MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN

KARAGANDA UNIVERSITY OF THE NAME OF ACADEMICIAN E.A.BUKETOV

«AGREED»
Director of KSF "Specialized boarding school "Darya""
_____ L.A. Temerkhanova
«28» 03 2022 г.

«AGREED»
Director of KSU «Lyceum school №66»
_____ B.N. Nurmachanov
«28» 03 2022 г.

«AGREED»
Director of LLP "Center of information systems WTO"
_____ O. A. Laptanovich
«28» 03 2022 г.

«CLAIM»
To Charman of the Board-Rector of Karaganda University of the name of academician E.A.Buketov
_____ professor N.O. Dulatbekov
«26» 05 2022 г.

EDUCATIONAL PROGRAM

«7M01503-Computer science»

Level: Master's Degree

Degree: Master of pedagogical Sciences

Karaganda, 2022

The educational program in the direction of training "7M01503 Computer science" is developed on the basis of:

- The Law of the Republic of Kazakhstan "On Education";

– State Mandatory Standard of Postgraduate Education No. 604 dated August 31, 2018;

– The National Qualifications Framework of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations;

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

– Classifier of training areas with higher and postgraduate education dated October 13, 2018 No. 569.

– 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" dated June 8, 2017 No. 133)

– Professional standards of the direction "Information and Communication Technologies" No. 171 dated 17 July 2017

Content

Passport of the educational program «7M01503-Computer science»

1. Code and name of the educational program: «7M01503-Computer science»
2. Code and classification of the field of education, areas of training: 7M015 Teacher training in natural science subjects
3. Group of educational programs – M012 Teacher training in Informatics
4. Volume of credits: 120 ECTS
5. Form of training: full - time
6. Language of training – Russian
7. Degree awarded– Master
8. Type of EP (acting, new, innovative) - acting
9. ISCED level - 7
10. The level of the NRK - 7
11. The level of the ORC - 7
12. Distinctive features of the EP: -
13. Number of the appendix to the license for the direction of personnel training: Appendix No. 16 to the state license No. KZ83LAA00018495 dated 07/28/2020
14. The name of the accreditation body and the validity period of the EP accreditation: -
15. The goal EP

The purpose of the EP "7M01503-Computer Science" is to train masters who are able to apply information and communication technologies in the educational field of detail, monitor and manage the educational process, and have the skills of research activities.

16. Qualification characteristics of the graduate

a) List of posts:

- Teacher
- Middle school teacher
- College teacher
- Teacher. University teacher
- Teacher-researcher
- Teacher. Manager in education

b) The sphere and objects of professional activity of the graduate:

The sphere of professional activity of graduates of the educational program "7M01503-Computer Science" are educational organizations.

The objects of professional activity of the Master of Education under the educational program "7M01503-Computer Science" are: general education schools, gymnasiums, lyceums, colleges, regardless of their forms of ownership and departmental subordination, institutes of advanced training and retraining of teaching staff, departments of education.

c) Types of professional activity

Masters of Pedagogical Sciences "7M01503-Computer Science" can perform the following types of professional activities:

– educational (pedagogical, educational):

- diagnostic - study of the student's personality, learning outcomes, upbringing and development;
- organizational and technological (organization of the process of education and upbringing based on pedagogical technologies)–
- managerial and pedagogical (interaction "subject-subject", management in education);
- project (modeling of education in higher education);
- research (creative search in solving problems of education, study of pedagogical experience, reflection).

d) Functions of the graduate's professional activity

The main functions of the activity are:

- educational - broadcasts educational information, teaches to independently acquire knowledge, constructs training sessions taking into account the needs and requests of students, uses new learning technologies, including online technologies, ICT, etc.;

- educating - introduces students to the system of social values, observes pedagogical tact, rules of pedagogical ethics, shows respect for the personality of students, is guided by a democratic style in relations with students, builds the educational process taking into account the national priorities of Kazakhstan, develops linguistic competence and multiculturalism of the individual, etc.;

- methodical - provides methodological support of the educational process, is guided by the principles and methods of developing educational and program documentation and designing situational pedagogical tasks, determines methods and techniques of education and upbringing, develops general academic skills and skills of students, improves qualifications by implementing an individual professional development plan, etc.;

- research - applies scientific principles and research methods in the educational environment; carries out psychological and pedagogical monitoring of students' activities, uses the results of diagnostics of individual characteristics and abilities of students to identify their needs and difficulties in learning, as well as increase their personal growth, etc.

