MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»
Chairman of the board –Rector
Doctor of historical sciences,
Academician Kozhamzharova D.P.
2023

EDUCATIONAL PROGRAM

7M01522-Physics and computer science with the basics of STEM learning

Registration number	7M01500255
Code and classification of the field of education	7M01Pedagogical sciences
Code and classification of areas of study	7M015 Teacher training in natural sciences subjects
Group of educational programs (EP)	M011 Teachers training in physics
OP type	current
ISCED level	7
NQF level	7
ORC level	7
Language of instruction	Kazakh RussianEnglish
Labor intensity of EP	120 credits
Distinctive features of the OP	-
Partner university (SOP)	-
Partner university (DDOP)	-

Shymkent , 2023y.

Drafters:

FULL NAME	Position	signature
Tursynbayev A.Z.	Candidate of pedagogical sciences, head of the «Physics» department	
Omashova G.Sh.	Candidate of phyc.-math.sciences, professor of «Physics» department	
Saidakhmetov P. A.	Candidate of phyc.-math.sciences, senior teacher of «Physics» department	Saidaxhmetov
Adyrbekova G.M.	Candidate of chemical sciences, head of the Center of educational program management	
Zhaidakbayeva L.K.	Candidate of pedagogical sciences, head of the «Computer Science» department	
Abdraimov R.T.	Master of physics	
Aikozy Assel	Master student of group MEP-21-11пк	
Ualikhanov B. S.	PhD., Head of the «Physics» department of the South Kazakhstan State Pedagogical University	
Sarsenbayeva Zh.P.	Director of A. Baitursynov school-gymnasium №50	
Myrzasalieva A.S.	Director South Kazakhstan Humanitarian and Economic College Директор Южно-	
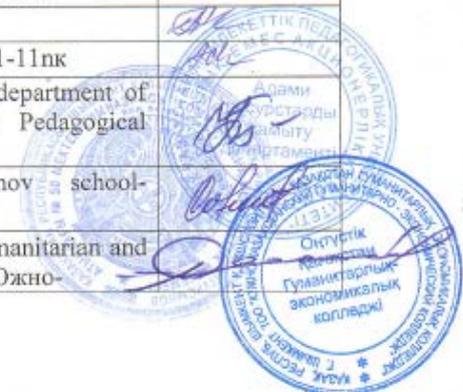
The EP was considered in the direction of training _____ at a meeting of the academic committee,

Minutes # 4 « 06 » 02 20 23 y.

Chairman of the Academic Committee _____ Urazbayev K.M.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU

Minutes # 4 «22» 02 20 23 y.

Chairman of the UMS _____ Abisheva R.D.

The EP was approved by the decision of the Academic Council of the University

Minutes # 13 «23» 02 20 23 y.

CONTENT

1. PROGRAM CONCEPT

University mission	Generation of new competencies, preparation of a leader who translates research and entrepreneurial thinking and culture
University values	• Openness - open to change, innovation and cooperation. • Creativity – generates ideas, develops them and turns them into values. • Academic freedom - **free in choice, development and action.** • Partnership - creates trust and support in relationships where everyone wins. • Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
Model of graduate	• Deep subject knowledge, its application and constant expansion in professional activities. • Information and digital literacy and mobility in a rapidly changing environment. • Research skills, creativity and emotional intelligence. • Entrepreneurship, independence and responsibility for self-activity and well-being. • Global and national citizenship, tolerance for cultures and languages.
Uniquenessof EP	• Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders. • Practice orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow you to be functionally literate and competitive in any life situation and be in demand in the labor market.
Academic Integrity and Ethics Policy	The university has taken measures to maintain academic honesty and academic freedom, protection from any kind of intolerance and discrimination: • Rules academic honesty (protocolscientist Council No. 3 October 30, 2018 .); • Anti-corruptionstandard (Order No. 373 н/к December 27, 2019). • Codeethics (protocolscientistCouncil No. 8 January 31, 2020).
Legal framework for the development of EP	1. Law Republic Kazakhstan "Education"; 2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 with amendments and additions dated December 29, 2021 No. 614; 3. State obligatory standard of higher and postgraduate education approved by the order of the Ministry of science and higher education of the Republic of Kazakhstan dated 20. 06. 2022 No. 2; 4. Rules organizations educational processon credit technology training approved by order of the Ministry of Education and Science of the Republic of Kazakhstan, April 20, 2011 No. 152; 5. Qualifying directory posts managers, professionals and other employees, approved by order Minister labor and social protection population Republic Kazakhstan, December 30, 2020 No. 553. 6. Management on using ECTS. 7. Management on developing educational programs higher and after university education , appendix 1 to the or derat directors TsBPiAM No. 45 о /д, June 30, 2021
About the	• Implementation principles Bologna process

