MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN

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

«AGREED»
Director of LLP "Center of information systems
WTO»

_____ O. A. Laptanovich
« 28 »   03   20 22 г.

«AGREED»
Director of LLP «SBG-12»

_____ S. S. Zhuzbaev
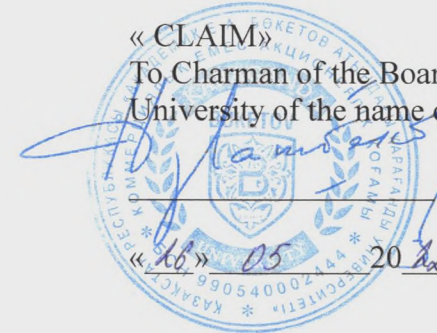« 28 »   03   20 22 г.

« AGREED»
Director of LLP «Creatida»

_____ S.P. Zaburdyaev
« 28 »   03   20 22 г.

« CLAIM»
To Charman of the Board-Rector of Karaganda
University of the name of academician E.A.Buketov

_____ professor N.O. Dulatbekov
« 16 »   05   20 22 г.

EDUCATIONAL PROGRAM

7M06101 *"Information Systems and Technology"*

Level: Master's Degree

Degree: Master of technical sciences

Karaganda, 2022

The educational program "7M06101 - Information systems and technologies" was developed on the basis of:

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

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

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

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

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

– Professional standard "Teacher" (Appendix to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated June 8, 2017 No. 133)

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

Content

Passport of the educational program

1. Code and name of the educational program: **"7M06101 - Information systems and technologies"**
2. Code and classification of the field of education, areas of training: 7M06 Information and Communication Technologies
3. Group of educational programs – M094 - Information technology
4. Volume of credits: 120 ECTS
5. Form of training: full - time
6. Language of training – Russian
7. Degree awarded– Master
8. Type of EP (acting, new, innovative) – acting
9. 9. ISCED level - 7
10. The level of the NRK -– 7
11. The level of the ORC - 7
12. Distinctive features of the EP: no
13. Number of the appendix to the license for the direction of personnel training: Appendix No. 16 to the state license No. KZ83LAA00018495 dated 07/28/2020.
14. The name of the accreditation body and the validity period of the EP accreditation: -
15. The goal EP:

To prepare a Master of Technical Sciences with fundamental and applied knowledge in the fields of information and digital technologies, research skills to carry out scientific, pedagogical, professional activities in the conditions of digitalization of the Republic of Kazakhstan and the implementation of the State Program of the Republic of Kazakhstan "Digital Kazakhstan".

16. Qualification characteristics of the graduate
a) List of posts:
- Software Designer
- Software Maintenance Specialist
- Database Administration Specialist
- Software developers and testing specialists, WEB and multimedia applications
- Software Architects
- Системный System Analyst
- System Administrator
- Network Administrator
- Teacher. College teacher
- Teacher. University teacher
- Teacher. Manager in Education

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

The sphere of professional activity of graduates under the educational program "7M06101 - Information systems and technologies" are: information centers, organizations of industry, science, education, culture, healthcare, agriculture, public administration.

The objects of professional activity of masters under the educational program "7M06101 - Information systems and technologies" are: design and research institutes, management bodies, departments, financial organizations, business structures, enterprises and organizations of various forms of ownership using methods of mathematics, applied mathematics and computer science, computer technologies in professional activities, the pedagogical process of colleges, universities.

c) Types of professional activity

The types of professional activity of graduates are: research; scientific and technological; scientific and production; organizational and managerial; educational (diagnostic - study of the student's personality, the results of training, education and development; organizational and technological - organization of the learning and education process based on pedagogical technologies; managerial and pedagogical - interaction "subject-subject", management in education; project - modeling of education in higher school; research - creative search in solving problems of education, the study of pedagogical experience, reflection).

d) Functions of the graduate's professional activity

The main functions of the activity are:

- research activities in areas using IT-technology methods, information systems and ICT;

- development of requirements and specifications of individual components of objects of professional activity based on the analysis of user requests, domain models and capabilities of technical means;

- organization of the process of developing software products with a given quality in a given time;

- implementation of pedagogical activity with wide application of multimedia and other IT technologies: organizational, diagnostic and analytical, socio-pedagogical, advisory, organizational and managerial.

