



Institute Automation and information technology
Department Software Engineering

EDUCATIONAL PROGRAM
7M06101 Software Engineering
Code and name of educational program

Code and classification of the field of education: **7M06 "Information and communication technologies"**

Code and classification of training directions: **7M06 "Information and communication technologies"**

Group of educational programs: **M094 "Information technology"**

Level based on NQF: **7**

Level based on IQF: **7**

Study period: **2 years**

Amount of credits: **120**

Almaty 2024

Educational program 7M06101 Software Engineering

code and name of educational program

was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes # 12 dated « 22 » 04 2024.

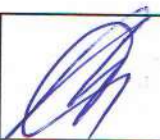

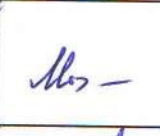

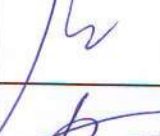
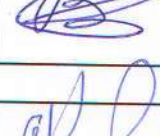


was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Minutes # 6 dated « 19 » 04 2024.

Educational program 7M06101 «Software Engineering»

code and name of educational program

was developed by Academic committee based on direction 7M061 «Information and communication technologies»

№	Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:					
1	Abdoldina Farida Nauruzbaevna	Candidate of Technical Sciences	Head of Department, Associate Professor	NJSC "Kazakh National Research Technical University named after K.I. Satpayev", mob. phone: +7 707 820 6525	
Teaching staff:					
2	Mukhamediev Ravil Ilgizovich	Candidate of Technical Sciences	Professor	NJSC "Kazakh National Research Technical University named after K.I. Satpayev", mob. phone: +7 777 241 8672	
3	Moldagulova Ayman Nikolaevna	Candidate of Physical and Mathematical Sciences	Professor	NJSC "Kazakh National Research Technical University named after K.I. Satpayev", mob. phone: +7 701 727 9025	
4	Mukajanov Nurzhan Kakenovich	PhD	Associate professor	NJSC "Kazakh National Research Technical University named after K.I. Satpayev", mob. phone: +7 775 724 8242	
5	Gertsen Yevgeniy Alexandrovich	Master of Science	Senior teacher	NJSC "Kazakh National Research Technical University named after K.I. Satpayev", mob. phone: +7 777 209 4343	
6	Baimbetov Daulet Abibullaevich	Master of Science	Senior teacher	NJSC "Kazakh National Research Technical University named after K.I. Satpayev", mob. phone: +7 707 891 4322	
Employers:					
7	Konysbaev Amiret Tuyakuly	Candidate of Philosophical Sciences	President of the Association	Association of Innovative Companies FEZ "PIT", mob. phone: +7 708 106 5028	
8	Nurseitov Daniyar Borisovich	Candidate of Physical and Mathematical	Expert (disciplinary)	BigDATA sector, KMG engineering LLP, mob. phone: +7 777 127 7711	

NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»



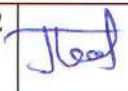

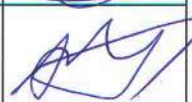
		Sciences			
9	Akylaev Zhasulan Akzholovich	Master of Science	Head of Department	Transactional systems testing department Transactional systems department of JSC Halyk Bank of Kazakhstan, mobile. phone: +7 771 701 2811	
Alumni Representatives:					
10	Mereke Askhat Asylbekuly	Master of Science	Lead programmer 1st category (senior full- stack)	"The Boss media group" LLP, mob. phone: +7 707 426 0165	
11	Dzhamalov Jalal Kudratovich	PhD	Team Lead	JSC Kaspi Bank, Kaspi Pay transfer development team, mobile. phone: +7 701 949 7935	
Receiving education:					
12	Rystygulov Panabek Abashovich	Master of Science	Doctoral student, 1st year	mobile. phone: +7 775 202 4224	
13	Mukin Dmitry Mikhailovich	Bachelor	Master's student, 1st year	mobile. phone: +7 707 157 5233	
14	Halmatai Nurbek Kasymuly	-	Student, 3rd year	mobile. phone: +7 700 484 4808	

Table of contents

	List of abbreviations and designations	5
1	Description of educational program	6
2	Purpose and objectives of educational program	6
3	Requirements for the evaluation of educational program learning outcomes	7
4	Passport of educational program	8
4.1	General information	8
4.2	Relationship between the achievability of the formed learning outcomes according to educational program and academic disciplines	12
5	Curriculum of educational program	20
6	Additional educational programs (Minor)	22

List of abbreviations and designations

EP – educational program

BC – basic competencies

PC – professional competencies

LO – learning outcomes

MOOC – Massive Open Online Courses

NQF – National Qualifications Framework

IQF – Industry Qualifications Framework

SE – Software Engineering

1. Description of educational program

The main focus of the master's program is on an in-depth study of software development technologies, understanding the architecture of computer systems, and expanding knowledge in the field of development paradigms for distributed, resilient network applications.