organization of educational process	• With a student centered education • Availability • Inclusiveness
Ensuring the quality of the EP	• In the interior systemensur equality • Attraction of stakeholders to the development of the EP and its evaluation • Systematic monitoring • Content update (update)
Requirements for applicants	U are established in accordance with the Model Rules for Admission to Education in Educational Organizations Implementing Educational Programs of Higher and Postgraduate Education Order of the Ministry of Education and Science of the Republic of Kazakhstan, No. 600 October 31, 2018
Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)	For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS).For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website http://lib.ukgu.kz/ is open 24/7. An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

2. EP PASPORT

Purpose of the OP	Training of highly qualifiedcompetitive masters who meet modern principles of teaching in the field of STEM education, based on leadership and an integrative approach to teaching and research .
OP Tasks	– meeting the needs of the individual in intellectual, cultural and moral development by obtaining higher postgraduate education; - training of masters, teachers of physics, capable of successfully mastering related areas of professional activity, as well as advanced training, training in additional education programs and continuing education in doctoral studies; – meeting the needs of society in qualified specialists in the field of education and teaching physics in universities that are able to integrate academic values with entrepreneurial ideas; - development of a favorable educational environment for the implementation of professional, cultural and linguistic needs of students ; – formation of a deep professional understanding of fundamental problems and practical methods for their solution in the field of physics and methods of teaching physics and its applications in scientific and pedagogical activities; - the formation of professional ability to plan and independently conduct effective scientific and pedagogical work, as well as to critically evaluate its results; - the formation of the ability to adapt and apply general methods of solution to the solution of non-standard problems; - preparation for professional activities at a university, research institute, in production or doctoral studies.
Harmonization of EP	• 7th level National offrameworkRK qualifications; • Dublin descriptors of7 skill levels; • 2 cycleof Framework for Qualification of the European Higher Education Area; • Level 7 of theEuropeanQualificationframeworkforlifelonglearning.
Connectionof EPwith the professional sphere	Professional standard "Teacher", approved by the order of the acting Minister of Education of the Republic of Kazakhstan dated December 15, 2022 No. 500.
Scrollqualifications and positions	A graduate in this EP is awarded the degree of Master of Pedagogical Sciences / Master of Education in the educational program 7M01522-Physics and Informatics with the basics of STEM education. Masters of EP 7M01522-Physics and Computer Science with the basics of STEM education can hold the positions of assistant teacher, teacher, senior teacher of physics and computer science in universities, colleges, teacher-researcher and teacher-master in secondary and secondary specialized educational institutions, and researcher in scientific - research institutions.
Sphere of professional activity	– area of education, - social sphere for the development of children and young people in general education and higher education organizations, educational institutions and centers, – scientific activity and entrepreneurship in the field of education, – fields of physics and computer science, physics and computer science in education and in production.
Objects of	– higher, secondary and secondary specialized educational institutions

professional activity	(universities, colleges, educational institutions of technical and vocational education, lyceums, school gymnasiums), – management organizations: state educational authorities, departments of education; – research organizations.
Subjects of professional activity	- the educational process in the unity of its value-target guidelines, content, methods, forms and results; –scientific and pedagogical, innovative, informational and analytical activities in the field of methods of teaching physics and informatics.
Types of professional activity	*pedagogical and educational:* – organization of the educational process at different levels of the education system (organization of the process of education and upbringing, design and management of the pedagogical process, diagnostics, correction, prediction of the results of pedagogical activity); – preparation and conduct of classes in physics and informatics; – management of scientific work of students; – conducting optional classes in physics and informatics; – organization of cultural and leisure work with young students in the field of education, development of programs, methods and technologies for educational work in the field of physics and computer science, as well as its scientific and technical achievements. *research* : – conducting scientific research on the problems posed in the field of education; - selection of the necessary research methods; – formulation of new tasks arising in the course of scientific research; – work with scientific literature using new information technologies, tracking scientific periodicals; – analysis of the received scientific information using modern computer technology. *scientific and innovative* : – application of the results of scientific research in innovative activities; – development of new methods of scientific and pedagogical activity; – participation in the formulation of new tasks and the development of new methodological approaches in scientific and innovative research; – processing and analysis of the received data with the help of modern information technologies. *organizational and managerial* : – participation in the organization of research and scientific and innovative work; – participation in the organization of seminars, conferences; – preparation of abstracts, writing and design of scientific articles; – participation in the preparation of applications for grant competitions and the preparation of scientific and pedagogical projects, reports and patents.
Educational Outcomes	**EO1** Apply STEM technologies for the development of functional literacy of students based on a deep understanding of modern trends in education. **EO2** Effectively use psychological and pedagogical technologies in professional activities necessary for the training, development and education of students, including those with special educational needs **EO3** Conduct training sessions professionally, actively using STEM

