

MINISTRY OF SCIENCES AND HIGHER EDUCATION
OF THE REPUBLIC OF KAZAKHSTAN
M.Auezov SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»

Chairman of the Board-Rector

D.Zh.Ahmed-Zaki




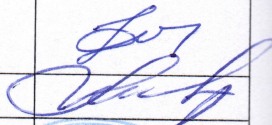

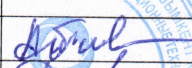
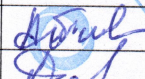
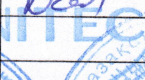





EDUCATION PROGRAMME

7M06130– Computer engineering and software

Registration number	7M06100008
Code and classification of the field of education	7M06 - Information and communication technologies
Code and classification of training areas	7M061 - Information and communication technologies
Group of educational programs	M094 - Information technologies
Type of EP	current
ISCE level	7
NQF level	7
IQF level	7
Language of learning	Kazakh, Russian, English
The complexity of the EP	120 credits
Distinctive features of EP	-
University Partner (JEP)	-
University Partner (TDEP)	-


Shymkent, 2025y.

Drafters:

Name	Position	Sign
Sabira T. Akhmetova	Candidate of phys-math. sciences, associate professor, Head of chair "Computer engineering and software"	
Nurzhamal N. Dausheyeva	Candidate of technical sciences, senior lecturer	
Lazzat E. Shaimerdenova	Senior lecturer	
Olzhas A. Zhantassov	lecturer	
Student's name	group	
Abitov Arman	MIT – 24 – 4nk	
Altynbekov Darkhan	MIT – 24 – 4nk	
Employer's name		
Kayrat P. Dzhumagaliev	Head of the Department of JSC "National Information Technologies"	
Zhandos M. Zhunisov	Director of «KazMBS» LP	
Aleksandr A. Pavlov	Director of "Digital Systems" LP	
Murod I. Akmalov	Director of "KomSity Shymkent" LP	
Aleksandr V. Gatsko	Director of "ART Technology" LP	

The EP was considered at a meeting of the Academic Quality Committee of the "Information and communication technologies and telecommunications" the Higher School,

Minutes # 5 « 17 » 03 2025 y.

Chairman of the Committee  A. Imanbayeva

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

Minutes # 4 « 18 » 03 2025 y.

Chairman of the EMM  E. Imangaliev

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

Minutes # 10 « 27 » 03 2025 y.

CONTENT

1.	Concept of the program	4
2.	Passport of the educational program	6
3.	Competences of ep graduate	10
3.1	Matrix of correlation of learning outcomes on the EP as a whole with the competencies being formed	12
4.	Matrix of the influence of modules and disciplines on the formation of learning outcomes and information on labor intensity	13
5	Summary table on the volume of loans disbursed in the context of EP modules	22
6.	Strategies, learning methods and artificial intelligence, monitoring and evaluation	23
7	Educational and resource support of the EP	24
	Agreement sheet	25
	Appendix 1. Review from the employer	
	Appendix 2. Expert opinion	
	Appendix 3. Professional standards	

1. CONCEPT OF THE PROGRAM

University Mission	Generation of new competencies, training of a leader who translates research thinking and culture
University Values	<ul style="list-style-type: none"> – Openness - open to change, innovation and cooperation. – Creativity - generates ideas, develops them and turns them into values – Academic freedom - free to choose, develop and act. – Partnership - creates trust and support in a relationship where everyone wins. – Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
Graduate Model	<ul style="list-style-type: none"> – Deep subject knowledge, their application and continuous expansion in professional activity – Information and digital literacy and mobility – Research skills, creativity and emotional intelligence – Entrepreneurship, independence and responsibility for their activities and well-being – Global and national citizenship, tolerance to cultures and languages
Uniqueness of the educational program	the program was developed in accordance with the Atlas of New Professions and Competencies, and is aimed at training competent specialists for transport and logistics and scientific and pedagogical structures who are able to organize and manage the activities of a structural enterprise, independently determine the goals of professional activity, choose and justify methods and means to achieve them.
Academic Integrity and Ethics Policy	<p>The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination:</p> <ul style="list-style-type: none"> • Rules of academic integrity (Order No. 212 dated 10.10.2022); • Anti-Corruption Standard (Order No. 221 dated 07.12.2021). • Code of Ethics (order No. 212 dated 10.10.2022).
Regulatory and legal framework for the development of EP	<ol style="list-style-type: none"> 1. Law of the Republic of Kazakhstan “On Education”; 2. Model rules for the activities 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. Standard rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 600 with amendments and additions dated 06/02/2023. No. 252 4. State mandatory standards for higher and postgraduate education, approved by order of the Ministry of Education and Science of July 20, 2022 No. 2; 5. Rules for organizing the educational process in credit technology of education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152; with changes and additions from 09/23/2022. No. 79