- socio-communicative - is guided by the knowledge of the psychology of communication when interacting with the professional community and stakeholders of education, uses methods of teamwork and professional cooperation within the framework of the policy of the organization of education, initiates innovative ideas that unite education stakeholders, etc.

17. Formulation of learning outcomes based on competencies

Type of competencies	Codes	Learning outcomes
Behavioural skills and personal competencies (Soft skills)	LO1	Demonstrates actual knowledge of modern history and philosophy of science, applied natural sciences, contributing to the implementation of the main directions of modernization of public consciousness
	LO2	Owns knowledge in analyzing methodological problems arising in solving research and practical problems, including in interdisciplinary areas.
Professional competencies (Hard skills, Digital skills)	LO3	Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, normative documents, taking into account the individual and special educational needs of students, the methodology of conducting training sessions
	LO4	Fluent in English and translation techniques at the level of understanding the functional features of oral and written professionally-oriented texts
	LO5	Applies in practice modern methods of analysis of innovative solutions to applied and scientific problems in the field of education, methods and models of commercialization of innovative technologies in the field of IT and education, owns methods of organization and effective management of IT projects
	LO6	Applies information and communication technologies for the design, development and use of digital educational resources and robotics in education, owns methods of analysis and visualization of big data
	LO7	Owns modern programming languages for the development of cross-platform educational resources for solving scientific and educational tasks, taking into account the requirements of information security

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

Learning outcomes code	Name of the module	Name of disciplines	Volume (ECTS)
LO1, LO2	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
LO1, LO3		Higher school pedagogy	4
LO2, LO3		Psychology of management	4
LO2, LO3		Pedagogical practice	4
LO4	Professional languages	Foreign language (professional)	4
LO4, LO6 LO2, LO4		Professional foreign terminology in computer science/ Culture and Ethics of Academic writing	5
LO2, LO5	IT innovations	Commercialization of the results of scientific and technical activities Scientific innovative entrepreneurship	5
LO2, LO5		Innovation in the IT sphere and education IT Project Management	5
LO3, LO6	Professional	Design and development of digital educational resources	4
LO3, LO6		Technologies of project activity with the use of ICT	4
LO3, LO6, LO7		Computer technologies in science and education	4
LO3, LO6 LO2, LO6	Information Technology	Educational online platforms/ Visualization technologies in education	5
LO7		Programming in Python/ Programming in Java	4
LO7		Cryptology (in English)/ Information security technologies	5
LO7		Web application development / Cloud technologies	4
LO7 LO6, LO7		Mobile application development / Robotics in Education	4
LO2, LO3, LO6		Research practice	14
LO2	Research work	Research work of a master's student, including internship and completion of a master's thesis (NIRM)	24
LO2	Final certification	Preparation and defense of a master's thesis	12

19. Matrix of achievability of learning outcomes

NN	Name of disciplines	Brief description of the discipline (30-50 words)	Number of credits	Generated learning outcomes (codes)						
				LO1	LO2	LO3	LO4	LO5	LO6	LO7
Cycle of basic disciplines University component										
D1	History and philosophy of science	The history and philosophy of science as the study of the general laws of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Features of scientific knowledge. Historical development of institutional forms of scientific activity. Scientific communities and their historical types. Training of scientific personnel. Changing the place and role of science in the life of society.	4	+	+					
D2	Higher school pedagogy	Pedagogy of higher education, its specifics and categories. Modern educational paradigms. The essence and objectives of higher and postgraduate professional education. Characteristics of Kazakhstan's system of higher and postgraduate professional education. Didactics of higher education. Objectives, content and regulatory framework of higher professional education. Competence-based approach in the training of professionals. The concept and structure of pedagogical communication.	4	+		+				
D3	Psychology of management	The subject and main tasks of management psychology. The personality of the subordinate. Psychology of managing his behavior. Psychology of group process management. Psychological characteristics of the personality of the head. Psychological influence in management activities. The communicative competence of the manager. Psychology of conflict management.	4		+	+				
D4	Foreign language (professional)	Formation of intercultural and communicative competence of students in the process of foreign language education; formulating and reasoned statement of one's position, using the language means of the studied languages; possession of business speech skills in the professional field of communication.	4				+			
Cycle of basic disciplines Component of choice										
D5	Professional foreign terminology in computer science	English in the field of IT: work and professional communication. International communication. Professional terminology in English in the areas of ICT: the main types of personal computers, hardware and software, operating systems, programming, software product design, the use of Internet resources in professional activities.	5				+		+	

