓ Research in the field of fundamental and applied physics ✓ Teaching and research in the field of physics

5. Expected Learning Outcomes of the Educational Program

1. Classifies the methods of social sciences and humanities in various fields of his professional activity.
2. Analyzes physical problems of a research and applied nature, performs statistical processing of experimental results, performs mathematical, physical and numerical modeling of properties of objects and processes.
3. Demonstrates mastery of the culture of thinking and public speaking; correct and logical formalization of their thoughts in oral and written form, participation in discussions on professional issues.
4. Develops an algorithm for acquiring new knowledge in the field of physics using modern educational technologies..
5. Speaks languages in the spheres of social and scientific communication; is able to continue training and conduct professional activities in a foreign language environment, creates and presents scientific products in a foreign language.
6. Builds a system of acquired knowledge in solving specific scientific, practical and other physical problems.
7. Plans fundamental scientific and professional training in the field of physics, owns modern information technologies, including methods of studying, processing and storing scientific information.
8. Classifies modern scientific and practical problems in physics, organizes and conducts research, experimental research activities in the chosen direction.
9. Has the skills of organizing and managing scientific and innovative projects, planning and forecasting the work of a pedagogical team.

6. Modular Curriculum

Cycle/ Component	Code of the Discipline	Title of the Discipline	Semester	Credit	Number of ECTS Credits	Form of Assessment	Курсовая работа	Budgeted Student Workload Hours							Distribution by Courses and Semesters of the Educational Program			
										Classroom Activities			Independent Work		Year 1		Year 2	
								Total Number of Hours	K Number of Contact Hours	Lectures	Seminar Classes	Laboratory Work	IWSIW	IWS	1st Semester	2nd Semester	3rd Semester	4th Semester
Module 1 – General Education, 15 academic credits																		
BD UC	HPS 5201	History and philosophy of science (in Kazakh)	1	3	3	exam		90	30	15	15		15	45	3			
BD UC	FL (P) 5202	Foreign language (professional) (in English)	1	3	3	exam		90	30		30		15	45	3			
BD UC	PHE 5203	Pedagogy of higher education (in English)	1	3	3	exam		90	30	15	15		15	45	3			
BD UC	MP 5204	Management psychology	1	3	3	exam		90	30	15	15		15	45	3			
BD UC	OPSR 5205	Organization and planning of scientific research (in English)	1	3	3	exam		90	30	15	15		15	45	3			
Module 2.1 – Corpuscular Optics and Physics of Magnetic Phenomena, 19 academic credits																		
BD EC	Mat 5206	Materials Science (in English)	1	5	5	exam		150	45	15	30		25	80	5			
PD UC	MTPHE 5207	Methods of Teaching Physics in Higher Education (in Kazakh)	1	5	5	exam		150	45	15	30		25	80	5			
PD EC	MCCOS 5301	Methods of Calculating Corpuscular-Optical Systems (in English)	2	4	4	exam		120	40	20	20		20	60		4		
PD EC	FPMP 5302	Fundamental Principles of Modern Physics (in Kazakh)	2	5	5	exam		150	45	15	30		25	80		5		
Module 2.2 – Technologies and Methods, 19 academic credits																		
BD EC	MSTSM 5206	Materials Science and Technology of Structural Materials (in English)	1	5	5	exam		150	45	15	30		25	80	5			
PD UC	MTPHE 5207	Methods of Teaching Physics in Higher Education (in Kazakh)	1	5	5	exam		150	45	15	30		25	80	5			
PD EC	STTP5301	Special Topics in Theoretical Physics (in English)	2	4	4	exam		120	40	20	20		20	60		4		