	<p>6. Qualification reference book for positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553.</p> <p>7. Methodological recommendations for introducing ECTS principles into the educational process and expanding academic freedom. Appendix to the order of the Minister of Science and Higher Education. of the Republic of Kazakhstan dated February 12, 2024 No. 57</p> <p>8. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the National Center for the Development of Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan dated May 4, 2023 No. 601 n/k</p>
Organization of the educational process	<ul style="list-style-type: none"> – Implementation of the principles of the Bologna Process – Student-centered learning – Availability <p>Inclusivity</p>
Quality assurance of the educational process	<ul style="list-style-type: none"> – Internal quality assurance system – Involvement of stakeholders in the development of the EP and its evaluation – Systematic monitoring – Updating the content (updating)
Requirements for applicants	<p>They are established in accordance with the Standard Rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education by order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated October 31, 2018, with changes and additions dated June 2, 2023. No. 252</p>
Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)	<p>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.</p> <p>An individual differentiated approach is provided for all types of classes and in the organization of the educational process.</p>

2. PASSPORT of the Educational program

Purpose of the EP	Training of masters with conceptual knowledge in the field of information and communication technologies and professional activities, who are able to choose appropriate methods and means of information processing, to carry out pedagogical, scientific, innovative activities to obtain new knowledge.
Tasks of the EP	<ul style="list-style-type: none"> • meeting the needs of the individual in intellectual, cultural and moral development through postgraduate education in the field of information and communication technologies; • to provide master's students with a solid Foundation in the field of programming, information technology, operation of telecommunication equipment, equipment of local area networks, servers and personal computers, design of computer and telecommunication networks, ensuring their protection and reliability of information transmission, according to the principles of building Web-models in the Internet; which will allow them to work successfully in the selected area or other relevant areas; • provide master's students with lifelong learning skills that will enable them to successfully adapt to changing technologies throughout their professional career; • provide master's students with communication skills that will allow them to effectively collaborate with other team members for the further development of a particular system; • to provide master's students with a broad education that is necessary to understand the impact of information technology in the global and social context of research; • Establishing conditions for the development of in-demand knowledge and skills, as well as a conscious attitude towards enhancing the welfare of society and conserving the planet within the framework of the SDGs (Sustainable Development Goals)
Harmonization of EP	<ul style="list-style-type: none"> • 7th level of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin descriptors of the 7th level of qualification; • 2 cycle of a Framework for Qualification of the European Higher Education Area); • 7th Level of European Qualification Framework for Life long Learning).
Connection of the EP with the professional sphere	<ol style="list-style-type: none"> 1. Industry qualifications framework industry: information and communication technologies, approved by the minutes of the meeting of the Industry Commission in the field of information, Informatization, communications and telecommunications dated December 20, 2016 No. 1. 2. Professional standard "Development of high-load and real-time applications", approved by Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 259 dated 12/24/2019 3. Professional standard "Testing of Web and multimedia applications", approved by Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 259 dated 12/24/2019. 4. Professional standard "Management and design of computer hardware and embedded systems", approved by Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No.259 dated 12/24/2019 5. Professional standard "Teacher", approved by the Order of the Minister