	technology to develop students' life skills.
	EO4 Integrate and apply science and engineering practices into teaching, learning materials and assessment, demonstrating skills in analyzing, selecting and transforming information.
	EO5 Reasonable to plan and manage projects at all stages of their life cycle, solving problems based on critical thinking, applying digital technologies and resources, using logical, systematic and sequential approaches
	EO6 Plan and conduct research in the field of natural and pedagogical sciences to improve the practice of education, introducing the results of research into practical pedagogical activities in cooperation with colleagues.
	EO7 Generate new ideas and solve professional problems, including interdisciplinary areas.
	EO8 Critically determine the strategy of scientific, socio-pedagogical and communicative activities, making decisions and taking responsibility for the results.

COMPETENCES OF THE GRADUATE OF EP

SOFTSKILLS (Behavioral skills and personality qualities)

SS 1. Competence in managing one's own literacy	SS1.1. Strive for professional and personal growth throughout life. SS 1.2. Constantly update own knowledge within the chosen trajectory and in an interdisciplinary environment, carry out further learning with a high degree of independence and self-regulation. SS 1.3. To be capable of reflection, an objective assessment of one's achievements, an awareness of the need to form new competencies and continue education in doctoral studies.
SS 2. Language competence	SS2.1. The ability of possessing a sufficient level of communication in the professional field in the state, Russian and foreign languages for negotiating and business correspondence. SS 2.2. The ability of mastering the skills of mediation and intercultural understanding.
SS 3. Mathematical Competence and Competence in the field of Science	SS3.1. The ability to interpret the methods of mathematical analysis and modeling for solving applied problems in the field of study. SS3.2. The ability to plan the setting of scientific experiments, integrate and implement the results of scientific research in the professional field. SS 3.3. The ability to analyze and comprehend modern methods of pedagogical and psychological science and apply them in pedagogical activity.
SS 4. Digital competence, technological literacy	SS 4.1. The ability to confidently use modern information and digital technologies, artificial intelligence systems for work, leisure and communications. SS 4.2. Proficiency in the use, recovery, evaluation, storage, production, presentation and exchange of information in a wide range of digital devices. SS 4.3. Ability to confidently use global information resources and apply technological literacy in research and computational and analytical activities.
SS 5. Personal, social and academic competencies	SS 5.1. Possession of the norms of business ethics, social and ethical values and focus on them in professional activities. SS 5.2. Formation of a personality capable of mobility in the modern world, critical thinking and physical self-improvement. SS 5.3. Ability to work in a team, correctly, clearly and reasonably defend one's position during discussions and make decisions of a professional nature. SS 5.4. Ability to adequately navigate in various social spheres of activity and in conditions of uncertainty. SS 5.5. Ability to find compromises, correlate own opinion with the opinion of the team.
SS 6. Entrepreneurial competence	SS 6.1. The manifestation of leadership qualities and the ability to have a positive impact on others, to lead a team. SS 6.2. The ability to create conditions for the development of creative and entrepreneurial skills of the team. SS 6.3. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, respond to changing working conditions, allocate resources and manage your time. SS 6.4. Ability to work with consumer needs.
SS 7. Cultural awareness	SS7.1. The ability to show worldview, civil and moral positions.

and ability to express yourself

SS7.2. The ability to be tolerant of the traditions and culture of the peoples of the world, to have high spiritual qualities.

HARD SKILLS

Theoretical knowledge, practical skills and abilities specific to this direction

PC1 ability to independently set specific tasks of scientific research in the field of methods of teaching physics and solve them with the help of information technology and the use of the latest domestic and foreign experience.

PC2 the ability to apply knowledge of physics and methods of teaching physics to solve scientific and innovative problems, and apply the results of scientific research in innovative scientific and pedagogical activities.

PC3 ability to participate in the development of new methods and methodological approaches in scientific and innovative research and teaching activities

PC4 the ability to plan, organize and conduct research, scientific seminars and conferences in the field of education and physics.