BD UC	MCEMF 5302	Methods of Calculating Electric and Magnetic Fields (in Kazakh)	2	5	5	exam		150	45	15	30		25	80		5		
Module 3.1 – New Technologies, 26 academic credits																		
BD EC	MSNT 5208	Management of Science and New Technologies	2	5	5	exam		150	45	15	30		25	80		5		
PD EC	METHE 5303	Modern Educational Technologies in Higher Education (in Kazakh)	2	5	5	exam		150	45	15	30		25	80		5		
	SRWMS	Scientific Research Work of a Master's Student	1,2	16	16	report		480					480		5	11		
Module 3.2 – Theoretical Foundations of Physics, 26 academic credits																		
BD EC	IGTRQFT 5208	Introduction to General Theory of Relativity and Quantum Field Theory	2	5	5	exam		150	45	15	30		25	80		5		
PD EC	STMMP 5303	Special Topics in Mechanics and Molecular Physics (in Kazakh)	2	5	5	exam		150	45	15	30		25	80		5		
	SRWMS	Scientific Research Work of a Master's Student	1,2	16	16	report		480					480		5	11		
Module 4.1 – Solid State Physics and Nanotechnology, 33 academic credits																		
PD UC	LCS 6301	Luminescence of Crystalline Systems (in Kazakh)	4	5	5	exam		150	45	15	30		25	80				5
PD EC	RSPS 6302	Radiation-Stimulated Processes in Solids (in Kazakh)	3	5	5	exam		150	45	15	30		25	80			5	
PD EC	MSSSP 6303	Mössbauer Spectroscopy in Solid State Physics	4	5	5	exam		150	45	15	30		25	80				5
PD UC	NME 6304	Nanotechnology Methods and Equipment (in Kazakh)	3	5	5	exam		150	45	15	30		25	80			5	
BD	PP	Pedagogical Practice	3	5	5	report		150	150		150						5	
	SRWMS	Scientific Research Work of a Master's Student	3,4	8	8	report		240					240				5	3
Module 4.2 – Solid State Research Methods and Spectroscopy, 33 academic credits																		
PD UC	LCS 6301	Luminescence of Crystalline Systems (in Kazakh)	4	5	5	exam		150	45	15	30		25	80				5
PD EC	PMSSL 6302	Physical Methods for the Study of Solids and Liquids (in Kazakh)	3	5	5	exam		150	45	15	30		25	80			5	
PD EC	FSSICSS 6303	Fine Structure Spectroscopy of Impurity Centers in Solid Solutions	4	5	5	exam		150	45	15	30		25	80				5
PD UC	NN 6304	Nanosystems and Nanodevices (in Kazakh)	3	5	5	exam		150	45	15	30		25	80			5	
BD	PP	Pedagogical Practice	2	5	5	report		150	150		150						5	
	SRWMS	Scientific Research Work of a Master's Student	3,4	8	8	report		240					240				5	3
Module 5 – Practice and Scientific Research, 27 academic credits																		
PD	RP	Research Practice	3,4	19	19	report		570									10	9
	FC	Final Certification	4	8	8	FC		240										8
TOTAL:																		
		within the BD UC cycle		20	20			600	195	75	120		100	305	20	0	0	0
		within the BD EC cycle		10	10			300	90	30	60		50	160	5	5	0	0
		within the BD Practice cycle		5	5			150	150	0	150		0	0	0	0	5	0

	TOTAL:	**within the BD cycle**		**35**	**35**			**1050**	**435**	**105**	**330**		**150**	**465**	**25**	**5**	**5**	**0**
		within the PD UC cycle		5	5			150	45	15	30		25	80	0	0	0	5
		within the PD EC cycle		29	29			870	265	95	170		145	460	0	14	10	5
		within the PD Practice cycle		15	15			570	0	0	0		0	0	0	0	10	9
	TOTAL:	**within the PD cycle**		**53**	**53**			**1590**	**310**	**110**	**200**		**170**	**540**	**0**	**14**	**20**	**19**
		SRWMS		24	24			720	0	0	0				5	11	5	3
		Final State Examination		8	8			240	0	0	0				0	0	0	8
		TOTAL CREDITS:		**120**	**120**			**3600**	**745**	**215**	**530**		**320**	**1005**	**30**	**30**	**30**	**30**