The program is aimed at training a high-quality specialist in accordance with the level of competence, capable of independently conducting scientific research, independently developing complex software solutions, working in a team, and navigating modern Information Technologies. The educational program is structured taking into account current trends in software development and in close connection with the manufacturing sector.

The educational program was developed based on an analysis of the labor functions of software engineers, system administrators, and data analysts, as stated in professional standards.

Representatives of Kazakh companies in the field of software product development participated in the development of the educational program.

The master's program in scientific and pedagogical direction implements educational programs of postgraduate education for the training of scientific and scientific-pedagogical personnel for universities and scientific organizations with in-depth scientific, pedagogical and research training.

The content of the master's educational program consists of:

- 1) theoretical training, including the study of cycles of basic and major disciplines;
- 2) practical training of undergraduates: various types of internships, scientific or professional internships;
- 3) research work, including the completion of a master's thesis, for scientific and pedagogical master's programs
- 4) final certification.

2. Purpose and objectives of educational program

Purpose of EP: The purpose of the educational program is to prepare masters of technical sciences with specialized competencies in the study of integrated solutions for the development of software for computer systems.

To provide practice-oriented training for engineering and scientific specialists in the field of software product development who are able to apply various technologies, knowledge and skills of software development and design activities with an emphasis on in-depth study of aspects of creating distributed computing systems and a detailed study of hardware limiting factors of computer technology

Tasks of EP:

- Prepare specialists in engineering and scientific activities and production for production and technological activities related to the process of development and modification of software products focused on meeting the expectations and

requirements of users, for organizational and management activities related to the maintenance of software products of various classes and categories, information management systems.

- Select modern technologies for software design and development during the learning process.

- Teach undergraduates to develop software and algorithms for solving various problems based on analysis of the subject area.

- Carry out scientific and pedagogical activities, participate in the development of educational and methodological materials for teaching disciplines in colleges and universities in the field of Information and Communication Technologies.

- Create conditions for continuous professional self-improvement, development of social and personal competencies, social mobility and competitiveness in the labor market.

3. Requirements for evaluating the educational program learning outcomes

The educational program was developed in accordance with the State Compulsory Standards of Higher and Postgraduate Education, approved by order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 2 (registered in the Register of State Registration of Normative Legal Acts under No. 28916) and reflects the learning results, based on which develop curricula (working curricula, individual curricula for students) and working curricula for disciplines (syllabuses). Mastering disciplines of at least 10% of the total credits of the educational program using MOOCs on the official platform <https://polytechonline.kz/cabinet/login/index.php/>, as well as by studying disciplines through the international educational platform Coursera <https://www.coursera.org/>.

Assessment of learning outcomes is carried out based on developed tasks within the educational program in accordance with the requirements of the state compulsory standard of higher and postgraduate education.

When assessing learning outcomes, uniform conditions and equal opportunities are created for students to demonstrate the level of their knowledge, skills and abilities.

When conducting intermediate certification online, online proctoring is used.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	7M06 «Information and communication technologies»
2	Code and classification of training directions	7M06 «Information and communication technologies»
3	Educational program group	M094 «Information technology»
4	Educational program name	7M06101 Software Engineering
5	Short description of educational program	<p>The main focus of the master's program is on an in-depth study of software development technologies, understanding the architecture of computer systems, and expanding knowledge in the field of development paradigms for distributed, resilient network applications.</p> <p>The program is aimed at training a high-quality specialist in accordance with the level of competence, capable of independently conducting scientific research, independently developing complex software solutions, working in a team, and navigating modern Information Technologies. The educational program is structured taking into account current trends in software development and in close connection with the manufacturing sector.</p>
6	Purpose of EP	<p>The purpose of the educational program is to prepare masters of technical sciences with specialized competencies in the study of integrated solutions for the development of software for computer systems.</p> <p>To provide practice-oriented training for engineering and scientific specialists in the field of software product development who are able to apply various technologies, knowledge and skills of software development and design activities with an emphasis on in-depth study of aspects of creating complex software systems and applications, the use of modern architectural solutions for software development and detailed study of the hardware and technical capabilities of computer technologies</p>
7	Type of EP	New
8	The level based on NQF	7
9	The level based on IQF	7
10	Distinctive features of EP	No
11	List of competencies of educational program	<p>Requirements for key competencies of graduates of scientific and pedagogical master's programs must:</p> <p>1) have an idea:</p> <ul style="list-style-type: none"> - about the role of science and education in public life; - about modern trends in the development of scientific knowledge;