17. Formulation of learning outcomes based on competencies

Type of competencies	Codes	Learning outcomes
Behavioural skills and personal competencies (Soft skills)	LO1	Demonstrates current knowledge of modern history and philosophy of science, applied natural sciences, contributing to the implementation of the main directions of modernization of public consciousness
	LO2	Owns the skills to analyze methodological problems that arise in solving research and practical problems, including in interdisciplinary areas; applies modern theoretical and practical research methods in order to create software intelligent systems, effective data analysis.
Professional competencies (Hard skills, Digital skills)	LO3	Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students, the methodology of conducting training sessions
	LO4	Proficient in English and translation techniques at the level of understanding the functional features of oral and written professionally-oriented texts, including scientific and technical nature
	LO5	Applies in practice modern methods of analysis of innovative solutions to scientific and applied problems, planning and organization of processes of the life cycle of IP and ICT enterprise management, methods and models of commercialization of innovative technologies in the field of IT, owns methods of organization and effective management of IT projects.
	LO6	Owns mathematical, computer methods of analysis, modeling and visualization of data for solving scientific and applied problems in the IT field, designing and developing software, taking into account the requirements of information security.
	LO7	Owns modern technologies and means of programming, testing, protection and documentation for the implementation of all stages of the software life cycle.

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

Learning outcomes code	Name of the module	Name of disciplines	Volume (ECTS)
LO1, LO2	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
LO1, LO3		Higher school pedagogy	4
LO2, LO3		Psychology of management	4
LO2, LO3		Pedagogical practice	4
LO4	Professional languages	Foreign language (professional)	4
LO4, LO7 LO2, LO4		Professional foreign terminology in the IT sphere/ Culture and Ethics of Academic writing	5
LO2, LO5	IT innovations	Commercialization of the results of scientific and technical activities Scientific innovative entrepreneurship	5
LO2, LO5		Coinnovation in the IT field IT Project Management	5
LO6, LO7	Professional	Software development technologies	4
LO6, LO7		Design and development of corporate information systems	5
LO3, LO6, LO7		Computer technologies in science and education	4
LO2, LO6 LO7	Information Technology	Applied problems of numerical methods/ Theory of algorithms	5
LO7		Python Programming/ Programming in Java	4
LO6, LO7 LO6		Cryptology (in English)/ Information security technologies	5
LO7		Web application development/ Mobile application development	4
LO2, LO6 LO2, LO6, LO7		Visualization in research / Methods of analysis and visualization of big data	4
LO1, LO2. LO6, LO7		Research practice	14
LO2	Research work	Research work of a master's student, including internship and completion of a master's thesis (NIRM)	24
LO2	Research work	Preparation and defense of a master's thesis	12