	of Science and Higher Education of the Republic of Kazakhstan, No. 591 dated November 20, 2023.
Name of the degree awarded	After the successful completion of this educational program, the graduate is awarded the degree: Master of Technical Sciences in the educational program "7M06130 – Computer Engineering and Software"
List of qualifications and positions	The graduate of this EP is awarded the degree of "Master of technical Sciences". Master's in the specialty 7M06130 - Computer Engineering and Software can hold primary positions as a software engineer, programmer, software maintenance specialist, software designer without qualifying work experience in accordance with the qualification requirements of the Qualification directory of managers, specialists and other employees, approved by order of the Minister of Labor and social protection of the population of the Republic of Kazakhstan on May 21, 2012 № 201-р-м.
Field of professional activity	<ul style="list-style-type: none"> - project activities in the field of computer programming; - organizational and managerial activities for the management of computer equipment, services for the placement and processing of digital data, as well as the creation and maintenance of web portals; - research activities in the field of information and communication technologies and computer systems; - pedagogical activity in the field of teaching technical disciplines in higher educational institutions.
Objects of professional activity	<ul style="list-style-type: none"> - design organization; - industrial enterprise; - financial institution; - research institutions; - public administration bodies; - higher education institutions -etc.
Subjects of professional activity	<ul style="list-style-type: none"> • development hardware for the modern operating systems, taking into account the principles of reliability and fault tolerance, design of real-time systems, processing of distributed data using parallel computers; • software and hardware for regional and global information networks and Internet technology development; • software for computer visualization of science and technology, animation of natural processes, abstract concepts in research and teaching activities; • modern approaches to the design of database management systems (DBMS), expert systems and artificial intelligence systems, pattern recognition problems; • modern mathematical methods, methods of applied mathematics, computer science to solve problems of science, education, technology, Economics and management; • methods of teaching computer science, programming in higher educational institutions.
Types of professional activity	<ul style="list-style-type: none"> • research; • pedagogical; • design; • industrial-technological;

	<ul style="list-style-type: none"> • organizational and managerial.
<p>Learning outcomes</p>	<p>LO1 Demonstrate proficiency in foreign and national languages to the extent necessary to obtain professional content from scientific sources;</p> <p>LO2 Demonstrate the skills of logical and analytical thinking, argumentation of scientific decisions, practical analysis in a professional environment;</p> <p>LO3 Apply methods of system analysis of objects and information processes, operations research and decision-making, application of big data analysis and development of algorithms, big data processing methods, neurocomputing methods;</p> <p>LO4 Critically assess the state of modern technologies in the field of computer technology and software for the practical application of software and hardware in information systems;</p> <p>LO5 To carry out work on the design, maintenance and development of software systems using artificial intelligence methods and demonstrating deep modern knowledge in the field of object-oriented programming, distributed computing technology, network technology, telecommunications systems, their interpretations, methods and ways of implementing systems within a research context;</p> <p>LO6 Possess modern methods of research and demonstrate originality, independence and creative thinking in solving problems of designing software systems;</p> <p>LO7 Use the principles of construction of modern sensor technologies, basic methods, algorithms for the formation and transformation of images based on the principles of the organization of structures of hardware and software;</p> <p>LO8 To Demonstrate knowledge of methodology of programming, to be able to solve complex problems in information technology, to formulate conclusions with incomplete or limited information based on the integration of knowledge;</p> <p>LO9 Use innovative methods of pedagogy and psychology to activate the educational process using modern information and digital technologies, to critically evaluate the scientific organization of the work of a higher school teacher;</p> <p>LO10 Investigate and describe management practices relevant to the design, implementation, testing, deployment and maintenance of computer systems, information security management of information systems, protection against external and internal threats;</p> <p>LO11 Evaluate and apply modeling methods in the study and design of systems, including intelligent systems; modeling languages and application packages for modeling discrete systems;</p> <p>LO12 Develop and apply technologies, methods and means of teaching special subjects in universities, the ability to organize the educational process on credit technology training.</p>

3. COMPETENCES OF EP GRADUATE

SOFTSKILLS (Behavioral skills and personal qualities)	
SS 1. Competence in managing one's own literacy	<p>SS1.1. Strive for professional and personal growth throughout life.</p> <p>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.</p> <p>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.</p>
SS 2. Language competence	<p>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.</p> <p>SS 2.2. The ability of mastering the skills of mediation and intercultural understanding.</p>
SS 3. Mathematical Competence and Competence in the field of Science	<p>SS3.1. The ability to interpret the methods of mathematical analysis and modeling for solving applied problems in the field of study.</p> <p>SS3.2. The ability to plan the setting of scientific experiments, integrate and implement the results of scientific research in the professional field.</p> <p>SS 3.3. The ability to analyze and comprehend modern methods of pedagogical and psychological science and apply them in pedagogical activity.</p>
SS 4. Digital competence, technological literacy	<p>SS 4.1. The ability to confidently use modern information and digital technologies, artificial intelligence systems for work, leisure and communications.</p> <p>SS 4.2. Proficiency in the use, recovery, evaluation, storage, production, presentation and exchange of information in a wide range of digital devices.</p> <p>SS 4.3. Ability to confidently use global information resources and apply technological literacy in research and computational and analytical activities.</p>
SS 5. Personal, social and academic competencies	<p>SS 5.1. Possession of the norms of business ethics, social and ethical values and focus on them in professional activities.</p> <p>SS 5.2. Formation of a personality capable of mobility in the modern world, critical thinking and physical self-improvement.</p> <p>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.</p> <p>SS 5.4. Ability to adequately navigate in various social spheres of activity and in conditions of uncertainty.</p> <p>SS 5.5. Ability to find compromises, correlate own opinion with the opinion of the team.</p>
SS 6. Entrepreneurial competence	<p>SS 6.1. The manifestation of leadership qualities and the ability to have a positive impact on others, to lead a team.</p> <p>SS 6.2. The ability to create conditions for the development of creative and entrepreneurial skills of the team.</p> <p>SS 6.3. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, respond to changing working conditions,</p>

