

**Ministry of Science and Higher Education of the Republic of Kazakhstan
NJSC "Korkyt Ata Kyzylorda University"**



GRADUATE MODEL

**Bachelor's degree in the educational programm
«6B06150-Computing and software»**

Kyzylorda, 2023

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Introduction

The graduate model of Korkyt Ata University is a comprehensive image of the result of studying at the university at all levels of education. The graduate model is recommended for use in the development of educational programs.

The development of a graduate's competence model is an important prerequisite for the implementation of the main directions of the Bologna process and a requirement of the modern labor market. The competence model of a graduate (bachelor) is designed to answer the question of what professional tasks a specialist of a certain rank (position), of a particular profile should be able to solve. The formation of a modern graduate model that meets the needs of all interested parties is the main strategic goal of Korkyt Ata University and is provided with the necessary resources for the educational process, including personnel, educational, methodological, informational and logistical support. The University conducts a targeted personnel policy and systematic improvement of the material and technical base of the university to ensure the quality of training of a bachelor graduate in demand in the labor market.

1. Description of the educational program

The educational program 6B06150-Computing and software is implemented in order to develop the potential of higher education, taking into account the educational needs and requests of students. The educational program includes materials that ensure the quality of training of students and the introduction of appropriate educational technologies in the field of personnel training.

The main idea of the educational program is to theoretical and practical training of specialists in the development and operation of database systems, taking into account the requirements of computer hardware and software, and the formation of students' knowledge of methods and tools for automation of production processes and industries and their application skills

2. The constituent components in the formation of the graduate model of the educational program

The key components of the formation of the graduate Model of the educational program include information about the goals and objectives of the educational program, objects, types and directions of professional activity, the competence model of a specialist (*Appendix 1*), including descriptors, a variety of competencies in accordance with the educational program, the results of the educational program.

2.1 Objectives of the Educational Program:

The goal of the educational program 6B06150 - Computer equipment and software is to train highly qualified specialists competent in the field of software development, software maintenance specialists, IT designers, system architects and engineers in the field of mathematical and organizational – legal support, software architects, system analysts, software design, mobile application development, application testing specialists capable of self-development and career growth in the relevant industry.

2.2 Objectives of the Educational Program:

Training of qualified specialists in the field of development and use of hardware and software capable of developing and implementing innovative solutions in the IT field; integration of educational

and scientific activity; establishing partnerships with higher educational institutions of near and far countries in order to improve the quality of education, support technical and cultural relations; expanding relations with employers, conducting courses, seminars, master classes, internships, industrial experiences in order to determine the requirements for the quality of training of specialists.

2.3 General and professional competencies

General competencies:

GC 1 To enter into communication in oral and written forms in Kazakh, Russian and foreign languages

GC 2 Use various types of information and communication technologies in professional activities;

GC 3 Ability to take responsibility, work out solutions together with others and participate in their implementation, tolerance to different ethnocultures and religions;

GC 4 Find compromises, correlate your opinion with the opinion of the team;

GC 5 Use the basics of knowledge and methodologies explaining the world to identify problems and conclusions based on evidence, apply their knowledge to solve professional problems;

GC 6 Build a personal educational trajectory throughout life for self-development and career growth;

GC 7 Focus on a healthy lifestyle to ensure full-fledged social and professional activities through methods and means of physical culture;

GC 8 Conduct scientific research, experiments with the writing and presentation of various types of works based on the principles of academic integrity.

0 *Professional competencies:*

PC1 knows how to determine the stationary conditions of high-order multidimensional systems and learns to study their stability;

PC 2 Can use basic programming tools; can independently design software, analyze the subject area; can use standard software in his professional activity; The ability to form judgments about the meaning and consequences of one's professional activity, taking into account social, professional and ethical positions. Ability to develop and apply algorithmic and software solutions in the field of system and application software. Ability to create and monitor work plan, plan resources needed for work performance, evaluate results of one's work;

Ability to advise customers on the rational choice of IT infrastructure management methods and tools. Ability to protect intellectual property rights. Professional on the basis of information and bibliographic culture, using information and communication technologies and taking into account the basic requirements of information security;

The ability to solve standard tasks of professional activity on the basis of information and bibliographic culture, using information and communication technologies and taking into account the main requirements of information security

PC 3 Ability to form technical tasks and participate in the development of computer hardware and (or) software. Ability to organize industrial testing of the software being developed. Ability to use modern technologies of development of software complexes using case-tools, quality control of developed software products. Understanding of the current methods of verification of software models (SO); Can use basic programming tools; can independently design software, analyze the subject area; can use standard software in his professional activities.