	<ul style="list-style-type: none">- about current methodological and philosophical problems of natural (social, humanitarian, economic) sciences;- about the professional competence of a higher school teacher;- about the contradictions and socio-economic consequences of globalization processes. <p>2) know:</p> <ul style="list-style-type: none">- methodology of scientific knowledge;- principles and structure of the organization of scientific activity;- psychology of cognitive activity of undergraduates in the learning process;- psychological methods and means of increasing the effectiveness and quality of training. <p>3) be able to:</p> <ul style="list-style-type: none">- use the acquired knowledge for the original development and application of ideas in the context of scientific research;- critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;- integrate knowledge acquired within different disciplines to solve research problems in new unfamiliar conditions;- by integrating knowledge, make judgments and make decisions based on incomplete or limited information;- apply knowledge of pedagogy and psychology of higher education in their teaching activities;- apply interactive teaching methods; -- carry out information-analytical and information-bibliographic work using modern information technologies;- think creatively and creatively approach solving new problems and situations;- be fluent in a foreign language at a professional level, allowing you to conduct scientific research and teach special disciplines in universities;- summarize the results of research and analytical work in the form of a dissertation, scientific article, report, analytical note, etc. <p>4) have the skills:</p> <ul style="list-style-type: none">- research activities, solving standard scientific problems;- implementation of educational and pedagogical activities on credit technology of education;- methods of teaching professional disciplines;- use of modern information technologies in the educational process;- professional communication and intercultural communication;- oratory, correct and logical presentation of one's thoughts in oral and written form;- expanding and deepening the knowledge necessary for everyday professional activities and continuing education in doctoral studies. <p>5) be competent:</p> <ul style="list-style-type: none">- in the field of scientific research methodology;- in the field of scientific and scientific-pedagogical activities in higher educational institutions;- in matters of modern educational technologies;- in carrying out scientific projects and research in the professional field;
--	--

		- in ways to ensure constant updating of knowledge, expansion of professional skills and abilities.
12	Learning outcomes of educational program	<p>LO1: Apply the software development life cycle by demonstrating competence in communication, planning, analysis, design, creation, deployment, evaluation and testing of a software product in terms of module, functionality, integration.</p> <p>LO2: Establish interpersonal and group communications; define your role in the team, set goals and formulate tasks related to its implementation; build interaction taking into account the social characteristics of team members; design and organize team work; determine the needs of team members in mastering new knowledge and skills.</p> <p>LO3: Apply a foreign language at a professional level, which allows teaching basic disciplines in universities, reviewing literary sources, analyzing trends in modern science and identifying promising areas of scientific research.</p> <p>LO4: Integrate knowledge obtained from different courses to solve research problems in new unfamiliar environments and generate new ideas in the context of scientific research in software development.</p> <p>LO5: Apply software and hardware design concepts for multiprocessor processing, process and flow models of operating systems, real-time systems, combinable and sequential digital circuits, select methods and develop algorithms for solving problems of managing complex and distributed infrastructures of large enterprises and technological complexes.</p> <p>LO6: Extract the necessary information from various sources, including real-time information flows, develop scientific, technical and innovative solutions for the information infrastructure of the enterprise, taking into account the possibilities of big data technologies, cloud computing models and information security principles.</p> <p>LO7: Apply the methods of statistical analysis and machine learning in relation to the tasks of processing various data, including structured, unstructured, scientific, genomic, etc., conduct scientific research, organize work on the collection, storage and processing of information, create analytical systems and recommender services based on machine learning and deep learning algorithms.</p> <p>LO8: Plan and conduct seminars, practical, laboratory classes, taking into account the requirements of the developed and approved working curricula and guidelines, develop educational and methodological materials to accompany the educational process and implement innovations in the education and upbringing of students, apply the knowledge of pedagogy and psychology of higher education in their pedagogical and research activities.</p> <p>LO9: Apply a modeling approach to software development, use different kinds of models for software development, describe possible risks in software development life cycle management.</p>
13	Education form	Full-time
14	Period of training	2 years
15	Amount of credits	120