	allocate resources and manage your time. SS 6.4. Ability to work with consumer needs.
SS 7. Cultural awareness and ability to express yourself	SS7.1. The ability to show worldview, civil and moral positions. SS7.2. The ability to be tolerant of the traditions and culture of the peoples of the world, to have high spiritual qualities.
PROFESSIONAL COMPETENCIES (HARDSKILLS).	
Theoretical knowledge, practical skills and abilities specific to this area	PC1. ability to use knowledge of architecture methods, algorithms of real-time systems functioning.
	PC2. ability to evaluate and select modern operating environments and information and communication technologies for Informatization and automation of applied problem solving and IP creation.
	PC3. comprehensive knowledge and deep understanding of the tasks of system engineering at the present stage, knowledge of the theoretical foundations of information systems as a technical science and understanding of its research methods, knowledge of computer science teaching skills in higher education.
	PC4. The ability to understand the skills of using computer technology, artificial intelligence , and programming tools for the effective implementation of hardware and software complexes and possess practical skills in object-oriented analysis, design, and programming.
	PC5. possess the ability to use software and hardware for the development of modern operating systems, taking into account the principles of reliability and fault tolerance, design of real-time systems, processing of distributed data using parallel computers.
	PC6. The ability to show professional values: professionalism; innovation; creativity; meritocracy; integrity.

3.1 Matrix for correlating learning outcomes in the EP as a whole with the competencies being developed

	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12
GC1	✓				✓					✓		✓
GC2	✓	✓								✓		
GC3		✓		✓							✓	
GC4	✓			✓								✓
GC5			✓			✓					✓	
GC6		✓		✓				✓	✓			
GC7				✓		✓					✓	
PC1				✓	✓	✓						
PC2				✓			✓			✓		
PC3			✓			✓						✓
PC4				✓	✓						✓	
PC5		✓			✓		✓			✓		
PC6	✓								✓			✓

4. MATRIX OF THE INFLUENCE OF DISCIPLINES ON THE FORMATION OF LEARNING OUTCOMES AND INFORMATION ABOUT LABOR INTENSITY

№	Module name	Cycle	UC/CC	Component Name	Brief course description	Number of credits	Formed LO (codes)												
							PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
1	Module of scientific and pedagogical training	FS	UC	History and philosophy of science	Purpose: Examines the history and philosophy of natural and technical sciences. Content: examines the New European science in culture and civilization, the structure of scientific knowledge, philosophical problems of specific sciences, communication technologies of the XXI century and their role in modern science. Defines the ways of solving modern topical methodological and philosophical problems of natural and technical sciences. Develops critical thinking and logic.	4	✓	✓			✓								
		FS	UC	Foreign language (professional)	Purpose: Allows you to develop oral communication skills in a foreign language, intercultural competencies, business correspondence exchange skills. Content: to master the main types of reading foreign-language original sources, preparation of written reports on scientific topics in the specialty: scientific report, presentation, discussions, abstracts and articles on the topic of scientific research in a foreign language, annotation of scientific text, preparation of a summary.	4	✓							✓					
		FS	UC	Management psychology	Purpose: Examines the basic principles of modern psychological science, necessary in the professional activities of highly qualified specialists. Content: Forms a scientific and theoretical worldview on fundamental psychological concepts, the ability and skills of psychological research of personality,	3									✓				