PC5 ability to prepare and execute scientific and pedagogical documentation, scientific reports, reviews, reports and articles.

PC6 ability to lead research activities of students in the field of physics and methods of teaching physics.

PC7 the ability to methodically competently build lesson plans for the sections of academic disciplines in physics and publicly present the theoretical and practical sections of these disciplines in accordance with the approved teaching AIDS.

3. COMPETENCES OF

3.1 Matrix for correlating the learning outcomes of the EP in general with the competencies being formed

	EO1	EO2	EO3	EO4	EO5	EO6	EO7	EO8
SS1	+	+	+			+	+	
SS2	+	+	+			+	+	
SS3		+	+	+	+		+	+
SS4	+	+		+	+			
SS5		+			+			
SS6			+	+	+			+
SS7					+		+	
PC1	+	+	+		+		+	+
PC2	+	+	+		+	+	+	+
PC3		+		+		+		
PC4			+		+	+		+
PC5			+				+	
PC6							+	
PC7			+		+	+		+

4.MATRIX A OF THE INFLUENCE OF DISCIPLINE ON THE FORMATION OF EDUCATIONAL OUTCOMES AND INFORMATION ON LABOR INTENSITY

No.	Module name	Cycle	Component	Name of the discipline	Brief description of the discipline	Amount of credits	Formed educational outcomes (codes)							
							EO1	EO2	EO3	EO4	EO5	EO6	EO7	EO8
1	Moduleof Scientific and pedagogical training	BD	UC	History and philosophy of science	Purpose: Study of the problems of the phenomenon of science as a subject of special philosophical analysis, patterns and trends in the development of special activities for the production of scientific knowledge taken in a socio-cultural context. Contents. Identification of the specifics and relationship of the main problems of history and philosophy of science. Study of the laws of the development of science and the structure of scientific knowledge, methods of scientific research. Knowledge of the main concepts and directions of the non-classical and post-classical stage of the development of science. Analysis of the realities of modern theory and practice based on understanding the methodology of natural science, socio-humanitarian and technical knowledge. Critical thinking as a prerequisite for the development and functioning of modern society. Technologies for the development of critical thinking: consideration and study	4						v		v

						4										v
2		BD	UC	Foreign language (professional)	The aim is systemic deepening of communicative competence within the framework of foreign language education's international standards based on the further skills and abilities' active language proficiency development in the professional activities of the future master's student Contents. Levels B2, C1 are presented in the form of a pragma-professional orientation for professional and academic aims at an advanced level: scientific information base, interpretation of scientific information, argumentation, persuasion, scientific controversy, academic writing. Use of innovative methods and technologies, and attraction of modern means (Internet resources). Demonstration of language material's knowledge in any related discipline	4									v
3		BD	UC	Higher School pedagogy	The aim: formation of the foundations of the professional and pedagogical culture of a university teacher, general pedagogical competencies, familiarization of undergraduates with the theoretical and methodological foundations of higher education pedagogy, technologies for planning, organizing and managing the educational process at a university. Contents. Modern paradigms of education, history and latest trends in the development of higher professional education in the world and in Kazakhstan. Genesis and methodology of pedagogy of higher	4		v							

№															
				education, the competence of a university teacher. Problems of university didactics, problems of organizing educational work with students, management of a modern university. Modern approaches and methods of teaching and organization of educational activities of students, evaluation of educational achievements.											
4	Methodol ogy	PD	EC	Methods of teaching the basic principles of physics	Purpose: to familiarize with the basic principles of physics, the methodology of their training and the possibilities of their application in solving problems of professional activity. Contents: Scientific and methodological analysis of the basic principles of physics and methods of their teaching. Physical methods of studying nature, objects of studying physics: phenomena, body, matter and physical field. Examples of solving physics problems using general methodological principles of physics are given: the principles of symmetry, relativity, causality, superposition, complementarity, etc. The main demonstrations and experiments of physics are presented.	4							v		
5		PD	EC	Methods of Teaching educational robotics	Purpose: formation of master students' theoretical knowledge in the methodology of teaching robotics and skills in the development of methodological documents that provide the educational process Contents: psychological and pedagogical								v		