16	Languages of instruction	Kazakh, Russian
17	Academic degree awarded	Master of Technical Sciences
18	Developer(s) and authors	Mukazhanov N.K., Abdoldina F.N., Akhmediyarova A.T.

Professional Standard for the EP

№	Name of professional standard	Date of approval of the PS
1	Creation and management of information technologies	24.12.2019
2	Computer systems infrastructure	05.12.2022
3	Professional standard: Teacher (faculty) of higher and (or) postgraduate education organizations	20.11.2023
4	Software testing	05.12.2022

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits									
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9
Cycle of basic disciplines University component												
1	Foreign language (professional)	Purpose: to improve and develop foreign language communication skills in the professional and academic field. Content: general principles of professional and academic intercultural oral and written communication using modern pedagogical technologies (round table, debates, discussions, analysis of professionally oriented cases, design).	3			+						
2	Management Psychology	Purpose: to acquire skills in making strategic and managerial decisions, taking into account the psychological characteristics of the individual and the team. Content: the modern role and content of psychological aspects in management activities, methods for improving psychological literacy, the composition and structure of management activities, both at the local and foreign levels, the psychological feature of modern managers.	3		+							
3	History and philosophy of science	Purpose: to explore the history and philosophy of science as a system of concepts of global and Kazakh science. Content: the subject of philosophy of science, dynamics of science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.	3			+						
4	Higher education pedagogy	Purpose: to learn how to solve scientific and pedagogical problems, taking into account new technologies in the field of higher education. Content: methodological and theoretical foundations of higher school pedagogy, modern pedagogical technologies, planning and organization of learning and upbringing processes, the use	3								+	

		of communicative technologies of subject-subject interaction between a teacher and a student in the educational process of a university, human resource management in higher educational institutions.											
5	Teaching practice	Aimed at developing practical skills and teaching methods. Pedagogical practice can be carried out during the period of theoretical training without interruption from the educational process. At the same time, master's students can be involved in teaching classes at the bachelor's level.	8	+	+	+	+					+	
Cycle of basic disciplines Component of choice													
6	Advanced Software Development	The purpose of this course is to provide undergraduates with the in-depth knowledge and practical skills necessary to develop, implement and maintain complex software systems. This course provides undergraduates with the knowledge and skills to apply sophisticated methods, methodologies, and technologies to create high-quality software that meets complex requirements and solves complex problems. The course promotes the use of best practices and tools to improve the efficiency, reliability, scalability, and maintainability of software systems. Key aspects of advanced software development: advanced programming languages and agile development methodology paradigms, continuous integration and continuous delivery (CI/CD), microservice architecture and containerization, cloud computing, etc.	5	+								+	+
7	IT project management	The main goal of the course "Management of IT projects" is to provide undergraduates with the knowledge and skills necessary for effective planning, implementation and completion of IT projects. Questions considered in the course: enterprise architecture and its management; concept, methodology and standard of corporate management; methodologies and standards of information technology management; Tendencies and prospects for the development of information management. As a result, master's degree students will be able to apply management methodology in IT projects	5		+								
8	Intellectual Property and Research	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to understand, protect and	5				+						