					introduces the main methods of experimental psychological research and areas of psychocorrective work, conflict management in the team, stress and methods of their resolution.															
		FS	UC	Pedagogy and psychology of Higher School	<p>The aim is to develop undergraduates' skills in planning and organizing the educational and scientific process based on the principles of student-oriented learning and assessment, extrapolating innovative (including digital) and practice-oriented teaching methods and technologies into the educational process, preparing them for academic and scientific and methodological activities in the educational institution.</p> <p>Contents: Higher school pedagogy as a science and academic discipline. Methodology of higher education pedagogy. Modern global trends in the development of higher education. History, current state and prospects for the development of higher education in Kazakhstan. Didactics of higher education. Student-centered learning and assessment in higher education, its patterns and principles. Contents of education in higher education institutions. Innovative pedagogical technologies, forms and methods of teaching in higher education institutions. Concepts, strategies, mechanisms for promoting global and national values among students and in society. Department of OHPO. Support and develop the educational environment and organizational culture in accordance with the policies and procedures of the OHPO.</p>	5												✓		✓
2	Methodological Fundamental	MS	CC	Methods of teaching specialized disciplines	<p>The aim: The methodological system of teaching computer science and programming at the university is considered; The formation of a set of professional and methodological</p>	5												✓		✓

	s of Teaching				actions for the student, deepening knowledge about educational activities. Contents: the main components of the methodological system, pedagogical functions of the programming course, forms, methods and means of teaching, methods of studying the thematic line "Presentation of information", "Computer", "Formalization and modeling", "Information technology".													
				Pedagogical practice	Purpose: The methods of conducting lectures, practical and laboratory classes in various special disciplines of the specialty computer engineering and software are considered. Content: Attending lectures by leading teachers of the department. Familiarization and compilation of the educational and methodological complex of the profile discipline. Planning of educational and educational work.	4	✓								✓			✓
3	Computer Modeling systems and information security	FS	UC	Software development technologies for real-time systems	Purpose: studies: the history of development, classification, features of real-time OS and the application of this knowledge in the design of applications for various purposes running under real-time OS. Content: features of real-time operating systems, types and standards of RTOS, parameters of real-time operating systems, requirements imposed by the OS when designing real-time systems, features and types of RTOS architectures, task management, synchronization and interaction of processes, memory management, fault tolerance of RTOS.	6			✓				✓		✓			
				Real-Time operating systems	Purpose: The issues of development of real-time information and control systems are considered. Content: concepts of functioning and implementation of real-time systems, analysis, stages and methods of designing				✓				✓		✓			

				real-time systems. Simulation of real-time systems. Methods of testing and verification of real-time systems.															
		MS	CC	Information security methodology	Purpose: to ensure the required level of knowledge, skills and abilities of undergraduates of the structure, logical organization, information security service management system as the main link of information security systems. Content: The application points of the information protection (IP) process are investigated. Legislative and regulatory framework of the Republic of Kazakhstan IP. Principles, methods, and means of solving IP problems. Analysis and classification of threats by information systems. Cybersecurity methodology. Hardware and software protection mechanisms for external and internal threats. Implementation of the security model. Cryptology. The use of cryptography for IP. Means of protecting information systems from remote attacks.	6									✓		✓		
		MS	CC	Comprehensive information security systems	Purpose: The levels of formation of the information security regime are considered: legislative, administrative, procedural, software and technical. Content: Detection, assessment, reflection of various information threats as a concept of comprehensive protection. Designing and implementing security policies to protect confidentiality, integrity, and availability. Preventive protection systems. Organization of software and hardware protection of information of computer networks.										✓		✓		
		MS	CC	Mathematical Modeling in	Purpose: The issues of classification of mathematical models, classification features,	6			✓									✓	

				Scientific Researches	methodological principles of model construction are considered. Contents: mathematical formulation of the modeling problem, mathematical models in scientific research, modeling under uncertainty, modeling under stochastic uncertainty, modeling of Markov random processes													
		MS	CC	Computer Modeling of Control Systems	Purpose: To study the theory and process of modeling, Classification of models, Cognitive, meaningful, conceptual, formal models. Content: Computer models, Structural analysis, Principles and Methodologies of structural analysis, Functional-oriented and information-oriented methodologies of structural analysis, SADT methodology, Approaches and software tools of structural analysis, CASE-tools, Simulation modeling, Measurement methods of computer systems, Dynamic systems, Object-oriented modeling, Approaches to visual modeling of complex dynamic systems.			✓										✓
				Research practice	Purpose: Familiarization with the latest technological achievements of domestic and foreign science, international and domestic standards corresponding to the work performed within the specialty is carried out. Content: research and analysis of modern methods and tools of modern programming languages.	6		✓	✓				✓					
4	Computational Complexes and Methods of Design Applications	MS	CC	Bigdata Analytics	Purpose: to develop skills in the field of: analysis of large amounts of information. Content: Data mining. Statistical modeling. Machine learning. Computational approaches to modeling. Statistical limits of data mining. Indexes. Distributed file systems. Algorithms that use MapReduce.	6		✓					✓					