					features of teaching robotics are considered. Methodical principles for the study of robotics. Methods and means of teaching the basics of educational robotics. Methodological aspects of the use of educational constructors in teaching robotics. A method for teaching robotics based on the Arduino, Raspberry Pi and MyRIO platforms is proposed. The organizational forms of teaching robotics are outlined.												
6		BD	EC	Modern practices of STEM education in physics	Purpose: to expand the professional competencies necessary for a physics teacher using a STEM integrated approach in teaching. Contents: modern domestic and foreign STEM education practices are considered. The analysis of the integration of physics into the STEM context is carried out. Examples of practices of applying technologies and engineering tasks in teaching physics are given. Real problems are solved through physics. STEM practices are being adapted to different age groups and educational levels. The design and analysis of lessons and educational materials based on STEM principles are demonstrated.	5	v		v							
7		BD	EC	Modern practices of STEM education in computer science	Purpose: to expand the professional competencies necessary for a computer science teacher using a STEM integrated approach in teaching. Contents: modern domestic and foreign		v		v							

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					STEM education practices are considered. The analysis of the integration of computer science into the STEM context is carried out. Examples of practices of using computer science tools and technologies in solving interdisciplinary problems are given. STEM practices are being adapted to different age groups and educational levels. The design and analysis of lessons and educational materials based on STEM principles are demonstrated.											
8		PD	UC	Methods and technologies of STEM education	Purpose: Development of creative abilities of master students for the original solution of interdisciplinary problems, as well as mastering the basics of designing STEM classes to achieve educational goals. Contents: The content, teaching methods, technologies and didactic tools of STEM education are considered. Methods and technologies of STEM education are being explored, such as project-based learning, problem-based learning, research method, design thinking method, virtual reality technologies. The specifics of the implementation of STEM methods and technologies in modern lessons of various types in teaching physics are shown.	5	v		v						

№		BD/PD	EC	Course	Description										
9	Technology	BD	EC	Introduction to STEM	Purpose: to provide insight into the concepts and current issues in STEM education at the national and global levels. Contents. Definition and principles of STEM education. Features and conditions for the implementation of STEM education. STEM policies and initiatives at the national and global levels. Strategies for Integrated STEM Learning based on a critical review of the history, methods, and theory of Integrated STEM Learning within the framework of contemporary research. STEAM in the field of inclusive and special education.	4	v								v
10		BD	EC	Concepts of modern natural science	Purpose: formation of the scientific worldview of master students based on the assimilation of the most important natural science concepts and theories that underlie modern natural science and determine the prospects for its development. Contents: the main stages of the development of the natural science picture of the world are considered. The fundamental concepts and principles on the basis of which these pictures of the world are described. Key scientific achievements in the field of natural science. Methods of scientific cognition of various levels of organization of matter, space and time. Principles and categories of modern interdisciplinary concepts of natural science.								v		
11		PD	EC	Online	Purpose: to acquire the knowledge and	5					v	v			

				Educational Platforms	skills necessary for the successful development, implementation and management of online platforms in an educational environment. Contents: Definition and features of online educational platforms. Fundamentals of designing educational online platforms: structure, principles of development, functionality, interface and usability for users. Technical aspects of online educational platforms. Development, placement, management and updating of content on an online platform. Organization of interaction and communication on online platforms: services and tools. Analysis of data and statistics on the use of the platform. Managing the development and updating of online platforms.									
12		PD	EC	Digital technologies in education	Purpose: formation of skills and abilities of master students in the development of digital educational resources. Contents: Historical overview of the development of digital technologies in education. The trends and prospects for the use of digital technologies in education are analyzed. The issues of designing the content of digital educational resources (DER) are considered: principles for designing the content of the DER, principles for presenting educational material, didactic requirements for the DER, technologies for creating the basic components of the DER, means and stages				v	v			

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					of creating the DER. Digital literacy and safety in the online environment. Ethical issues in the use of digital technologies in education.										
13		BD	UC	Teaching practice	Purpose: formation of practical skills of teaching and learning methods. Contents: The student studies and analyzes the organization of the educational process in higher education, the teaching experience of leading university teachers during their classes. Attends scientific and methodological consultations. Plans, develops the content of training sessions and conducts them independently. Works individually with students; conducts reflection on his own pedagogical activity. Prepares a report on the results of the internship and defends it.	4		v					v		
14	Leadership	BD	UC	ManagementPsychology	Purpose: to ensure the competence of a psychologist by mastering his knowledge in the field of psychological management, developing skills in managing the organization's human resources. Content: мethodological foundations of management psychology. Development of psychological theories of management. General theoretical questions of management psychology. Psychology of managerial communication. Psychological characteristics of the staff. Psychology of employee motivation. Technologies of human resource management of the	4		v							v