		manage intellectual property (IP) in the context of scientific research and innovation. The course is aimed at training specialists who can effectively work with IP, protect the results of scientific research and apply them in practice.											
9	High load distributed computing	The purpose of this course is to master models for constructing large computing systems. The course is based on modern problems of building scalable systems. The content of the discipline includes issues of high-load distributed computing, architecture of high-load systems, data management and processing, performance and scalability. This course is aimed at preparing specialists capable of developing and maintaining high-load distributed systems, ensuring their stability, performance and security under real-world workloads.	5				+	+					
10	Methods of optimal management decisions	The purpose of this course is to provide undergraduates with the theoretical knowledge and practical skills necessary to make informed and optimal decisions in management. The course is aimed at training specialists capable of using quantitative and qualitative methods to analyze and solve complex management problems in various areas of business and economics. The course content covers the following topics: decision theory, quantitative methods of decision making, methods of forecasting and data analysis, game theory and strategic decisions, methods of project analysis and management, information systems and technologies for decision making	5			+							
11	Sustainable Development Strategies	Purpose: To train graduate students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Graduate students will study the concepts and principles of sustainable development, the development and implementation of sustainable development strategies, the evaluation of their effectiveness, and international standards and best practices. Cases and examples of successful sustainable development strategies are included.	5				+						
12	Cloud technologies	The course will provide the competencies necessary to work with cloud systems with different settings. The content of the course examines the following issues: collection, visualization, storage of data, their security and automation; design and	5							+			

		deployment of a cloud storage system; developing the most convenient and effective strategy for migrating legacy systems to the cloud; development of testing methods to evaluate the effectiveness of corporate cloud systems in order to draw up recommendations for their improvement.										
13	Ecosystem Modeling	The main goal of the course is to provide undergraduates with the knowledge and skills necessary to create, analyze and interpret ecosystem models. The content of the discipline includes ways to apply mathematical and computer models to understand the dynamics of ecosystems, predict their changes and support decisions in the field of natural resource management and environmental protection.	5						+			+
Cycle of profile disciplines University component												
14	Research methodology and innovation activities	The purpose of mastering the course is to develop the skills of conducting research activities in the master's student. The content of the discipline includes issues of determining the direction of research; goals and objectives of the study; stages of writing a scientific publication, literature review; organization of a scientific experiment; directions of innovation activity; The role of scientific research in innovation	5						+	+		
15	Software architecture and design	The goal of this course is to provide undergraduates with an understanding of the fundamental principles, techniques, and tools of software architecture and design to create high-quality, scalable, and resilient systems. Course content: As part of the course, undergraduates learn the basic concepts of software architecture, such as layering, modularity, microservice architecture and architectural styles. They delve into the design process, including requirements analysis, creating class and sequence diagrams, SOLID principles, and design patterns. The course also includes exploration of modern architecture approaches such as cloud computing, containerization, and microservices. Practical projects allow undergraduates to apply acquired knowledge to real software development problems and analyze architectural solutions based on specific cases.	5		+					+		+
16	DevOps engineering	The purpose of this course is to teach students how to optimally	5		+	+				+		+

		organize the systems development life cycle and ensure the continuous delivery of high-quality software. DevOps is achieved through various practices and tools that automate processes between software development and IT teams, allowing them to build, test, and release software faster and more reliably. Course topics: Version control systems and application build automation, Flexible methodologies and Continuous Integration, Continuous Delivery and Continuous Deployment, DBOps: relational and non-relational databases, Docker containerization and data storage, Microservices, balancing and caching, etc.										
17	QA/QC and Continuous Integration	The purpose of this course is to master the basic elements of the theory of computational complexity. As part of the course, students will gain knowledge in the field of quality assessment, software quality control, learn to develop test cases, perform testing using test cases, detect errors during testing and document them, evaluate and test a software product in terms of module, functionality, and integration.	5	+								+
18	Business Intelligence	The course is aimed at developing in master's students a complex of theoretical knowledge and practical skills in using modern information tools of business analytics for business management. During practical classes, undergraduates master skills in working in the most popular business analytics platforms: Power BI, Qlik Sense, Tableau to support decision-making in marketing and business management; skills in conducting OLAP (online analytical processing) when solving analytical problems: exploratory analysis, data research, generating analytical reporting.	5						+	+		
19	Reserch Project	The purpose of this course is to teach undergraduates to conduct independent scientific research and work on scientific projects. Course content covers the following topics: Developing a research topic and questions, developing research methodology, collecting data, analyzing data, writing and presenting a research report, managing a research project, ethics and professional standards in research.	4		+		+					
20	Research practice	The undergraduate research practice is carried out with the aim of familiarizing himself with the latest theoretical,	4			+	+			+		+

		methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.											
Cycle of profile disciplines													
Component of choice													
21	Artificial Intelligence and Machine Learning	The purpose of this course is to provide master's students with comprehensive knowledge and practical skills in the field of artificial intelligence (AI) and machine learning (ML). The course content covers the following topics: Introduction to Artificial Intelligence and Machine Learning, Machine Learning Algorithms, Deep Learning and Neural Networks, Data Collection and Processing, Model Evaluation and Improvement, Application of AI and ML in Various Domains, Tools and Libraries for AI and ML, ethics and social aspects of AI.	5									+	
22	Big Data processing and applications	The goal of the discipline is to master the principles and obtain practical skills in organizing and technologies for storing, transforming and analytical processing of big data. The discipline examines the theoretical and practical aspects of using big data technologies and developing applications for processing big data. The lecture course examines trends in the development of infrastructure solutions for processing and storing big data. Practical exercises cover the development of applications for processing big data.	5									+	
23	System and network administration	The purpose of this course is to provide undergraduates with in-depth knowledge and practical skills in the administration of information systems and computer networks, taking into account modern requirements for reliability, security and operational efficiency. Contents: The course covers advanced operating system administration techniques (Windows, Linux), including in-depth study of configuration, monitoring and security. Master's students also learn complex aspects of computer network administration, including network architecture, device management, routing, segmentation, and security. The course also includes cloud technologies, virtualization and data backup techniques. Practical classes are aimed at solving real problems of administering systems and	5	+									

		networks, as well as developing strategies to ensure the effective operation of the organization's information infrastructure.											
24	Virtual and augmented reality (VR/AR)	The goal of the course is to immerse undergraduates in the world of virtual and augmented reality (VR/AR), as well as master the technologies and methods of their development and application. Course content includes learning the basic principles of VR and AR, hardware and software, creating virtual and augmented scenarios, content development, programming for VR/AR using specialized development tools, as well as analyzing practical cases and use cases in various industries.	5				+	+					
25	Mobile computing and applications	The purpose of this course is to provide knowledge and skills in developing and using mobile applications, as well as technologies related to mobile computing. The course covers topics such as: Mobile development for Android and iOS, Development of cross-platform mobile applications, Optimizing performance and energy consumption, Cloud computing and mobile applications, Mobile application security, Application programming interfaces (APIs) and mobile services, Mobile computing and the Internet of things (IoT), etc.	5				+	+					
26	Software reliability	The main goal of the course is to provide undergraduates with the knowledge and skills necessary to develop, test and maintain highly reliable software. The course is aimed at training specialists capable of creating fault-tolerant systems, minimizing the risks of failures and ensuring high quality and reliability of software products. Course content covers the following topics: understanding the basic concepts of software reliability, designing reliable software, reliability testing methods and tools, principles of designing fault-tolerant systems, software security and reliability, certification and reliability standards.	5	+				+					
27	Business Process Modeling	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to analyze, develop and optimize business processes in an organization. The course content covers the following topics: Understanding the basics of business process modeling, studying modeling methodologies and tools, analyzing and describing current business processes,	5		+			+					+

		developing and optimizing business processes, modeling processes using BPMN, automating business processes, quality management and business improvement -processes, change management and organizational aspects.											
28	Development of intelligent applications	The main goal of the discipline is to provide undergraduates with comprehensive knowledge and practical skills necessary to create, implement and optimize intelligent applications. This course provides knowledge on the application of the capabilities of artificial intelligence and data analysis in applications that represent intelligent solutions. Course topics: modern intelligent applications, Applications of machine learning and natural language processing in applications, Advanced machine learning methods, Development of intelligent agents, etc.	5								+		
29	Generative AI	The goal of this course is to provide students with an understanding of generative artificial intelligence methods and technologies for generating new data in various fields. The Generative AI course covers the principles, algorithms, and applications of generative models in artificial intelligence. The course covers topics such as: Generative Adversarial Networks (GAN), Autoencoders and Representation Learning, Deep Generative Models, Text Generation and Natural Language Processing (NLP), Image Generation, Music Generation and Creative Artificial Intelligence, Ethical and Social Implications, etc.	5								+		
Master's student's research work													
30	Master's student's research work, including internship and master's thesis	Systematization of theoretical knowledge, development of skills in setting problems on the research topic and solving them consistently. Research work includes assessing the objects of research, describing its problems, identifying a narrow area for research work, conducting an experiment, analyzing the results of the experimental part, preparing and defending a research report and summing up the results.	24			+	+					+	