D6	Culture and Ethics of Academic writing	Features of academic writing. General requirements for scientific work. Types of academic texts. Style of presentation. Errors in written scientific papers. Working with sources. References and citation rules. Plagiarism. The author's attitude to the cited material. Various ways of quoting. Structuring and preparation for writing a scientific text. Essay. Practical recommendations for writing a scientific text	5		+		+			
D7	Commercialization of the results of scientific and technical activities	Theoretical foundations of the commercialization of the results of scientific activity, including the stages of project development and implementation, systematization of concepts and basic theoretical concepts; creative implementation of theoretical and applied knowledge in practice (in the organization of project work).	5		+			+		
D8	Scientific innovative entrepreneurship	Study of the essence, content and characteristics of high-tech production and business. Fundamentals, infrastructure, and trends in the development of modern innovative entrepreneurship. Methods, strategies, features of functioning and management of high-tech business. Characteristics, criteria, and features of small knowledge-intensive business.	5		+			+		
D9	Innovation in the IT sphere and education	Innovative development: basic approaches and new paradigms. Innovative infrastructure. Innovations: definitions and classification. Stages of commercialization and business models of startups. IT project management in education. The life cycle of an IT project. Project initiation. Project planning. Development of the project schedule. Project risk management. Quality management. Educational projects.	5		+			+		
D10	IT project management	The concept and basic elements of the enterprise IT infrastructure. The life cycle of an IT project. Project initiation. Project planning. Development of the project schedule. Project human resource management. Project cost management. Project risk management. Quality management. Interaction management. Implementation of an IT project.	5		+			+		
Cycle of profile disciplines University component										
D11	Design and development of digital educational resources	Types of digital educational resources (DER). Classification of digital educational resources by areas. Fundamentals of pedagogical design. Designing the content of digital educational resources: the principles of designing the content of the DER, the principles of presenting educational material. Didactic requirements for the DER. Technologies for creating the basic components of the DER. Means and stages of creating a DER.	5			+			+	
D12	Technologies of project activity with the use of ICT	Project method. The structural logic of instructional design. Integration of ICT and modern educational technologies. Stages of work on the project using ICT. Formation of project teams. Types of projects: information, creative, game, role, research, applied (practice-oriented). The design and presentation of the results of the project activities.	4			+			+	

D13	Computer technologies in science and education	Computer technologies, basic concepts, science as an object of computerization. Types of scientific and technical information and its processing. Computer technologies in theoretical research. The composition and methods of theoretical research. Computer support for theoretical research. Computer technologies in scientific experiment, modeling and processing of scientific research results.	4			+			+	+
Cycle of profile disciplines Component of choice										
D14	Educational online platforms	Platforms for online education. Review of Internet resources with educational content. Create online courses. ISpring Online platform. Tools to create online courses, services to host courses and create a training portal: LearningApp, Wordscloud, Kahoot!, Prezi.	5			+			+	
D15	Visualization technologies in education	Data visualization. 3D visualization, visual images. Creation of three-dimensional images, animations and diagrams, various types of graphs (dot and line graphs; histograms; pie charts). Methods of expressiveness and data analysis. Algorithms for visual representation of numerical solutions. Three-dimensional modeling. Promising areas of development of concepts and methods of visual representation.			+				+	
D16	Programming in Python	The basic structure of the standard Python modules. Built-in object types. Numerical algorithm. Matrix calculations. Processing of text information. Create applications with GUI. Overview of graphic libraries: Tkinter, PyQT. Object-oriented programming. Classes in Python. Definition of data, methods, operations. Inheritance. Multiple inheritance. Composition in the development of classes. Functional programming. Development of Web applications.	4							+
D17	Programming in Java	An introduction to Java programming. Basic concepts and definitions. Syntax and structure of the language. Java and Object-Oriented Programming. Class inheritance and modification. Polymorphism. Interfaces. Development tools. Working with text and multilingual support. Graphical user interface. Collections.								+
D18	Cryptology (English)	Principles of construction of systems of cryptographic protection of information; the key systems, cryptographic algorithms and protocols that form the basis of cryptographic information protection in modern computer networks and their cryptographic properties; General approaches regarding the choice of parameters of the cryptosystems, algorithms for their constructing and testing; basic concepts of information security, means of access control, cryptographic techniques.	5							+