7 **Educational Program Map (Scientific and Pedagogical Track, 2 Years)**

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 – General Education, 15 academic credits						
BD UC	HPS 5201	History and philosophy of science (in Kazakh)	1	3	3	LO1, LO3
BD UC	FL (P) 5202	Foreign language (professional) (in English)	1	3	3	LO7, LO8
BD UC	PHE 5203	Pedagogy of higher education (in English)	1	3	3	LO5, LO9
BD UC	MP 5204	Management psychology	1	3	3	LO8, LO9
BD UC	OPSR 5205	Organization and planning of scientific research (in English)	1	3	3	LO1, LO2, LO9
Module 2.1 – Corpuscular Optics and Physics of Magnetic Phenomena, 19 academic credits						
BD EC	Mat 5206	Materials Science (in English)	1	5	5	LO2; LO3
PD UC	MTPHE 5207	Methods of Teaching Physics in Higher Education (in Kazakh)	1	5	5	LO5; LO6; LO8
PD EC	MCCOS 5301	Methods of Calculating Corpuscular-Optical Systems (in English)	2	4	4	LO2; LO4
PD EC	FPMP 5302	Fundamental Principles of Modern Physics (in Kazakh)	2	5	5	LO2; LO3
Module 2.2 – Technologies and Methods, 19 academic credits						
BD EC	MSTSM 5206	Materials Science and Technology of Structural Materials (in English)	1	5	5	LO1; LO4
PD UC	MTPHE 5207	Methods of Teaching Physics in Higher Education (in Kazakh)	1	5	5	LO5; LO6; LO8
PD EC	STTP5301	Special Topics in Theoretical Physics (in	2	4	4	LO2; LO4

		English)				
BD UC	MCEMF 5302	Methods of Calculating Electric and Magnetic Fields (in Kazakh)	2	5	5	LO3; LO4
Module 3.1 – New Technologies, 26 academic credits						
BD EC	MSNT 5208	Management of Science and New Technologies	2	5	5	LO3; LO5
PD EC	METHE 5303	Modern Educational Technologies in Higher Education (in Kazakh)	2	5	5	LO3; LO5; LO6
	SRWMS	Scientific Research Work of a Master's Student	1,2	16	16	
Module 3.2 – Theoretical Foundations of Physics, 26 academic credits						
BD EC	IGTRQFT 5208	Introduction to General Theory of Relativity and Quantum Field Theory	2	5	5	LO1; LO2
PD EC	STMMP 5303	Special Topics in Mechanics and Molecular Physics (in Kazakh)	2	5	5	LO3; LO4
	SRWMS	Scientific Research Work of a Master's Student	1,2	16	16	
Module 4.1 – Solid State Physics and Nanotechnology, 33 academic credits						
PD UC	LCS 6301	Luminescence of Crystalline Systems (in Kazakh)	4	5	5	LO2; LO5
PD EC	RSPS 6302	Radiation-Stimulated Processes in Solids (in Kazakh)	3	5	5	LO3; LO4
PD EC	MSSSP 6303	Mössbauer Spectroscopy in Solid State Physics	4	5	5	LO2; LO4
PD UC	NME 6304	Nanotechnology Methods and Equipment (in Kazakh)	3	5	5	LO3; LO4
BD	PP	Pedagogical Practice	3	5	5	
	SRWMS	Scientific Research Work of a Master's Student	3,4	8	8	
Module 4.2 – Solid State Research Methods and Spectroscopy, 33 academic credits						
PD UC	LCS 6301	Luminescence of Crystalline Systems (in Kazakh)	4	5	5	LO2; LO5
PD EC	PMSSL 6302	Physical Methods for the Study of Solids and Liquids (in Kazakh)	3	5	5	LO3; LO4
PD EC	FSSICSS	Fine Structure Spectroscopy of Impurity	4	5	5	LO1; LO2