				Generalizations of MapReduce. Communication value model. MapReduce complexity theory. Search for similar objects. Data flow analysis.														
MS	CC	Bigdata Processing	Purpose: to develop skills in the field of: analysis of large amounts of information. Content: Data. Approaches and definitions. Creating data. Data maintenance. Data synthesis. Data usage. Publication of data. Data archiving. Data destruction. Metadata. The metadata lifecycle. Big data. Big Data management systems. Distributed frameworks. Deployment systems. Data integration. Architecture of the Big data processing system.				✓					✓						
MS	CC	Parallel computing	Purpose: studies the issues of parallelism and parallel programming of a computing complex. Contents: Theoretical basis of parallel programming. Model of a parallel machine. Parallel programming model. Creating parallel programs.	6				✓	✓									
MS	CC	Distributed computing	Purpose: Distributed computing tasks, Distributed model programming systems are studied. Content: In this component of the module, the elements of creating distributed applications based on CORBA technologies are studied. XML technologies, DataSnap. Technologies for creating distributed applications based on COM components and COM+ transaction objects. Chronology of parallel programming development. Parallel computers. Parallel algorithms.					✓	✓									
FS	CC	Designing ofr IT technologies	Purpose: The issues of analysis and design of the IP infrastructure are considered Content: IP infrastructure with distributed localization, Internet and Intranet access, corporate	4			✓		✓						✓			

				secrecy and security. Analysis and planning, installation, performance monitoring and problem solving strategies.															
				Internet Application Programming	Purpose: The issues of project management methodology for the development of Web-oriented information systems are considered. Content: JavaScript scripting language, Apache Web server, Denwer Integrated Development Environment, Development of database-oriented web applications, MySQL databases, DBMS for web-oriented information systems, Web content management systems, CMS Joomla, CMS MODx, NUKE family, XOOPS family.				✓		✓							✓	
		MS	CC	Telecommunication systems and network technologies	Purpose of studying the discipline is to acquire knowledge on the basics of building and practical use of modern telecommunications and computer network technologies. Contents: Examines the fundamental issues of network theory; the main trends in the development of wireless telecommunications technologies; principles of construction, structures and algorithms for the functioning of wireless telecommunications technologies; issues of applying the knowledge gained to analyze the physical processes occurring in devices for the formation, transformation and processing of signals.	5			✓	✓									
		MS	CC	New generation network technologies	Purpose: to master the principles of building architectures and principles of operation of modern and promising network technologies for various purposes, the basics of their design, management methods and network analysis. Content: study of the principles of modern network technologies; computer network				✓	✓									

					architectures; network management system architectures; skills in building new generation networks; application of acquired knowledge in practice in modern issues of new generation networks.														
5	Research and sensory technologies	MS	CC	Sensory Technology and Artificial Intelligence	Purpose: The basics of modern artificial intelligence are considered. Contents: purpose of mechanical manipulation, locomotion, computer vision, industrial automation issues, for environmental assessment and for human-computer interaction	5				✓		✓					✓		
				Artificial Intelligence in Sensory Systems	Purpose: The basic concepts of artificial intelligence are considered. Content: Architecture and the main components of systems And, Control systems with fuzzy logic, The basic structure and principle of operation of the fuzzy logic system, Expert systems, Methodology for building expert systems, Neural networks and neural network management.					✓		✓				✓			
		MS	CC	Theoretical and Empirical Research in Computer Science	Purpose: the role of empiricism in research in the field of computer science is considered. Content: research issues that require some form of empirical validation with the participation of people, or those who want to create an empirical basis for a research program. Qualitative and quantitative data analysis.	4		✓	✓		✓								
MS	CC	Planning Reserach and Experimental Studies	Purpose: The methods and forms of formation of scientific and educational texts are studied. Content: stages of scientific research, research methods: theoretical and experimental research methods, observation, comparison, measurement, experiment, abstraction, analysis, synthesis, historical method, method of induction and deduction.		✓		✓		✓										