№																
					organization. Psychological support of the personnel policy of the organization. Psychology of conflict in the organization. Technologies for preventing professional deformation of personality. Practical implementation in the form of creating diagnostic tools, developing digital methods for training leaders, and management consulting.											
15	v	BD	EC	Leadership and teamwork	Purpose: formation of master students' knowledge about the psychological aspects of the individual, the structure and functioning of the team; mastering the skills of team management as an organization system. Contents: the essential characteristics of leadership are considered. The concept of leadership. Differences between management and leadership. Leadership and governance. Theories of leadership. A modern approach to leadership. The laws of leadership. Behavioral theories of leadership. A professional team. Signs of a professional team. Stages of development of a professional team. Ethical aspects of leadership.	6										v
16		PD	EC	Projects management	Purpose: to form master students' ideas about modern project management technology and to acquaint students with the principles of project management in the tasks of their future professional activities. Contents: an introduction to the problems of project management is considered.							v				

					Project management methodologies are being studied. Modern tools and methods of project management are outlined at all stages of the project life cycle: project initialization, planning of its work, organization and management of the project team, project resources, change and problem management in the project, project quality and control.										
17	Physics of high technologies	PD	EC	Technologies for converting solar and thermal energy into electrical energy	Purpose: formation of theoretical knowledge and practical skills necessary to work with solar and thermal energy systems. Contents: examines the principles and technologies of converting heat into electricity using various technical devices. Thermoelectric energy conversion and thermoelectric materials, thermoelectronic energy conversion and photovoltaic energy are described. Solar thermal technologies, various solar energy collection systems, principles of solar thermophotovoltaics and thermoelectrics are considered. Spectral control methods that are crucial for solar thermal systems are discussed.	6								v	
18		PD	EC	Thermal radiation	Purpose: to give an idea of the current problems of the use of thermal energy and its transfer through various media. Contents: the principles of thermal radiation and their application to engineering problems of heat and photon transfer are investigated. The radiation properties of materials are considered.									v	

					Radiation transfer in absorbing, emitting and scattering media. Coherent laser radiation. The fields of application of lasers, visualization, infrared measuring equipment are given. The solution of problems related to the choice of a thermal radiation receiver is considered. Evaluation of the main parameters of devices using thermal energy											
19		PD	EC	Physical foundations of high technologies	Purpose: formation of master students' deep knowledge about the essence of physical ideas, theories, models underlying the development of modern high technologies. Contents: researches in semiconductor microelectronics, nonlinear optics, superconducting technology, nanoelectronics are described. The theoretical foundations of physical processes occurring in typical electronic, optoelectronic and other technical devices of high-tech physics are explained. Studies using electronic and nuclear magnetic resonance are considered. The theories and models underlying the development of high technologies are presented.	6									v	
20		PD	EC	Experimental physics	Purpose: to provide in-depth knowledge about the relationship between experiment and theory, accelerating the professional development of the student as a scientist in such skills as conducting an experiment and analyzing its data. Contents: examines modern scientific research in the fields of physics and										v	

№		PD	EC	Name	Description	Credits									
					astrophysics: the use of accelerators and detectors, energy, lasers and their applications, semiconductors and nanotechnology, superconductors, cosmology. The essence of the theoretical foundations of experimental methods of physical research is revealed. Research methods, methods of processing and analysis of experimental and theoretical physical information are described.										
21	v			Research practice	Purpose: familiarization with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data. Contents: the master student plans a research work, gets acquainted with the topics of research work and chooses a research topic. Master student studies special scientific domestic and foreign literature. Collects, processes, analyzes and systematizes scientific information on the topic. Selects the appropriate method of scientific research and studies the method of processing experimental data. He makes presentations at research seminars and conferences. Prepares a report on the research work and makes a presentation of the work performed.	6							v		v
22		PD	EC	Intelligent robotic systems	Purpose: formation of knowledge and skills of master students necessary for the development and application of intelligent	6				v	v				

No		PD	EC	Course	Description	Cr									
					robotic systems in various fields. Content: the classification and purpose of intelligent systems are considered. Evolutionary and neural network methods in the design of intelligent systems are outlined. Static and dynamic characteristics of software operations, information processing methods for robot control, principles of sensor systems organization, adaptation in robotic systems, information evaluations of sensor systems, robotic recognition systems are studied. The use of intelligent robotic systems is discussed.										
23		PD	EC	Educational Robotics	Purpose: mastering the basics of robotics and the formation of knowledge, skills and competencies necessary for the use of robotic designers in the educational process. Contents: the history of the development of robotics, the classification of robots, modern technologies in robotics are outlined. Theoretical and physical foundations of robotics are studied. The basics of designing robots, hardware and software of robotics are considered. The solution of problems and problems using robotic solutions is given. A review of the application of educational robotics in various subject areas is carried out.						v	v			
24		PD	EC	Cloud technologies	Purpose: to develop practical skills of undergraduates necessary for effective design, deployment and management of cloud resources and services.	5					v	v			