PC 4 Willingness to study scientific and technical information, domestic and foreign experience on the topic of research; ability to organize installation and adjustment of information communication equipment; ability to find and eliminate problems;

As a result of studying this subject, students will: know the typical laws of probability distribution,

reliability models of networks with different configurations, reserve models; the ability to use a systematic approach when researching, designing and using computer networks; should master the practical skills of calculating reliability characteristics based on test results.

PC 5 Development of multimedia products; creation and editing of media elements; creating presentations with media elements; Placement of multimedia products on the Internet. Mastering: skills of designing multimedia objects; - multimedia information processing skills; - skills of placing, testing and updating multimedia objects; - methods of using information technologies when creating a project of multimedia objects; tools for creating and modifying multimedia objects; skills of formalizing the obtained results in the form of a presentation; modern tools for creating, modifying and viewing multimedia products; mastering the basics of WEB design; mastering the principles of creating WEB sites using new information technologies; Learn how to effectively use JavaScript scripts in WEB site development.

PC 6 The ability to use theories and methods of theoretical and applied innovation, management systems and strategies, quality management of innovative projects, to choose appropriate methods for solving experimental and theoretical problems. Ability to critically analyze modern issues of innovation, taking into account the economic, social, environmental and technological aspects of human life. Able to create conceptual interface design, sketching and prototyping complex interfaces, taking into account trends in interface design and development of visual culture.

The ability to independently obtain, develop and use mathematical, natural science, socio-economic, engineering knowledge, develop, implement and adapt application software to formalize and solve the tasks of software development and modification.

PC 7 Ability to use computer skills, mastering information technology methods, compliance with the basic requirements of information security. Willingness to participate in work on preparation, repair and commissioning of automation and control systems and tools;

Knows modern theoretical and experimental methods used for the development of information protection technologies and professional service processes. Can determine the effectiveness of methods used to develop information protection technologies and professional service processes. Has mastered modern theoretical and experimental methods of developing information protection technologies and professional service processes.

PC 8 has knowledge in the field of programming and modern computer technologies during the development of applied information systems. Able to optimize algorithms when creating application programs or application complexes. Analyzes standard technical requirements for software design. Able to develop technical requirements for software development;

Study of technologies and methodologies of client-server applications, modern models of client-server applications; mastering methods of designing and developing client-server applications using modern technologies; working with client-server application design tools, acquiring skills in using client-server application development standards accompanying the process of creating client-server applications;

Ability to solve standard tasks of professional activity on the basis of information and bibliographic culture, using information and communication technologies and taking into account the basic requirements of information security. Ability to integrate hardware and software in information and automated systems. Ability to develop business plans and technical tasks for equipping departments, laboratories, offices with computer and network equipment. Ability to participate in tuning and repair of software and hardware complexes;

As a result of mastering the subject, the learner should master the following skills: - description of the data processing task; - justification of the method of solving the selected problem; - implementation of assigned tasks in the programming language; applications of distributed systems based on database

systems

PC 9 Able to use prospective methods of research and solving professional tasks based on knowledge of world trends in the development of computing and information technologies;

Ability to participate in IT infrastructure organization and information security management, develop mobile applications for iOS OS according to the MVC concept, add and use existing libraries in mobile applications development projects for iOS OS, configure JSON-Server test and organize client-server interaction in iOS OS applications;

Application of modeling methods when choosing the structure of corporate information systems; design of corporate information systems using object-oriented modeling methods and UML language; solving the problem of project management with the help of specialized software tools; creating configurations based on the platforms of modern corporate systems (1C: Enterprise, Galaxy); hardware and software architecture selection. As a result of mastering the subject, the learner will learn: the basic concepts of the theory of corporate information systems, their classification, CIS tasks, CIS requirements; development history of enterprise management circuits (CIS development history); should know the principles of creating corporate information systems;

Organization and support of the implementation of a set of measures on information security, the ability to manage the process of their implementation, taking into account the solvable tasks of the organizational structure of the protection object, external influences, possible threats and the level of development, the ability to manage the process of their implementation based on the analysis of the structure and content of information processes, the goals and objectives of the enterprise It is possible to determine the types and forms of exposed information, the types and possible methods and ways of implementing threats.