	6303	Centers in Solid Solutions				
PD UC	NN 6304	Nanosystems and Nanodevices (in Kazakh)	3	5	5	LO2; LO4
BD	PP	Pedagogical Practice	3	5	5	
	SRWMS	Scientific Research Work of a Master's Student	3,4	8	8	
Module 5 – Practice and Scientific Research, 27 academic credits						
ПД	RP	Research Practice	3,4	19	19	
	FC	Final Certification	4	8	8	

8. Summary Table Reflecting the Number of Credits Earned by Modules of the Educational Program (Scientific and Pedagogical Track, 2 Years)

Year of Study	Semester	Number of Modules	Number of Courses		Academic Credits						Total Hours	ECTS	Quantity	
			UC	EC	Theoretical Training	Teaching Practice	Research Practice	Научно-исследова-тельская работа	Итоговая аттестация	Всего	UC	EC	Theoretical Training	Teaching Practice
1	1	3	6	1	25			5		30	900	30	7	1
	2	2	1	3	19			11		30	900	30	4	2
2	3	1	1	1	20	5	10	5		30	900	30	2	1
	4	1	1	1			9	3	8	30	900	30	2	2
total		**5**	**7**	**9**	**6**	**5**	**5**	**19**	**24**	**8**	**3600**	**120**	**15**	**6**

9. RESOURCE SUPPORT OF THE EDUCATIONAL PROGRAM

The resource support is formed based on the requirements for the conditions of implementation of master's educational programs in the field of study **7M05301 – Physics**, and includes:

- personnel support;
- educational, methodological, and informational support;
- material and technical support.

9.1. Personnel Support

The implementation of the master's educational program must be provided by academic and teaching staff who, as a rule, have a basic education corresponding to the profile of the discipline they teach and are systematically engaged in scientific and/or scientific-methodological activities.

The proportion of full-time faculty members in the Department of Physics, including those teaching core and specialized courses in accordance with the State Compulsory Standard, is 80%.

9.2. Educational, Methodological, and Informational Support

The educational, methodological, and informational support includes: standard and working curricula for the discipline, teaching and methodological complexes, syllabi, assessment and measurement materials, active handouts, didactic materials, and regulatory documents governing various types of academic activities.

The educational program 7M05301 – Physics is fully provided with educational and methodological documentation and materials for all academic disciplines of the curriculum, including the standard and working programs of disciplines, teaching and methodological complexes (TMC), syllabi, assessment and measurement tools, active handouts, didactic materials, and others.

Each master's student has access to the Internet, including the university's electronic library, the Kazakh branch of the Republican Scientific and Technical Library (AF RNBT), KazNEB, Clarivate Analytics, Scopus, Springer, and the resources of the university’s scientific library. The library collection is equipped with printed and electronic editions, as well as educational and scientific literature for all specialty disciplines.

In addition, master's students have contractual access to the AF RNBT fund, including the dissertation fund of the Russian State Library.

The educational, methodological, and informational support of the educational process meets the requirements of higher education.

9.3. Material and Technical Support

In the implementation of the educational program 7M05301 – Physics, a material and technical base is used that ensures the conduct of all types of classes provided for by the working curriculum and complies with current sanitary and fire safety standards and regulations.

The material and technical base includes an academic building with classrooms, specialized rooms and laboratories, and computer labs for conducting classes in the specialty 7M05301 – Physics.

The Department of Physics is equipped with the following educational laboratories: Mechanics, Molecular Physics, Electricity and Magnetism, Optics,

Atomic and Nuclear Physics, Astronomy, Theory of Electric Circuits, Robotics, Methods of Teaching Physics.

In addition, the department houses scientific laboratories in the fields of: Radiation Physics of Materials, Nanotechnology, Polymeric and Composite Materials.

All laboratories are equipped with modern digital equipment, allowing for practical and laboratory sessions in accordance with the latest scientific and technological advancements.

10. 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

Director of the Aktobe Regional Planetarium — Bulekov K.Sh.

Director of Aktobe Higher Polytechnic College — Mukhambetpaizova Zh.S.