					Contents: a review of the cloud computing paradigm, a review of cloud system architectures is conducted. Cloud deployment models are analyzed: private cloud, public cloud, hybrid cloud, public cloud. The differences between cloud and cluster computing are discussed. Examples of Microsoft and Google cloud services are demonstrated. Modern cloud systems are considered: Microsoft Azure, AWS, Google cloud, Microsoft OneDrive, Dropbox, Mega, GoogleDrive, Yandex.disk, CloudMail.Ru , iCloud.									
25		PD	EC	Augmented reality	Purpose: to give an idea of the basic principles, methods and technologies related to the creation and application of augmented reality. Content: the basic concepts and definitions of augmented reality objects, technologies and augmented reality platforms are studied. Visualization and display in augmented reality are considered. The basics of application development using AR technologies, functions, tools, stages of work on the implementation of the project of its own augmented reality application are described. Examples of the use of augmented reality in real scenarios are investigated.					v	v			
26		PD	EC	Organization of Computer Laboratory Work in Physics	Purpose: to improve students' knowledge of physics with the help of computer laboratory work. Contents: Sets out the methods of	5			v		v			

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					organizing and conducting computer laboratory work in accordance with the purpose of the lesson. Describes the methodology for creating exercises (qualitative tasks; experimental tasks; research tasks) based on the experiment. Explains the methods of computer raster graphics and animation elements using a programming language, the construction of computer models in physics. The method of using computer laboratory work from PhET and a computer program from Vladimir Vaščák is given.										
27		PD	EC	Formation of ICT-competence of Future Teachers of Physics	Purpose: to form an idea about the use of ICT tools in the educational process. Contents: the concept of "ICT competence" and its components are defined. Professional tasks and ICT competence of a physics teacher are considered. Educational portals and Internet sites in the field of natural science education and digital educational publications on physics on CD are analyzed. The problems of the formation of ICT competence, the theoretical foundations of the methodological system of its formation in the classroom on the course of general physics, the criteria for its formation in future teachers are presented. The use of ICT in the organization of independent work of students is discussed.			v		v				
28		PD	EC	Artificial Intelligence and	Purpose: to develop the ability to apply machine learning methods to control and	5								v	

				Machine Learning	predict the behavior of physical systems. Contents: the use of a programming language in machine learning is considered. The simplest methods, neural networks of various structures, and the scope of their applicability are described. Optimization algorithms, methods of selecting the appropriate structure and parameters of the method, nuances related to the set and preprocessing of input data, regression and clustering are studied. "Ab-initio" modeling of the properties of cyber-physical systems using machine learning. Examples of the application of machine learning to solve actual problems of physics are given.											
29		PD	EC	Modeling of Cyber-physical Systems Based on Machine Learning	Purpose: formation of theoretical knowledge and practical skills in the field of design, modeling and debugging of cyberphysical systems. Contents: solved and unsolved problems in the field of artificial intelligence are considered. The basic concepts and methods of machine learning, the problems of formalization of reasoning, the Godel incompleteness theorem, the universal Turing machine are presented. The application of machine learning methods to tasks related to the professional field is discussed. The stages of designing and manufacturing cyberphysical systems and the software tools used are described; formalization, technology, engineering and modeling of cyberphysical systems are										v	

№	Module name			Discipline name	Purpose / Contents	Credits									
					considered.										
30	Module research work and final certification			Research work of a master student, including passing an internship And completing a master's thesis	Purpose: to demonstrate the consistent implementation of the dissertation work plan and its writing. Contents: the student completes the dissertation plan, performs a scientific review on the research topic, following which he prepares an article; makes a list of used literature; collects, processes scientific information on the topic of the dissertation; applies or develops modern research methods, research tools; solves research problems using modern methods of processing, verification and presentation of scientific data; prepares an article, abstract and dissertation.	24							v		v
31				Execution and Defence of Master's Thesis	Purpose: assessment of the achieved learning outcomes and mastered competencies upon completion of the study of the master's educational program. Contents: a master student draws up a dissertation work in accordance with the requirements for such works, as well as the requirements of the QMS of the university; delivers a scientific report on the main results of the prepared dissertation, made on the basis of the results of research work. When defending a dissertation, a master student must demonstrate his research and teaching competencies acquired during his studies at the master's program and their compliance with the requirements of the educational program.	8							v		