PC 10 Ability to independently learn and use new methods of research, mastering new areas of professional activity. Ability to create resource and information bases for practical activities in various fields. Ability to think abstractly, analyze, synthesize, improve and develop one's intellectual and general cultural level. To be ready to know the modern problems of science and education in solving professional problems. The ability to independently acquire and use new knowledge and skills with the help of information technologies, not directly related to the field of professional activity;

Ability to use modern methods and technologies of teaching and diagnostics. Demonstrate rapid prototyping technologies in terms of exact replication of geometric shape, assembly, appearance and search for materials as similar as possible to given materials. With this in mind, trained in RPM technologies in prototyping, they are able to shorten production lead times, completely eliminating the long and time-consuming phase of manual prototyping.

PC 11 Able to conduct research using software products and/or hardware, including planning, conducting, data collection, and analysis. Knows the specifics of conducting research using software products and/or hardware, including planning research, conducting, collecting, and analyzing. May use software products and/or hardware, including research design, data management, collection, and analysis. Proficient in the use of software products and/or hardware, including research design, conduct, data collection, and analysis. Capable of designing interactive user interfaces and graphic design. Knows features of design and development of graphic design of interactive user interfaces. Able to design interactive user interfaces and graphic design. Has skills in designing and developing graphic design of interactive user interfaces;

Ability to use regulatory documents on metrology, quality, standardization in practical activities; ability to use safety equipment, industrial sanitation, fire safety principles and labor protection standards; development of projects for the implementation of innovations, including formulation of technical tasks, use of automation tools during production design and preparation, creation of a set of documents for the project; the ability to develop computer models of the studied processes and systems and use them to

design, design and determine the optimal options for technological solutions;

2.4 Matrix of correlation of learning outcomes of the educational program with the competencies being formed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9
G1	+								
G2	+								
G3	+								
G4	+								
G5	+								
G6	+								
G7	+								
G8	+								
SC1	+								
SC2	+								
/SC3					+				
SC4	+								
SC5				+		+			
SC6	+								
SC7	+								
SC8				+		+			
SC9					+				
SC10			+						
SC11		+							
SC12	+		+						
SC13	+								
SC14				+		+			
SC15				+					
SC16		+							
SC17	+			+					
SC18			+						
SC19		+			+				
SC20		+			+	+			
SC21					+	+			+
SC22					+				
SC23	+								
SC24				+	+	+		+	
SC25			+	+		+			+
PC1							+	+	
PC2				+	+	+	+		
PC3				+	+	+			
PC4				+					
PC5			+						
PC6					+	+			+

PC7						+			
PC8			+		+	+			
PC9					+	+		+	
PC10			+						
PC11						+			

LO 1	Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
LO 2	Knows the methodology of database design, the principles of building architectures of computer systems and the technology of creating web applications. Knows how to use information and communication technologies to work with modern graphic software and owns CASE software design tools using visual modeling
LO 3	Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization
LO 4	Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology.
LO 5	Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications
LO 6	Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
LO 7	Owns design methods and technologies for developing software products. Able to develop documentation necessary for testing and quality management of a software product. Uses expert systems in the development of artificial intelligence systems and knows how to use neural networks in pattern recognition tasks
LO 8	Demonstrate the ability and willingness to apply the acquired natural science, humanitarian, socio-economic, entrepreneurial, legal, environmental knowledge, life safety culture and leadership qualities in various spheres of life.
LO 9	Engaged in the design, programming, deployment and maintenance of Edge ecosystems. A narrow-profile blockchain specialist who ensures the integration of blockchain technology into business processes. Engaged in the development and improvement of reality transformation technologies, constructs basic templates of spaces, which are then used by editors and designers for specific tasks. Develops algorithms and rules for analysis, decision-making, work, training and self-learning, communication, interaction and development of universal AI.