		MS	CC	Neurocomputing	<p>Purpose: to master the technology of creating information processing systems for the autonomous generation of methods, rules and algorithms of processing in the form of an adaptive response in the conditions of functioning in a specific information environment.</p> <p>Contents: the study of the main types of neural networks, a detailed examination of the mathematical foundations of neural network training, neurocomputing methods; the implementation of typical neurooperations at the software level (weighted summation and nonlinear transformation).</p>	5			✓		✓							✓	
		MS	CC	Designing intelligent systems/	<p>Purpose: to study software tools for designing intelligent systems for various subject areas.</p> <p>Contents: Modern and promising technologies for the creation and implementation of intelligent systems, the development of the purpose and scope of intelligent systems; theoretical aspects of artificial intelligence technologies; mathematical and algorithmic foundations for the design of intelligent systems, the formation of skills for the design, implementation and maintenance of intelligent systems.</p>				✓		✓							✓	
		FS	CC	Cloud computing and virtualization	<p>Purpose: The principles of cloud computing, popular virtualization platforms, server deployment in a virtual environment and virtualization services (Google, Microsoft, Red Hat, etc.) are considered, Content: Software as a service (SaaS) and platforms as a service trend (PaaS). Students will be able to use virtualization platforms from different</p>	5			✓		✓		✓						

				vendors to deploy the project														
				Smart devices	Purpose: The course material will be studied on the Raspberry Pi platform and BeagleBone Black Wireless (computing module). Content: This course will discuss the main trends and conditions of the Internet of Things (IoT), as well as social challenges and opportunities. Internet-enabled devices will be examined. IoT and their impact on the development of electronics, software, sensors, drives and network connectivity.			✓		✓		✓						
6	Module of research work and Final Attestation			Research work of a Master Student, including passing an internship and completing a master's thesis	Purpose: the study of the problems of the specialty and subject according to the topic of the master's thesis is considered. Content: Research of modern achievements of science, technology and production with the study of practical recommendations and methods for solving managerial tasks. The use of modern mathematical models, technical and technological systems, computer software and experimental data results in the implementation of a master's thesis. Conducting experimental research work according to the plan of the academic period.	24		✓	✓	✓			✓					
				Execution and Defense of Master`s Thesis	Purpose: Writing and execution of a master's thesis. Preparation for the defense of a master's thesis. Preparation of the presentation of the work and accompanying dissertation documents. Content: Abstract. Terms and definitions. A list of abbreviations and designations. Normative references. Introduction. The main part consists of 3-4 chapters, including a feasibility study of software development, as well as a conclusion, a list of references, applications.	8		✓	✓	✓	✓	✓		✓		✓	✓	
				Total:		120												

5. SUMMARY TABLE REFLECTING THE VOLUME ASSIMILATED CREDITS OF EDUCATION PROGRAM MODULES

Course of Study	Semester	The number of mastered modules	The number of studied disciplines			Number of KZ credits					Total hours	Total of KZ credits	Number	
			RC	UC	CC	Theoretical training	Educational practice	Research practice	SWMS	Final examination			exam	differentiated credit
1	1	7	-	5	2	29			1			30	6	2
	2	4	-	-	4	23	4		3			30	4	2
2	3	5	-	-	5	26		6	3			35	5	2
	4	0	-	-	-	-			17	8		25	1	1
Total		16		5	11	78	4	6	24	8		120		