D19	Information security technologies	The main provisions of the theory of information security. Security models and their application. Substantiation of the problem of information protection in information systems. Theoretical and practical methods of information protection. Cryptographic models. Symmetric cryptosystems. Cryptographic means of information protection. Public key systems. Basic technologies for building secure systems.								+
D20	Web application development	Classification and types of Web applications. Web application development tools: HTML, HTML5, CSS3. Client-server interaction. Technologies for developing client-server applications. Web design. JavaScript and jQuery libraries. Platform Node.js . Vue frameworks.js, Angular2 and React 15. CMS systems. A programming interface for accessing and managing the content of DOM API Web pages. Prototyping of application interfaces and software complexes: Axure tools, Adobe Experience Design, Figma, Sketch.	4							+
D21	Cloud technologies	Cloud deployment models: private cloud, public cloud, hybrid cloud, public cloud. The main models of providing cloud computing services. Overview of solutions from leading vendors - Microsoft, Amazon, Google. Development of Web applications for deployment in a cloud environment. Virtualization technologies.								+
D22	Mobile application development	Android platform device. Overview of programming environments. The main types of Android applications. Android application architecture. Main components. Application manifest. Resources. Basics of developing interfaces for mobile applications. Navigation controls and design. The basics of developing multi-window applications. Using the capabilities of the smartphone in applications. Database and Media in Android.	4							+
D23	Robotics in Education	Robotics in education: trends and trends. Introduction to LEGO Mindstorms EV3. LEGO MINDSTORMS EV3 robot software. Introduction to EV3 sensors: touch sensors, colors, gyroscope and operations on them. Programming EV3. Working with Arduino. Project activity.							+	+

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

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LO1	Demonstrates current knowledge of modern history and philosophy of science, applied natural sciences, contributing to the implementation of the main directions of modernization of public consciousness	Interactive lecture, discussion	Test, colloquium, control tasks
LO2	Owns knowledge in analyzing methodological problems arising in solving research and practical problems, including in interdisciplinary areas.	Interactive lecture, discussion, panel discussion	Test, colloquium, control tasks
LO3	Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students, the methodology of conducting training sessions in the conditions of digitalization of education	Interactive lecture, discussion, panel discussion	Test, colloquium, control tasks, methodical portfolio
LO4	Fluent in English and translation techniques at the level of understanding the functional features of oral and written professionally-oriented texts	Interactive lecture, panel discussion, group work	Test, colloquium, portfolio, essay
LO5	Applies in practice modern methods of analysis of innovative solutions to applied and scientific problems in the field of education, methods and models of commercialization of innovative technologies in the field of IT and education, owns methods of organization and effective management of IT projects	Interactive lecture, discussion, panel discussion, group work	Test, colloquium, control tasks
LO6	Applies information and communication technologies for the design, development and use of digital educational resources and robotics in education, owns methods of analysis and visualization of big data	Interactive lecture, demonstration examples method, practical teaching method; group work	Test, colloquium, control tasks, methodical portfolio of digital resources
LO7	Owns modern programming languages for the development of cross-platform educational resources for solving scientific and educational tasks, taking into account the requirements of information security	Interactive lecture, method of demonstration examples practical method of teaching; group work	Test, colloquium, software product, control tasks