2.5. Personal qualities of a computer and software specialist

The rapid development of information technologies and large-scale digitization all over the world leads to a great demand for specialists in the field of computing and software. A competitive information technology specialist should have the following qualities:

Analytical skills: ability to systematically analyze information; systematization of information; data comparison; abstract information; design results, fast learner.

Diagnostic skills: ability to structure received information; implementation of innovative and combinational processes associated with forecasting skills; defining strategic, tactical and operational goals; formulating and solving professional problems; choosing, changing and developing new work methods; using positive experience; making management decisions; diagnose possible solutions.

Verbal and non-verbal skills: ability to build business relationships with colleagues; cooperation with partners; formulation of professional duties; oral and written language skills; proficiency in a foreign language; to perceive thought and being at once; navigating what is already known and what is not yet known; strategic thinking and logical forecasting of development; solving non-standard problems using original methods and tools; determining what is important in emergency situations.

Forecasting skills: confidence in one's actions in accordance with the assessment of all the happening situations; as a manifestation of extroversion and dominance, determination, control, information modeling, energy mobilization, perseverance, activity, resistance to workload, persistence in performing complex tasks.

Corrective skills: self-analysis, self-correction; determining the trajectory of self-development and self-education; understand your professional and personal abilities.

Conclusions

This graduate model is the methodological basis for the implementation of the technology of the competence approach. It is also important to understand that the formation of these competencies in a graduate is ensured through a certain way organized and implemented educational process. In market conditions, universities are beginning to pay more attention to the quality of graduates: after all, a graduate is exactly the result of university education that enters the labor market. And it has to be competitive. It is in order to prepare graduates in demand on the market that it is necessary to form a comprehensive portrait of him, a certain matrix of characteristics. From understanding the key advantages, characteristics, and competencies of graduates that employers need, it is possible to move on to creating an effective modern university: to form educational programs, create infrastructure, and use new learning formats.

The graduate's competence model

Module	ДДБ (Dublin Descriptors of bachelor)	Emerging competencies			Planned learning outcomes
		general education competencies	basic competencies	professional competencies	
1	2	3	4	5	6
M1	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 1			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 2			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 3			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 4			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing

					systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 5			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 3		LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 7			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 8			LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
M2	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 5		LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology. LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology,

					develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 6		LO 2 Knows the methodology of database design, the principles of building architectures of computer systems and the technology of creating web applications. Knows how to use information and communication technologies to work with modern graphic software and owns CASE software design tools using visual modeling
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 8		LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology. LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 11		LO 2 Knows the methodology of database design, the principles of building architectures of computer systems and the technology of creating web applications. Knows how to use information and communication technologies to work with modern graphic software and owns CASE software design tools using visual modeling
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 12		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization
M3	ДДБ1 ДДБ2 ДДБ3		BC 1		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and

	ДДБ4 ДДБ5				maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 2		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5	GC 6	BC 4		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 9		LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 10		LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization
M4	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 7		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems

ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 13		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 15		LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology.
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 17		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology.
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 19		LO 2 Knows the methodology of database design, the principles of building architectures of computer systems and the technology of creating web applications. Knows how to use information and communication technologies to work with modern graphic software and owns CASE software design tools using visual modeling LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications
ДДБ1 ДДБ2 ДДБ3			PC 1	LO 7 Owns design methods and technologies for developing software products. Able to develop documentation necessary for testing and quality management of a

	ДДБ4 ДДБ5				software product. Uses expert systems in the development of artificial intelligence systems and knows how to use neural networks in pattern recognition tasks LO 8 Demonstrate the ability and willingness to apply the acquired natural science, humanitarian, socio-economic, entrepreneurial, legal, environmental knowledge, life safety culture and leadership qualities in various spheres of life.
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 23		LO 1 Analyzes various methods of information protection and principles of building computer networks. Able to perform work on the installation, configuration and maintenance of technical, software and hardware. Monitors management and resolves administration issues in networks with various operating systems. Performs the current operational management of quantum computing systems - computing devices and networks at enterprises, is engaged in their maintenance, eliminates minor local-scale problems
M5	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 14		LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology. LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 16		LO 2 Knows the methodology of database design, the principles of building architectures of computer systems and the technology of creating web applications. Knows how to use information and communication technologies to work with modern graphic software and owns CASE software design tools using visual modeling
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 2	LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology. LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications

				<p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p> <p>LO 7 Owns design methods and technologies for developing software products. Able to develop documentation necessary for testing and quality management of a software product. Uses expert systems in the development of artificial intelligence systems and knows how to use neural networks in pattern recognition tasks</p>
<p>ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5</p>			PC 3	<p>LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology.</p> <p>LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications</p> <p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p>
<p>ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5</p>		BC 21		<p>LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications</p> <p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p>
ДДБ1		BC 22		LO 6

	ДДБ2 ДДБ3 ДДБ4 ДДБ5				Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 24		LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
M6	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 18		LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 20		LO 2 Knows the methodology of database design, the principles of building architectures of computer systems and the technology of creating web applications. Knows how to use information and communication technologies to work with modern graphic software and owns CASE software design tools using visual modeling LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 4	LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology.
	ДДБ1			PC 5	LO 3

ДДБ2 ДДБ3 ДДБ4 ДДБ5				Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 6	<p>LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications</p> <p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p> <p>LO 9 Engaged in the design, programming, deployment and maintenance of Edge ecosystems. A narrow-profile blockchain specialist who ensures the integration of blockchain technology into business processes. Engaged in the development and improvement of reality transformation technologies, constructs basic templates of spaces, which are then used by editors and designers for specific tasks. Develops algorithms and rules for analysis, decision-making, work, training and self-learning, communication, interaction and development of universal AI.</p>
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5		BC 25		<p>LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization</p> <p>LO 4 Knows the basic principles of electrical engineering, the most important properties and characteristics of electrical circuits and the modern analog and digital element base of computer technology.</p> <p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p> <p>LO 9</p>

					Engaged in the design, programming, deployment and maintenance of Edge ecosystems. A narrow-profile blockchain specialist who ensures the integration of blockchain technology into business processes. Engaged in the development and improvement of reality transformation technologies, constructs basic templates of spaces, which are then used by editors and designers for specific tasks. Develops algorithms and rules for analysis, decision-making, work, training and self-learning, communication, interaction and development of universal AI.
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 7	LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 8	LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved
	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 10	LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization
M7	ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5			PC 7	LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology,

					develops conceptual and theoretical models of scientific problems and tasks to be solved
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5				PC 8	<p>LO 3 Applies prototyping problem solving techniques. Able to analyze the management process and highlight its meaningful components. Owns the grouping of elements in accordance with the software architecture. Develops a visual structure and logical route at every level of the organization</p> <p>LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications</p> <p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p>
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5				PC 9	<p>LO 5 Develops methods for planning and managing the content, organizational structure, configuration and quality of the project. Able to apply the methods of mathematical analysis and modeling, theoretical and experimental research to solve scientific and applied problems. Owns service programs and shells for developing mobile applications</p> <p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be solved</p> <p>LO 8 Demonstrate the ability and willingness to apply the acquired natural science, humanitarian, socio-economic, entrepreneurial, legal, environmental knowledge, life safety culture and leadership qualities in various spheres of life.</p>
ДДБ1 ДДБ2 ДДБ3 ДДБ4 ДДБ5				PC 11	<p>LO 6 Has basic knowledge of the basics of algorithmization and programming, knows the features of an object-oriented and system approach in software design, knows how to use the methodology and tools of generalized programming technology, develops conceptual and theoretical models of scientific problems and tasks to be</p>

					solved
M8	ДДБ1				
	ДДБ2				
	ДДБ3				
	ДДБ4				
	ДДБ5				
	ДДБ1				
	ДДБ2				
	ДДБ3				
	ДДБ4				
	ДДБ5				

M 1-Socio and cultural knowledge

M2-Propaedeutics

M3-Basic knowledge

M4-Fundamental knowledge

M5-Special knowledge

M6-Applied and project knowledge

M7-Science, innovation and educational work

M8-Final certification