5.SUMMARY TABLE SHOWING THE VOLUME OF DISPUTED LOANS BY OP MODULES

Course of Study	Semester	Number of modules being mastered	Number of disciplines studied			Number of KZ credits					Total hours	Total loans KZ	Quantity	
			OC	UC	EC	Theoretical training	Ped. practice	Research practice	Scientific research work of a master student,	Final examination			copy	differential standings
1	1	4		5	2	29		-	1	-	900	30	5	2
	2	4		-	4	22	4	-	4	-	900	30	4	1
2	3	2			2	11		6	3	-	600	20	2	1
	4	1			3	16		-	4	-	600	20	3	
	5								12	8	600	20		
total				5	11	78	4	6	24	8	3600	120	14	4

6. STRATEGIES AND METHODS OF TRAINING, MONITORING AND EVALUATION

Strategies and learning	**Student - centered learning**: **the** learner is the center of teaching/learning **and an active** participant in the process of learning and decision-making. **Practice-oriented learning**: focus on the development of practical skills.

Teaching methods	Conducting lectures, seminars, various types of practices with:
	• application of innovative technologies:
	   • problem learning;
	   • case study;
	   • group work and creative groups;
	   • discussions and dialogues, intellectual games, olympiads, quizzes;
	   • methods of reflection, projects, benchmarking;
	   • Bloom's taxonomy;
	   • presentations;
	• rational and creative use of information sources :
	   • multimedia educational programs ;
	   • electronic textbooks ;
	   • digital resources .
	Organization of independent work of students, individual consultations.

Monitoring and assessing the achievability of learning outcomes	**Current control** on each topic of the discipline, control of knowledge in classroom and extracurricular activities (*according to the syllabus*). Evaluation forms:
	   • surveys;
	   • testing topics of academic discipline;
	   • test papers;
	   • protection of independent creative works;
	   • discussions;
	   • trainings;
	   • colloquia;
	   • essay , etc.
	R intermediate control at least two times during one academic period within the same academic discipline.
	Intermediate certification is carried out in accordance with the working curriculum, academic calendar.
	Conduct forms:
	   • examination in the form of testing;
	   • oral exam;
	   • a written exam;
	   • combined exam;
	   • protection of projects;
	   • protection of reports on practices .
	Final Certification.

7. TRAINING AND RESOURCE SUPPORT OF THE EP

Information Resource Center	The structure of the OIC includes 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The network infrastructure of the JIC is based on 180 computers with Internet access, 110 workstations , 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4 format scanners, the JIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system. The library fund is reflected in the electronic catalog available to users on the site http://lib.ukgu.kz on -line 24 hours 7 days a week. Thematic databases of their own generation have been created: "Almamater", "Proceedings of SKSU scientists", "Electronic archive". Online access from any device 24/7 via external linkhttp://articles.ukgu.kz/ru/pps . Catalogs are processed electronically. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKSU in Print", "Readers" and "SKR". The JIC provides its users with 3 options for accessing its own electronic information resources: from the "Electronic Catalog" terminals in the catalog hall and divisions of the JIC; through the information network of the university for faculties and departments; remotely on the website of the library http://lib.ukgu.kz/ . Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet" , Digital library "Aknurpress", "Smart-kitar", "Kitar.кз", etc. For people with *special needs* and disabilities, the library website has been adapted to the work of visually impaired users
Material and technical base	For the preparation of undergraduates in this direction, there is an appropriate material and technical base of the specialty, that is, classrooms, laboratories, a computer class that meets the requirements of the SES. The Department of Physics includes 6 classrooms: mechanics and molecular physics, electromagnetism, the TSE Laboratory and astronomy, optics, atomic and nuclear physics (an interactive whiteboard is installed here) and a computer class. There is a specialized scientific and technical experimental base in the laboratories of the center "SAPA" and "IRLIP", where EP 7M01522 - "Physics and Computer Science with the basics of STEM education" meets sanitary and technical standards and provides all types of practical, disciplinary training, research work of undergraduates provided for in the working curriculum of the specialty.

APPROVAL SHEET

according to the Educational program 7M01522- Physics and computer science
with the basics of STEM learning

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Director of DCS _____ Nazarbek U . B

Director of the DEC _____ Bazhirov T.S.