5. Curriculum of educational program



KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATBAYEV



CURRICULUM

of Educational Program on enrollment for 2024-2025 academic year

Educational program 7M06101 - "Software Engineering"
Group of educational programs M094 - "Information technology"

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in	Form of control	Academic degree: Master of Engineering Science			
								Allocation of face-to-face training based on			
								1 course		2 course	
1 semester		2 semester		3 semester		4 semester					
CYCLE OF BASIC DISCIPLINES (BD)											
M-1. Module of basic training (university component)											
LNG213	English (professional)	BD, UC	3	90	0/0/2	60	E	3			
HUM214	Management Psychology	BD, UC	3	90	1/0/1	60	E	3			
HUM212	History and philosophy of science	BD, UC	3	90	1/0/1	60	E		3		
HUM213	Higher school pedagogy	BD, UC	3	90	1/0/1	60	E		3		
component of choice											
ICT200	Advanced Software Development	BD CCH	5	150	1/0/2	105	E	5			
ICT215	IT project management				2/0/1						
MNG781	Intellectual property and research	BD CCH	5	150	2/0/1	105	E	5			
ICT216	High load distributed computing				2/0/1						
ICT201	Methods of optimal management decisions				1/0/2						
MNG782	Sustainable development strategies				2/0/1						
CSE795	Cloud Technologies	BD CCH	5	150	1/0/2	105	E		5		
ICT202	Ecosystem Modeling				1/0/2						
CYCLE OF PROFILE DISCIPLINES (PD)											
M-2. Module of professional activity (university component, component of choice)											
CSE770	Methodology of scientific research and innovation	PD, UC	5	150	2/0/1	105	E	5			
ICT204	Software architecture and design	PD, UC	5	150	1/0/2	105	E	5			
CSE784	Artificial Intelligence and Machine Learning	PD CCH	5	150	2/0/1	105	E	5			
CSE787	Big Data processing and applications				2/0/1						
ICT209	System and network administration				1/0/2						
ICT205	DevOps engineering				1/0/2						
CSE756	QA/QC and Continuous Integration	PD, UC	5	150	2/0/1	105	E	5			
ICT210	Virtual and augmented reality (VR/AR)	PD CCH	5	150	1/0/2	105	E		5		
ICT211	Mobile computing and applications				1/0/2						
ICT206	Software reliability	PD CCH	5	150	1/0/2	105	E			5	
ICT207	Business Process Modeling				1/0/2						
CSE791	Development of Intelligent Applications	PD CCH	5	150	2/0/1	105	E			5	
CSE793	Generative AI	PD, UC	5	150	2/0/1	105	E				5
SEC232	Business Intelligence				2/0/1						
CSE794	Reserch Project	PD, UC	4	120	2/0/1	75	E			4	
M-3. Practice-oriented module											
AAP229	Pedagogical practice	BD, UC	8							8	
AAP256	Research practice	PD, UC	4								4
M-4. Experimental research module											
AAP268	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	4					4			
AAP268	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	4						4		
AAP251	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	2							2	
AAP255	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	14								14
M-5. Module of final sttestation											
ECA212	Preparation and defense of a master's thesis	FA	8								8
Total based on UNIVERSITY:								30	30	29	31
								60	60		

NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
		Б	П	С	И
BD	Cycle of basic disciplines	20	15	35	
PD	Cycle of profile disciplines	33	20	53	
	<i>Total for theoretical training:</i>	0	53	35	88
	RWMS		24		24
FA	Final attestation	8			8
	TOTAL:	8	77	35	120

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 11 or "21" 04 2024 y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 or "19" 04 2024 y.

Decision of the Academic Council of the Institute of Automation and Information Technology. Protocol № 8 or "29" 02 2024 y.

Vice-Rector for Academic Affairs

Acting Director of the Institute of A&IT

Head of the Department of Software Engineering

Specialty Council representative from employers, President of the Association of Innovative Companies of the SEZ

Uskenbayeva R.K.

Kalpeeva Zh.B.

Abdoldina F.N.

Konysbayev A.T.

6. Additional educational programs (Minor)

Name of additional educational programs (Minor) with disciplines	Total number of credits	Recommended semesters of study	Documents on the results of mastering the additional educational programs (Minor)