19. Matrix of achievability of learning outcomes

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

D6	Culture and Ethics of Academic writing	Features of academic writing. General requirements for scientific work. Types of academic texts. Style of presentation. Errors in written scientific papers. Working with sources. References and citation rules. Plagiarism. The author's attitude to the cited material. Various ways of quoting. Structuring and preparation for writing a scientific text. Essay. Practical recommendations for writing a scientific text.	5		+		+			
D7	Commercialization of the results of scientific and technical activities	Theoretical foundations of the commercialization of the results of scientific activity, including the stages of project development and implementation, systematization of concepts and basic theoretical concepts; creative implementation of theoretical and applied knowledge in practice (in the organization of project work).	5		+		+			
D8	Scientific innovative entrepreneurship	Study of the essence, content and characteristics of high-tech production and business. Fundamentals, infrastructure, and trends in the development of modern innovative entrepreneurship. Methods, strategies, features of functioning and management of high-tech business. Characteristics, criteria, and features of small knowledge-intensive business.	5		+		+			
D9	Coinnovation in the IT field	Innovative development in the field of IT: basic approaches and new paradigms. Technological support IT. Information and strategic management in the field of IT. Innovative infrastructure of the enterprise. Information and strategic management in the IT-sphere. Strategic planning and organization of life cycle processes of IS and ICT enterprise management. Formation of innovation policy and implementation of innovation programs in the IT-sphere.	5		+		+			
D10	IT Project Management	The concept and basic elements of the enterprise IT infrastructure. The life cycle of an IT project. Project initiation. Project planning. Development of the project schedule. Project human resource management. Project cost management. Project risk management. Quality management. Interaction management. Implementation of an IT project.	5		+		+			
Cycle of profile disciplines **University component**										
D11	Software development technologies	Principles, models and methods used in the engineering cycle of the development of complex software products; classical fundamentals of software engineering. Project, risk and configuration management methods. Methods for determining requirements in software engineering. Methods of designing software systems. Principles of creating a user interface. The main approaches to software product testing.	5						+	+
D12	Design and development of corporate information systems	Basic concepts and standards of corporate information systems (CIS). The market of software for the automation of the organization. Design and development of corporate information systems. Modeling and development of CIS databases. Administration of CIS. Data backup and restore.	4						+	+

Code	Discipline	Description	Credits							
D13	Computer technologies in science and education	Computer technologies, basic concepts, science as an object of computerization. Types of scientific and technical information and its processing. Computer technologies in theoretical research. The composition and methods of theoretical research. Computer support for theoretical research. Computer technologies in scientific experiment, modeling and processing of scientific research results.	4				+			+	+
Cycle of profile disciplines **Component of choice**										
D14	Applied problems of numerical methods	Numerical modeling of equations; application of numerical methods to solve the equation of motion, proof of convergence, stability and uniqueness of the solution; numerical analysis of calculations of these equations; use of numerical results for the compilation of process modeling programs	3	+					+		
D16	Theory of algorithms	Turing machines. Recursive functions. Normal Markov algorithms. The complexity of the algorithm. Theoretical complexity: linear, quadratic, cubic. The efficiency of the algorithm. Permutations. Generating permutations, subsets of a set. Optimization problems on graphs. The maximum flow in the network. Problems of combinatorics, construction and implementation of algorithms for solving problems of a subject orientation.									+
D18	Programming in Python (in English)	The basic structure of the standard Python modules. Built-in object types. Numerical algorithm. Matrix calculations. Processing of text information. Create applications with GUI. Overview of graphic libraries: Tkinter, PyQT. Object-oriented programming. Classes in Python. Definition of data, methods, operations. Inheritance. Multiple inheritance. Composition in the development of classes. Functional programming. Development of Web applications.	4								+
D19	Programming in Java	Syntax and structure of the Java language. Java and object-oriented programming. Object Model in Java. class inheritance. Polymorphism. interfaces. Development tools. Operators and code structure. Exceptions. Text processing and multilingual support. Graphical user interface. Collections. java.awt package. Threads of execution. Synchronization. java.lang package. java.util package. java.io package. java.net library. Development of network applications.									+
D20	Cryptology (English)	Principles of construction of systems of cryptographic protection of information; the key systems, cryptographic algorithms and protocols that form the basis of cryptographic information protection in modern computer networks and their cryptographic properties; General approaches regarding the choice of parameters of the cryptosystems, algorithms for their constructing and testing; basic concepts of information security, means of access control, cryptographic techniques.	5							+	+