21. Criteria for assessing the achievability of learning outcomes

Codes of LO	Criteria
LO1	Knows: the subject of modern philosophy and its role in the history of human culture; the main stages in the development of world philosophical thought, schools and teachings, outstanding philosophers of the past and present. Can: establish cause-and-effect relationships in the history and philosophy of science, creatively apply historical knowledge in practice, use the categorical apparatus of thinking and philosophical methods of cognition for intellectual development. Owns: skills of theoretical and applied analysis of social processes
LO2	Knows: methodology for solving applied research and practical problems. Can: identify features, analyze the methodological problems that arise in solving applied problems. Owns: the skills of analyzing methodological problems that arise in solving research and practical problems, including in interdisciplinary areas
LO3	Knows: the main provisions of normative and conceptual documents in the field of education, features of the educational process; requirements for the teaching profession. Can: apply methods and methods of planning the activities of an educational organization in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students; apply various forms and methods for conducting training sessions; use innovative approaches in the educational process. Owns: the skills of designing and managing a holistic pedagogical process of educational organizations, methods of psychology in professional activities.
LO4	Knows: functional features of oral and written professionally oriented texts; requirements and principles of academic writing; specialized terms of informatics and pedagogy in English. Can: compose texts based on academic writing, apply foreign terminology in professional communication; participate in English in the discussion of topics related to the specialty; compose annotations of scientific articles and state the main content of texts according to the profile into the native language / from the native language. Owns: the technique of translating a professionally oriented text, methods of objective interpretation and critical evaluation from the perspective of intercultural dialogue.
LO5	Knows: the concept of innovation and the innovation process, the basics of the commercialization of innovative technologies in the field of IT and education, project management methodology, the structure and typical content of an IT project. Can: analyze and optimize the work plan and the cost of the project in the field of IT and education; draw up project documentation; apply information systems to solve practical problems of project management. Owns: methods for evaluating the effectiveness of innovative projects in the IT field and education, methods for analyzing project risks and determining measures to respond to them.
LO6	Knows: the basics of designing and developing digital educational resources, digital educational platforms, the features of using robotics in education, the basics of big data. Can: develop digital educational resources, use technologies and development environments to create robots, apply software packages for analyzing and visualizing big data. Owns: methods of design, development and application of digital educational resources and robotics in education, methods of analysis and visual presentation of big data.
LO7	Knows: programming technologies, methods of developing educational resources, basics and requirements of information security. Can: use methods and tools for designing and developing cross-platform educational resources, methods of protecting information in professional activities. Owns: skills in developing cross-platform applications and resources using modern programming languages in accordance with information security requirements

22. The graduate model of the educational program

Graduate Attributes:

- High professionalism in the field of pedagogy, IT technologies
- Emotional intelligence
- Adaptability to global challenges
- Leadership
- Entrepreneurial thinking
- Global citizenship
- Understanding the principles and culture of academic integrity

Types of competencies	Description of competencies
Behavioural skills and personal competencies (Soft skills)	Improves and develops his intellectual and general cultural level, strives for the development and growth of personal qualities, creative abilities to achieve the chosen goals, revaluation of accumulated experience The ability, based on deep knowledge of history and philosophy, relevant areas of social sciences, to show a scientific worldview and a civic position in their professional activities
Professional competencies (Hard skills, Digital skills)	Willingness to apply technologies of organization, planning and management of the educational process of higher education, to analyze psychological conditions and especially management activities in order to improve the efficiency and quality of work in the education management system, to consolidate the acquired knowledge and skills in the process of pedagogical practice Willingness to solve real communicative tasks in certain situations of communication and professional activity through the studied language, to master professional terminology, to develop professionally significant skills and experience of foreign language communication in all types of real activity (reading, speaking, listening, writing) in the conditions of scientific and professional communication in the field of computer science The ability to implement scientific programs, projects and commercialize the results of scientific and educational activities for innovative research in the IT field and education. The ability to apply pedagogical technologies and teaching methods in the field of IT, information and communication technologies in professional activities. Ability to design and develop applied and educational software products and applications.

Compilers:
Members of the working group:

Head of Department AMaI	E.A. Spirina
Professor of the Department AMaI	D.A. Kazimova
Associate Professor of the Department AMaI	N. A. Gorbunova
Associate Professor of the Department AMaI	R. Murathan
Deputy director for specialized education of KSU "School-Lyceum No. 66"	N.K. Mukasheva
Master's student	A.K. Konyrbaeva
Doctoral student	R.P. Bukh

The educational program was reviewed by the Faculty Council 28.03.2022y Protocol № 6/1
The educational program was considered at a meeting of the Academic Council from 28.04.22y Protocol № 5
The educational program was reviewed and approved at a meeting of the University Board 26.05.22y Protocol № 12

Member of the Board, Vice-Rector for Academic Affairs **T.Z. Zhusipbek**

Director of the Department for Academic Work **G.S. Akybayeva**

Dean of the Faculty of Mathematics and Information Technology **D.A. Kazimova**