6. STRATEGIES, LEARNING METHODS AND ARTIFICIAL INTELLIGENCE, MONITORING AND EVALUATION

<p>Learning strategies</p>	<p>Student-centered learning: The student is the center of teaching/learning and an active participant in the learning and decision-making process.</p> <p>Practice-oriented training: orientation to the development of practical skills.</p>
<p>Teaching methods</p>	<p>Conducting lectures, seminars, various types of practices with:</p> <ul style="list-style-type: none"> • the use of innovative technologies: <ul style="list-style-type: none"> • problem-based learning; • case study; • work in a group and creative groups; • discussions and dialogues, intellectual games, olympiads, quizzes; • reflection methods, projects, benchmarking; • Bloom's taxonomies; • presentations; • rational and creative use of information sources: <ul style="list-style-type: none"> • multimedia training programs; • electronic textbooks; • digital resources; • Machine learning methods. <p>Organization of independent work of students, individual consultations.</p>
<p>Monitoring and evaluation of the achievability of learning outcomes</p>	<p>Current control on each topic of the discipline, control of knowledge in classroom and extracurricular classes (according to syllabus). Assessment forms:</p> <ul style="list-style-type: none"> • survey in the classroom; • testing on the topics of the discipline; • * control works; • protection of independent creative works; • discussions; • trainings; • colloquiums; • essays, etc. <p>Boundary control at least twice during one academic period within the framework of one academic discipline.</p> <p>Intermediate certification is carried out in accordance with the working curriculum, academic calendar.</p> <p>Forms of holding:</p> <ul style="list-style-type: none"> • exam in the form of testing; • oral examination; • written exam; • combined exam; • project protection; • protection of practice reports. <p>Final state certification.</p>

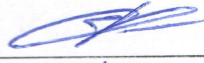
7. EDUCATIONAL AND RESOURCE SUPPORT OF THE EP

<p>Information Resource Center</p>	<p>The structure of the JRC has 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The basis of the network infrastructure of the OIC consists of 180 computers with Internet access, 110 automated workstations, 6 interactive whiteboards, 2 video doubles, 1 videoconferencing system, 3 scanners of A-4 format, 3. The software of the OIC – AIBS "IRBIS-64" for MSWindows (a basic set of 6 modules), an autonomous server for uninterrupted operation in the IRBIS system.</p> <p>The library fund is reflected in the electronic catalog available to users on the website http://lib.ukgu.kz is on-line 24 hours 7 days a week.</p> <p>Thematic databases of their own generation have been created: "Almamater", "Works of scientists of SKSU", "Electronic Archive". Online access from any device 24/7 via an external link http://articles.ukgu.kz/ru/ppp.</p> <p>Working with catalogs in electronic form. The EC consists of 9 databases: "Books", "Articles", "Periodicals", "Works of the teaching staff of SKSU", "Rare books", "Electronic Fund", "SKSU in print", "Readers" of "SKU".</p> <p>The JRC 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 JRC; through the university's information network for faculties and departments; remotely on the library's website http://lib.ukgu.kz /.</p> <p>Access to international and republican resources is open: "SpringerLink", "Envoy", "Web of Science", "EVSSO", "Epigraph", to electronic versions of scientific journals in open access, "Zan", "RMEB", "Adebiet", Digital library "Akpigress", "Smart-kitar", "Kitar.kz", etc.</p> <p>For people with special needs and disabilities, the library's website has been adapted to the work of visually impaired users in the JRC.</p>												
<p>Material and technical base</p>	<p>The material and technical base of the department, its equipment with computer equipment ensure high efficiency of the educational process. The Computer Engineering and Software Department has 403, 404, 405 computer classes of the academic building No.4. During the educational process, students use the computer classes of the main building to perform laboratory work and SRS. Also in the main building there is an educational and laboratory complex from Huawei (Huawei ICT Academy), in which the direction of "Computer Networks" is studied. Minimum characteristics of computers:</p> <table border="1" data-bbox="507 1742 1412 1948"> <thead> <tr> <th>Name</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td>1. CPU</td> <td>Core i3-9100 3.6GHz</td> </tr> <tr> <td>2. MB</td> <td>Gigabyte H310 LGA 1151</td> </tr> <tr> <td>3. RAM</td> <td>DDR4 8Gb</td> </tr> <tr> <td>4. HDD</td> <td>1 Tb</td> </tr> <tr> <td>5. VC</td> <td>Intel UHD Graphics 630</td> </tr> </tbody> </table>	Name	Parameters	1. CPU	Core i3-9100 3.6GHz	2. MB	Gigabyte H310 LGA 1151	3. RAM	DDR4 8Gb	4. HDD	1 Tb	5. VC	Intel UHD Graphics 630
Name	Parameters												
1. CPU	Core i3-9100 3.6GHz												
2. MB	Gigabyte H310 LGA 1151												
3. RAM	DDR4 8Gb												
4. HDD	1 Tb												
5. VC	Intel UHD Graphics 630												

AGREEMENT SHEET

by Education Program code
7M06130- «Computer engineering and software»

Director of IPO



Yelibayeva G.I.

/ Director of ASD



Nazarbek U. B.