Code	Name	Description								
D21	Information security technologies	Basic provisions of the theory of information security. Types of information security. Security models and their application. Classification of threats and objects of protection. Software security. Protection of information in information systems. Theoretical and practical methods of information protection. cryptographic models. Symmetric cryptosystems. Cryptographic means of information protection. Public key systems. Technologies for building secure systems.							+	
D22	Web Application Development (in English)	Classification and types of Web applications. Web application development tools: HTML, HTML5, CSS3. Client-server interaction. Technologies for developing client-server applications. Web design. JavaScript and jQuery libraries. Platform Node.js . Vue frameworks.js, Angular2 and React 15. CMS systems. A programming interface for accessing and managing the content of DOM API Web pages. Prototyping of application interfaces and software complexes: Axure tools, Adobe Experience Design, Figma, Sketch.	4							+
D23	Mobile application development	Android platform device. Overview of programming environments. The main types of Android applications. Android application architecture. Main components. Application manifest. Resources. Basics of developing interfaces for mobile applications. Navigation controls and design. The basics of developing multi-window applications. Using the capabilities of the smartphone in applications. Database and Media in Android.								+
D24	Visualization in research	Visualization of scientific data. 3D visualization, visual images. Creation of three-dimensional images, animations and diagrams, various types of graphs (dot and line graphs; histograms; pie charts) for solving scientific problems. Analysis of modern concepts and methods of visual representation of data. Methods of expressiveness and data analysis. Algorithms for visual representation of numerical solutions. Promising areas of development of concepts and visualization methods.	4		+				+	
D25	Methods of analysis and visualization of big data	Place and role of tools for visualization and analysis of big data. Stages of solving the problem of data analysis and their relationship, the life cycle of data analytics, methods and stages of Data Mining, Business Intelligence. Modern tools and technologies for visualizing data and analysis results. Innovative technologies for collecting and storing data (Hadoop, MapReduce, NoSQL databases, etc.). The statistical research language R			+				+	+

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

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LO1	Demonstrates current knowledge of modern history and philosophy of science, applied natural sciences, contributing to the implementation of the main directions of modernization of public consciousness	Interactive lecture, discussion	Test, colloquium, control tasks
LO2	Owns the skills to analyze methodological problems that arise in solving research and practical problems, including in interdisciplinary areas; applies modern theoretical and practical research methods in order to create software intelligent systems, effective data analysis.	Interactive lecture, discussion, panel discussion	Test, colloquium, control tasks
LO3	Owns the methods and methods of planning the activities of the organization of education in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students, the methodology of conducting training sessions	Interactive lecture, discussion, panel discussion	Test, colloquium, control tasks, methodical portfolio
LO4	Speaks English and translation techniques at the level of understanding the functional features of oral and written professionally-oriented texts, including scientific and technical nature	Interactive lecture, round table, group work	Test, colloquium, portfolio, essay
LO5	Applies in practice modern methods of analysis of innovative solutions to scientific and applied problems, planning and organization of processes of the life cycle of IP and ICT enterprise management, methods and models of commercialization of innovative technologies in the field of IT, owns methods of organization and effective management of IT projects.	Interactive lecture, discussion, group work	Test, colloquium, control tasks
LO6	Owns mathematical, computer methods of analysis, modeling and visualization of data for solving scientific and applied problems in the IT field, designing and developing software, taking into account the requirements of information security.	Interactive lecture, method of demonstration examples practical method of teaching; group work	Test, colloquium, control tasks
LO7	Owns modern technologies and means of programming, testing, protection and documentation for the implementation of all stages of the software life cycle.	Interactive lecture, method of demonstration examples practical method of teaching; group work	Test, colloquium, control tasks, software product

21. Criteria for assessing the achievability of learning outcomes

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

22. The graduate model of the educational program

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

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

Compilers:
Members of the working group:
Head of Department AMaI   E.A. Spirina
Professor of the Department AMaI   D.A. Kazimova
Associate Professor of the Department AMaI   N.A. Gorbunova
Associate Professor of the Department AMaI   R. Murathan
Master's student gr.MIST-53   E. Nurmakhanov
Director of BSolution LLP   A. Yesen

Notes:
The educational program was reviewed by the Faculty Council _28.03.2022_ Protocol № _6/1_
The educational program was considered at a meeting of the Academic Council from _28.04.22y_ Protocol № _5_
The educational program was reviewed and approved at a meeting of the University Board _26.05.22y_ Protocol № _12_

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

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

Dean of the Faculty of Mathematics and Information tehnologiy   D.A. Kazimova